ECONOMIC ROLE OF DERIVATIVES ON BANK LENDING, FIRM VALUE AND ECONOMIC GROWTH: EVIDENCE OF SOUTH AFRICA

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ABSTRACT

The South African financial system has had substantive growth in the derivative market from 1996 up to the present day. The instruments are growing at an astonishing rate, although the economic growth of South Africa was unstainable. It is growing at a slow rate that cannot be matched to the rate of derivatives growth. However, the causal analysis of derivatives markets and economic growth in developed market economies revealed that the variables tend to move together over time. What remains thorny to researchers is the question as to why such a relationship exists. Is it a pure coincidence, wealth effect, or is the derivative market a mirror or a leading indicator of the economy, or does the derivatives market drive the economy or reverse? The present study wishes to find out the answers to such questions regarding South Africa through examine the impact of derivatives on bank lending and firm's value and consequently economic growth.

This study is predominantly quantitative, and it followed financial development-growth nexus studies to establish its methodology. The adoption of the methodology followed that derivatives are regarded as part of financial development instruments among stocks, bonds, bank loans, and other financial instruments. In terms of the estimation technique, the system generalised method of moments (GMM) was deemed appropriate due to its well-acknowledged ability to account for endogeneity prone with panel data set and growth-related models.

This study revealed that derivatives, irrespective of type, positively influenced lending in the banking industry. Thus, the evidence shows that loan portfolios of banks that participate in derivative instruments increase. In addition, the analysis shows that derivatives permit banks to lend more to the private sector; there is a positive statistical relationship at 1 percent significance. Listed non-financial firms on the Johannesburg Stock Exchange use derivatives to manage foreign exchange, market, price, and interest rate risks during their operations. The results obtained suggested that the use of derivatives generates value for non-financial firms. There is a significant hedging premium for South African non-financial firms that use derivatives. Derivatives permit more significant extension of credit to the private and public sectors, which impacts the economic growth of South Africa; that is, if there is a 1% change in the loan portfolio growth, the real GDP of South Africa expanded by 1.52%, as estimated by the research findings. Also, derivatives allow non-financial firms to undertake capital investments, increasing the yearly South African real GDP by 1.15% if there is a 1% change in the firm value.

It is observed that economic growth pinned its roots in the efficiency of the banking sector. Banks effectively provide funding through lending to the private sector to secure credit and interest rate risks with derivatives. Thus, it is availing liquidity in an economy that is essential for the firms to capitalise, finance capital projects, and invest in opportunities to derive economic activities. Thus, economic growth increases the production of quality goods and services through the private and public sectors.

The research findings documented in this study supported policies to inspire the development of derivative markets as part of financial development. This can help deepen the financial sector in South Africa, which will help stimulate economic growth. Therefore, it is recommended that policymakers adopt strategies that reinforce the development of derivative markets in the country through fiscal or monetary interventions.

Keywords:

Derivatives, hedging, firm value, bank lending, and economic growth

DECLARATION

I, Chikwira Collin, student number **21649353,** declare that

(i) The research report in this thesis, except where otherwise indicated, is my original research.

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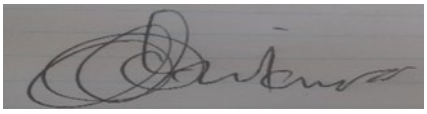
Signed  **DATE: 01 NOVEMBER 2021**

DEDICATION

This thesis is dedicated to GOD, my Mother, Vaida, my brothers, Joseph, James, Munyaradzi and Kudzai, and my sister, Marian.

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LIST OF ABBREVIATIONS

ADF	Augmented Dicker-Fuller
ARDL	Autoregressive Distributed Lag
BIS	Bank of International Settlement
CCPs	Central Clearing Counterparties
CBOT	Chicago Board of Trade
CDS	Credit Default Swaps
C &I	Commercial and Industrial loans
CF	Cashflows
EU	European Union
ECT	Error Correction Term
GDP	Gross Domestic Product
GMM	General Methods of Movement
JSE	Johannesburg Stock Exchange
JIBAR	Joburg Interbank Rate
IV	Instrumental Variables
OTC	Over-the-Counter
OLS	Ordinary Lease Squares
PWC	PricewaterhouseCoopers
ROA	Return on Assets
ROE	Return on Equity
SAFEX	South African Futures Exchange
SAFCOM	South African Commodities Market
SSF	Single Stock Futures
ISDA	Interest Swap Derivatives Association
VAR	Vector Autoregressive Model
VECM	Vector Error Correction Model
TA	Total Assets
MNCs	Multinational corporations
NIM	Net Interest Margin

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CHAPTER ONE:

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 INTRODUCTION

The speedy at which derivatives markets are evolved has prompted growth in research linking derivatives and economic development. The financial engineers, policymakers, researchers, and financial agencies are keen to find out the impact of derivatives on the financial system and economic growth (Oliinyk et al., 2019). They have been deemed power engines of the economy and financial system, which contribute to many aspects of the economy (Duc et al., 2019).

Vo, Huynh, and Ha (2019) maintained that derivatives markets in the financial system had accelerated financial stability and economic development. It implies that robust financial systems are arched with derivative markets, among other financial development components. Zhao and Moser (2017) defined a derivative market as an economic adapter that facilitates liquidity, smooth distribution of the vital blood of an economy through pooling world financial powered investors to distribute wealth through hedging and speculating in the financial market. Vo *et al*. (2019) assert that derivative markets allow the distribution of wealth among investors, the discovery of information by policy developers and makers, facilitate risk management on the precariousness of market variables, and protect primary industries from price instability.

Countries with derivative markets permit firms to carry out risk ventures because they can mitigate the calamities using derivative instruments, fuelling economic development and growth (Hong *et al.* 2019; Vo *et al.* 2019b). Moreover, derivatives are used to hedge against adverse outcomes for the firms that venture into high-risk and high returning capital projects. Also, in the banking industry derivatives, are vital assets mainly used to hedge interest rate and foreign exchange rate risks due to adverse outcomes of their trades (Tran *et al.* 2021). The benefits of hedging using derivatives allow firms to participate more in investments and banks in lending activities that increase production and economic growth. Several authors Phan, Nguyen and Faff (2014), Nguyen and Liu (2014), Sandu and Vanut (2014), Kim, Papanastassiou and Nguyen (2017a), Tanha and Dempsey (2017) and Nguyen, Kim and Papanastassiou (2018) explain that a derivative is a tool in the modern world used to alleviate costs and risks when the markets are imperfect. Thereby allowing firms to generate wealth and value is enhanced. In the financial technology world in which financial trading has become automated, one arm of the financial market where derivative instruments are traded has adapted. As a result, it is the fastest-growing market segment in the financial industry.

Escalating derivatives trading volumes ignited the banking industry to increase its lending activities to all sectors of the economy, irrespective of risks. It is because banks can secure their lending volatility with derivative instruments. Many authors, Brewer III, Minton and Moser (2000), Purnanandam (2007), Brewer III, Deshmukh and Opiela (2014), Zhao and Moser (2017), and Akhigbe *et al.* (2018b) empirically proved that those banks that hedge with derivatives can extend advances more efficiently, and their loan portfolios' growth is booming as compared to unhedged institutions.

Many empirical studies (Brewer III, Minton and Moser 2000; Purnanandam 2007; Brewer III, Deshmukh and Opiela 2014; Wen 2014; Zhao and Moser 2017) focused on derivatives impact on bank lending with bank lending proxied by commercial and industrial (C &I) loans. At the same time, Murray (2020) defined commercial and industrial (C &I) loans as loans issued directly for business use, not individuals purposes. The C & I loans can be given either to an individual but with the intention for commercial, industrial, and professional purposes. Under the C&I, loans exclude loans secured with real estate, financial institutions, and agriculture loans. C & I loans are the only way businesses can receive financing, but they are not one of the most accessible options. Prabha, Savard and Wickramarachi (2014) explained that C &I loans were used as a proxy for bank lending in empirical research, citing its functions of linking productive sectors of the economy and credit channels.

As explained above, C & I loans are for businesses. It excludes agricultural loans, real estate, and other financial institutions loans that the present study incorporated to extend bank lending and financing literature. The study contributed to the theory by evaluating the impact of derivatives on the growth of other loan types to the private sector, public sector, and mortgages—also, the effect of derivatives on aggregated loans, not only commercial and industrial loans. Combining public sector, private sectors, and mortgage loans and analysing their growth was a good proxy for lending activities in an economy. This empirical study also extends the literature by considering lending to be small and medium scales businesses, households, government, and mortgages.

Also, the study extended theoretical literature in corporate finance by assessing the impact of derivatives on the value of non-financial firms in South Africa. Although the literature on derivative use and firm value has grown in the last three decades, the effect on risk level and market value are still inconclusive. It is due to inconsistent reported empirical results. For instance (Allayannis and Weston 2001; Bachiller, Boubaker, and Mefteh-Wali 2021) confirm that the firm value is associated with hedging exchange rate risk. Phan *et al.* (2020) also ensure that hedged firms can increase their firm value by approximately 1.1 percent. Bachiller, Boubaker and Mefteh-Wali (2021) find that foreign currency derivatives derive firm value.

However, a contradiction exists in the empirical literature that is Geyer-Klingeberg, Hang and Rathgeber (2020) find that magnitude of firm value hedging using derivatives is shallow and not significant. Bernal-Ponce, Castillo-Ramírez and Venegas-Martinez (2020) confirm a decline in their total risk from interest rate changes but no effect on market risk. Adam, Fernando and Salas (2017) prove decreasing value due to hedging with derivatives, Likitwongkajon and Vithessonthi (2020) indicated that foreign investment is negatively associated with firm value and performance with the implication that foreign investments do not generate revenue growth and also no effect on firm efficiency. Firmansyah and Purnama (2020) find that the derivatives are not associated with firm value and considered harmful and unimportant for investment. Seok *et al.* (2020) indicated that use of derivatives for hedging had an insignificant impact to the firm value. Therefore, given these inconsistent results and the need to understand the diverse context of derivatives increasing usage in corporate finance motivate the current study utilising a case study of a single country South African listed non-financial firms.

Also, the main problem which yielded mixed results is the issue of endogeneity. For example, the effect could be omitted variables (Bujari, Martínez, and Lechuga 2016c). Therefore, in the significant difference in risk measures and corporate value between the firm value and derivatives empirical assessment, the study used a System Generalised Method of Moment (GMM) estimator, which is robust in controlling the endogeneity problem through data transformation by differencing the regressors and simultaneously removing the fixed effects. Also, persistent structural and behavioural heterogeneity between firms in developed and developing economies results in diverging economic implications on a firm's fundamentals, thus requiring a single country firm value analysis (Vengesai and Kwenda 2018).

The final section, which combined objectives one and two, linked the impact of derivatives to the economic growth contributed to the finance growth literature through putting together transmission channels that use the financial derivatives effects to the economic growth. While there are other channels through which derivatives can impact the overall economy, the current study gave special attention to bank lending and firm value.

The remainder of the chapter is organised as follows: the second section explains the background of the study, the third section covers the research problem, the objectives of the study and the aim are explained in the fourth section, the fifth section illustrates the research questions, the sixth section gives the importance of the study, and the seventh section explains the design of the research and delimitations of the study.

1.2 BACKGROUND TO THE STUDY

Lema and Grandes (2020) explained that a derivatives instrument is financial security or contract designed to derive its price or value from an underlying asset's price. For example, the price of oil futures contracts for 6-month maturity is derived from the price of oil today on the spot market. Likewise, the value of a 6-month call option on a sunflower is derived from the price of sunflower today on the spot market. Derivatives are not new financial instruments. Duc *et al.* (2019) highlighted that derivative markets were small until the 1970s. Since then, their growth has been driven by both demand and supply factors. In the 1970s and '80s, economic conditions such as rising volatility in stocks, interest rates, and exchange rates, along with the globalization of the capital markets, spurred demand for instruments to hedge risk (Bartram 2019). In addition, the introduction of new valuation techniques sparked the rapid development of the derivatives market. In the 4th industrial world, we cannot imagine modern finance without derivatives instruments. Four types of derivatives populate the market are forwards, futures, swaps, and options.

To support the growth rate of derivatives in modern commerce, the following chart in Figure 1 depicts that they are exponentially growing from their lower levels to higher levels. Figure 1 illustrated the derivatives growth trend at global markets,

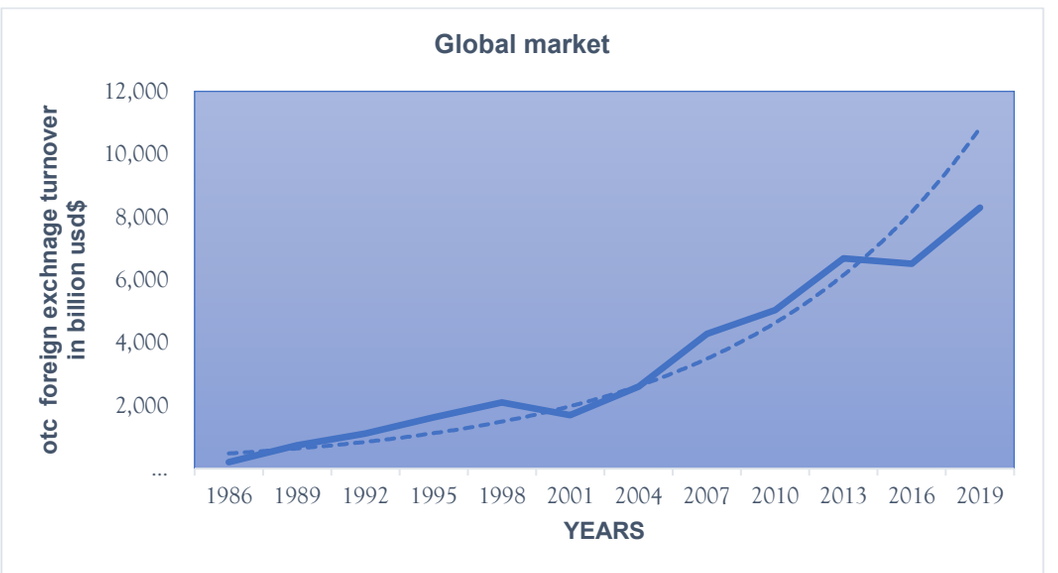


Figure 1. 1: OTC foreign exchange turnover by country in April 1986 - 2019

Source: Author's computations from Bank for international settlements triennial dataset

The BIS triennial central bank survey showed that derivatives are exponentially growing for the global derivatives market, as depicted by the dotted lines in Figure 1. The chart shows the average daily OTC exchange derivatives turnover in billions of United States dollars (USD) from 1986 to 2019. The statistics trend shows foreign exchange swaps, currency swaps, spot transactions,

options, and other foreign exchange products on the OTC derivatives market, which the banking institutions and non-financial firms mainly man.

Tanha and Dempsey (2017)show that the global derivatives markets have grown dramatically in the past three decades, despite experiencing a slowdown after the onset of the global financial crisis in 2008/9. However, the market size cited in the news media often refers to the notional amounts outstanding of contracts.

The Bank of International Setlement (2015) and Bank of International Setlement (2019) surveys reported derivatives showing that they are increasingly used in modern-day commerce. The statistics on the notional value of the global derivatives market at year ended 2014 were $630 trillion, with $532 trillion recorded in 2017 and $595 trillion in 2018 and $640 trillion by the year ended December 2020 for the value of the contracts outstanding. The structure and size of the global derivatives market are comprehensively reflected in these statistics. The statistics reported are the triennial survey covering exchange-traded derivatives, prime positions in the OTC markets, and turnover in the foreign exchange and OTC interest rate derivatives markets.

This reflects the phenomenal speed with which these derivatives financial instruments have evolved. Today derivatives have an estimated value of $640 trillion (Maverick 2020). To put this figure into perspective, it is several times greater than the whole world's gross domestic product (GDP), estimated to be $133 trillion (Hamadeh, Yamanaka and Purdie 2020). Then, derivatives were considered exotic instruments used only by the highest international finance priests; these have become ubiquitous. Moreover, more and more companies and even some governments are using or being forced to use derivatives in a fast-changing world of unprecedented risks. An understanding of derivatives is thus a necessity for anyone interested in the financial markets.

According to Abdel-Khalik and Chen (2015), statistics reveal that the total amount of derivatives traded among the largest 25 US banks increased by eighteen times from $16.6 trillion in 1995 to $308 trillion in 2012, while the US Gross Domestic Product (GDP) doubled from $ 7.7 trillion to $16.2 trillion over the same period. Support from International Swaps statistics shows that derivatives instruments are increasingly growing at an astonishing rate in the banking sector. The International Swaps and Derivatives Association (2019) (ISDA) revealed that derivatives' outstanding value was US$460.4 trillion, which was 7.7 percent greater in 2018 than in 2017. These figures showed volumes of derivatives reported in the banking institutions that take part in the surveys. The growth of derivatives in each sector reports a hidden benefit that cannot be resisted even as they become dangerous commerce instruments. Banks are the main players on the OTC derivatives market as either dealer, end-users, or acting as counterparties for intermediaries (Callahan and Hairston 2020). They also take positions in OTC swaps and exchange-traded futures

contracts to exploit arbitrage opportunities between two markets. Moreover, banks generate revenues by speculation through interest rates, commodities, equities changes, and foreign exchange fluctuations (Oliinyk *et al.* 2019).

A snapshot of a cross-sectional analysis of leading commercial banks (Absa, Nedbank, Standard Bank, and FNB Bank) financial reports growth of derivatives in the South African banking industry. It indicated that derivatives are increasingly used for hedging to secure the variability of operational and market risks (ABSA Bank 2016). The value of derivatives in 2016 increased by 28.7 percent and 18.7 percent for futures and options, respectively (Noumba 2018). Furthermore, the derivatives financial instruments increased by 29 percent from January 2015 to January 2016 (South Africa Reserve Bank, 2016). In addition, the Reserve Bank of South Africa further indicated that derivative instruments held by banks in South Africa grew from R261 billion to R337 billion between 2015 and 2016. Also, the JSE market profile (Johannesburg stock exchange 2018) strengthened the argument through their analysis which revealed that foreign currency derivatives are the most significant traded security followed by interest rate derivatives in terms of turnover. Again, the banks are the leading players. Furthermore, Bank Supervision Department (2018) also exhibited that in the banking sector, derivatives financial instruments held by banks as assets and liabilities expanded from 25.5 percent to 35.9 percent in 2018.

For the same periods, the loans issued increased from R3 674 billion in 2016 to R3 801 billion in 2018, as extracted from the Reserve bank of South Africa statistics. It also indicated that lending to domestic and commercial loans increased, and gross loans and advances had a growth rate of 2% in 2018 from1.4% in 2017 (Bank Supervision Department 2018). Most interestingly, banks are the major players in OTC markets. Brewer III, Minton and Moser (2000)Price Waterhouse Coopers (PWC) (2012), their study commissioned by the National Treasury of South Africa, reported that as of June 2012, OTC derivatives were valued at R27,7 trillion. This amount includes interbank trades between domestic and foreign banks and between domestic banks and other non-financial participants, including corporates.

Price Waterhouse Coopers (2016), from their analysis of major banks in South Africa, reports that combined earnings grew by 12.5%, which was driven by operating income which rose from 6.9%. Furthermore, the average return on equity, which grew by 17.9% from 2015 and 2016, concluded that banks are making profits in South Africa.

The exhibited evidence above showed a progressive growth of lending in the bank sector. As a result, banks are making profits, and there is also the growth of derivative usage in the South African context. Therefore, it raised the need for the present study to analyse if banks are using derivatives to increase lending volumes, are the derivatives used for hedging loan growth, and the

impact of derivatives growth on the bank lending in South Africa. Given the evidence of growing rates of loans and expansion of derivatives use in the banking industry. The study hypothesis is that what is the impact of derivatives on bank lending in South Africa. Theoretically, the use of interest rate derivatives helps banks manage mismatched maturities, reduce monitoring costs, and promote efficient lending by banks (Zhao and Moser 2017).

In the private sector, non-financial firms use derivatives when they are faced with uncertainty and financial constraints. In South Africa, non-financial firms are trading foreign exchange swaps and currency swaps (Clicks Group 2017). The BIS 2019 survey exhibited that in South Africa, non-financial customers are trading foreign exchange derivatives more and had a turnover of $4,682 million US dollars on a daily average. The OTC exchange market in South Africa revealed that it is trading spot transactions, outright forwards, foreign exchange swaps, currency swaps and options, and other products. The second-largest traded instruments by the non-financial firms are interest rates derivatives. Also, the instruments reported by non-financial firms trading on the interest rate derivatives are forward rate agreements, swaps, options, and other products. It has a turnover of $1,045 daily, averages in millions of US dollars. These statistics were based on the South Africa OTC derivatives markets, proving that derivatives are increasingly used daily in the corporate business. Phan *et al.* (2020) suggested that derivatives aid as a value-increasing strategy for a firm by reducing the costs and risks brought about by market imperfections. Seok *et al.* (2020) indicated that firms use derivatives to smother their earnings streams, confirming that corporate hedging enhances value compared to non-hedging firms. This is evidenced by higher profits and lower earnings volatility than non-hedgers. Firms using derivatives to hedge can actively manage their balance sheets by hold less cash and accessing external financing in capital markets. Derivative markets through their rate of growth have attracted a wide range of users in an economy which varies from financial institutions, government entities, corporates, hedge funds, and companies that manage assets (Prabha, Savard, and Wickramarachi 2014b).

Overall, economic growth occurs when the number of resources available to the economy increases, existing resources are used more efficiently, and new resources are introduced into production (Ross 2019b). In South Africa, economic growth is unsustainable, characterised by ups and downs mainly caused by severe droughts, which ended in 2016, and rampant commodity price cycles (Stats SA 2019). The economic growth is reviewed in the growth rate of the real gross domestic product (GDP). In South Africa, evidence showed that the annual growth rate of services declined from 3.9 percent in 2011 to 1.3 in 2016. Also, the major contributor to the growth of real GDP, the manufacturing sector growth rate fell from 3 percent in 2011 to 0.7 percent in 2016. At the same time, the mining sector was erratic. It registered negative growth rates in 2012 and 2014

before it raises to 3 percent in 2015 and fell to 1.1 percent in 2017 (Bank Supervision Department 2018). Through the Reserve bank of South Africa analysis, it revealed that real gross domestic product (GDP) per capita growth (annual in percentage) was declining since 2015 by 0.345 percent to 0.012 percent in 2017 (SARB 2018). Also, productivity growth has been slowed and appears to be slowing that is industry value-added as a percentage of GDP declined from 27 percent in 2015 to 25 percent in 2018 (Kreuser and Newman 2018) and (Aterido *et al.* 2019).

The country registered a gradual decline in the industrial sector from 5 % in 2010 to a negative 0.6 percent in 2016, and a pattern replicated in agriculture (Cook 2020). Also, Quantec standardised industry (2019) highlighted that recently the country entered a technical recession in the second quarter of 2018 as GDP declined by 0.7 percent after a 2.6 percent fall in the first quarter of 2018. This was mainly due to the negative contributions recorded in trade, transport, agriculture, and household consumption. However, later in the third quarter of 2018, the economy improved due to ending droughts and recovery of commodities prices on the world markets with 1.4 percent in 2018, 1.8 percent in 2019, and 1.9 percent in 2020.

Also, Statistics South Africa (2017) indicated that unemployment increased to high levels from 25.15 percent in 2015 to 27.04 percent in 2017, and the inequality remains very high (Wittenberg 2017). Given these reports, it is exhibiting that the South African economy is unsustainable. Low economic growth entrenches poverty and inequality. The challenges in the South African economy have over time been worsened by sustained low levels of investment and development (Aterido *et al.* 2019). With regards to increasing use and development of derivatives with the rate of economic growth in South Africa raised the need to analyse the impact of derivatives through bank lending and firm value on the economic growth of South Africa. The report of the Johannesburg stock exchange (2018) showed that derivatives are growing and are increasingly being used as instruments of the capital markets, locally and even in the global market. Salahuddin and Gow (2016) hypothesis that derivative markets provide the richest and largest source of information for policymakers, especially on the expectations of interest rates and volatility of prices.

However, despite the growth and increased usage of derivatives in the South African economy, South Africa has experienced many economic upheavals during mid-2015, which were believed to have been amplified by the macroeconomic developments and volatility of the world markets. The unsustainability of the South African economy has amplified the questions of who are the beneficiaries of derivatives growth in the economy? If the pillars of the economy are struggling to sustain the upheavals of the market fundamentals while derivatives are growing in use in the economy of South Africa.

Furthermore, to support the evidence that the derivatives are growing in the South African economy. Figure 2 below illustrates the exponential rate of growth of derivatives in the economy through the financial system. Figure 2 shows that derivatives are increasingly used and traded, as exhibited by the volume of foreign exchange derivatives transactions (see Figure.2 below). Statistics in Figure 2 below show the triennial turnover of foreign exchange derivatives from 1986 to 2019.

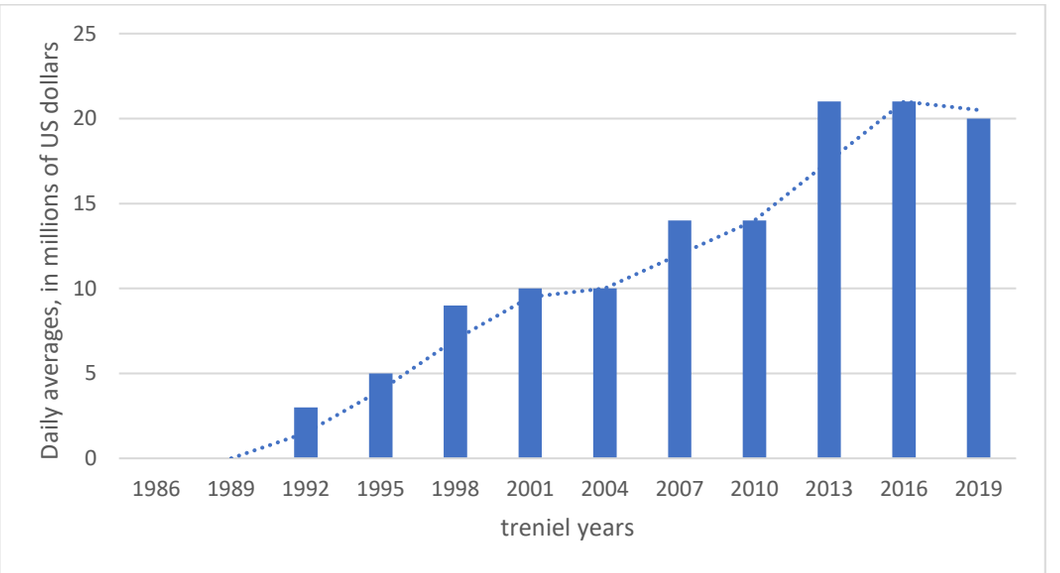


Figure 1. 2: South Africa Turnover of OTC Foreign Exchange Instruments

Source: BIS Triennial OTC derivatives statistics (TRIENNIAL) 2019

From Figure 2, South Africa started trading OTC foreign exchange derivatives in 1992, and the growth rate as depicted in Figure 2 to present is increasingly unstoppable. In South Africa, through April 2019, a foreign exchange market survey showed that banks were covering 75% of the reporting dealers. The survey also reflects that the number of banks participating in the OTC derivatives was four, and it grew to 11 from the period 1992 to 2019 (BIS) (2019).

The most traded and held derivative instrument is the interest rate derivatives and evidence from the triennial central bank survey reflected in Figure 3 below. The South African interest rate derivative market shows that it is growing daily as the volume of transactions in millions of USD is illustrated in figure 3.

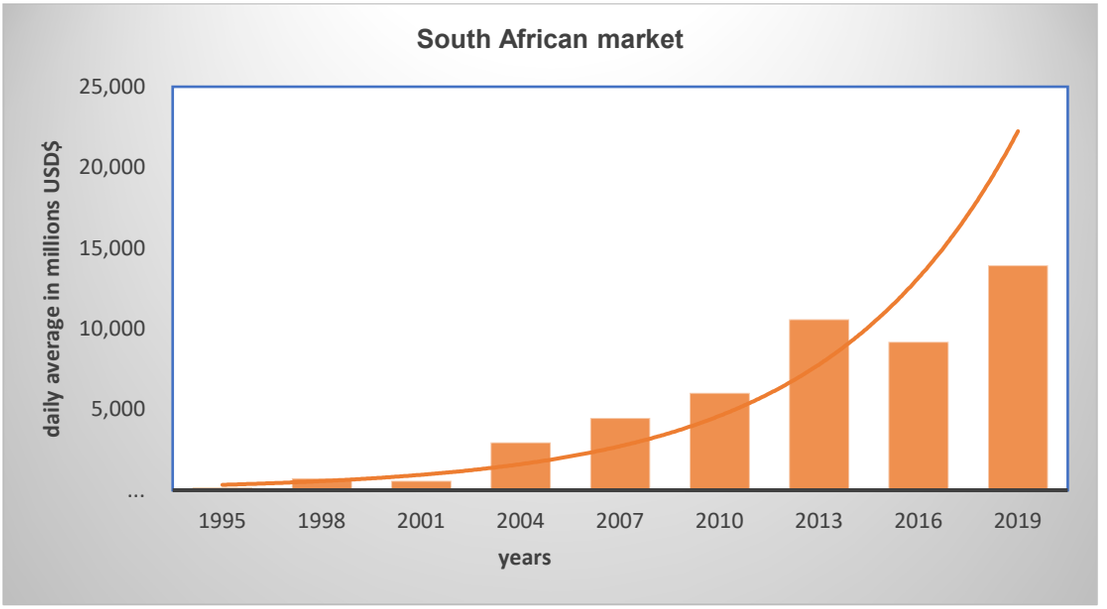


Figure 1. 3: OTC Interest Rate Derivatives Turnover April 1995 – 2019

Source: Author's computations from Bank for international settlements triennial dataset

Although the OTC derivatives market was characterised with no or limited regulation, this study was carried out when the regulations had made great inroads through the Dodd-Frank Act. In South Africa, this was through the Financial Markets Act of 2002, which came into effect in June 2013. The legislation propounds the objectives for the regulation and supervision of the OTC derivatives market. The regulatory framework aimed to maintain a stable financial market environment, reduce systematic risk, promote fair, efficient, and transparent markets, and boost investor confidence and protection.

The current study is built on augmented growth of derivatives use in the banking industry, non-financial firms, financial firms, government institutions, hedge funds, insurance companies, and even individual investors in an economy. Firmansyah and Purnama (2020) strengthen the argument on the growth of derivatives use though highlighted that price volatility, globalisation of markets, developments in technology, and discoveries in the financial theories have contributed to the explosive growth of derivatives. Given the rate at which derivatives grew and inconsistent empirical results created inconclusive debate on the practical importance of derivatives in the financial system.

Despite the growth, derivatives were also blamed for causing financial losses in commerce. For example, in the mid-1990s, trading derivatives were responsible for the collapse of Orange County, Procter, and Gamble and Mettagesellschaft and Barings Bank and the financial crisis of 2008/9 (Batta and Yu 2017b). The 2008/9 financial peril almost brought the global economy to a standstill, and the primary culprit was derivative instruments (Geyer-Klingeberg, Hang and Rathgeber 2020).

Especially OTC derivatives, particularly credit derivatives, were severely criticised, and even the greatest moneyman in history (Warren Buffet) described derivatives as "weapons of mass financial destruction" (Elwes 2018). Batta and Yu (2019) explained that credit derivatives raised counterparty risk, and if not controlled, their impact can contribute to the nearby shut down of the financial system. Consequently, significant regulation changes were proposed to institute and increase transparency to reduce systemic risk.

Given all the said risks explained, which were caused by trading and holding of derivatives instruments in the course of doing business, it is surprising that derivatives volumes are instead expanding in numbers. Before and after the calamities, derivatives grew at an astonishing rate in business and investments (Firmansyah and Purnama 2020). This explained that the corporate world wishes to reap the benefits brought by the derivatives instruments in finance. In addition, the massive growth of derivatives leaves many questions unanswered; specifically, their influence on the firm value, economic system growth, crises, and stability. Additionally, the presence of derivatives instruments in the financial markets supplicates the obvious question of what purpose they serve. According to Tejado, Pérez and Valério (2018) hypothesis which explains "equity and other fundamental markets exist and usually perform reasonably well without derivative markets." Therefore, from the theory's perspective, derivative markets may be essential apparatus in an economy because they can improve the performance of the markets of the underlying instruments. Ayturk, Gurbuz and Yanik (2016a) and Batta and Yu (2019) argue that derivative instruments bring economic benefits that do not exist if absent from the capital market.

Giraldo-Prietoa *et al.* (2017) highlight those derivative markets offer vast economic benefits if one appropriately understands how to deal with derivative instruments because they are very risky financial assets, although they enhance the necessary liquidity and mobilise the required capital for economic growth. In the capital market, where investors search for lucrative investments, they also employ derivative instruments to unbundle and redistribute various risks to secure their wealth against market volatility. Furthermore, derivatives permit foreign exchange, interest rate, market, and default risks to be mitigated. In the end, it will facilitate cross-border capital flows and create more opportunities for portfolio diversification (Sajjad *et al*., 2013). Regardless of the danger and criticism attached to the derivative markets, these markets are the pillars of several economic functions such as hedging adverse outcomes, risk management, and liquidity enhancement in the capital markets (Giraldo-Prietoa *et al.* 2017).

Ayturk, Gurbuz and Yanik (2016a) are theoretical perspectives that emphasise that for the financial system to trade smoothly and transact efficiently, derivative markets are fundamental institutions as part of the capital markets. Therefore, derivative markets make the capital market an attractive

platform for investors and the corporate world. Furthermore, Shen and Hartarska (2018) explained that the evidence reflected that derivative instruments have been in existence for many years because of their ability and beneficial contributions in promoting commerce and businesses of all forms and sizes. Hence, the derivatives' benefits and contributions in corporate finance are traced in risk mitigation, liquidity generation on the capital markets, and investor price discovery. In an in-depth analysis, derivatives are of significant assistance in completing markets and equipping firms and investors with the ability to move freely among investment opportunities at their disposal (Geyer-Klingeberg, Hang and Rathgeber 2020).

In corporate finance, it is argued that individuals, governments, and companies borrow to finance their operations, investments opportunities, and fund capital expenditure as a basis for supplementing their capital. Steadily, the explosive use of derivatives by banks and non-financial firms is illustrated above. The overwhelming borrowing trends in South Africa mean the non-financial firms borrow for capitalisation, investment opportunities, and expansion. This has brainstormed the impact of derivatives on banks' lending activities and firm value, which trailed to economic growth. According to ABSA Bank (2016), financial reporting note 52.8, the Bank utilizes derivative instruments to hedge against adverse effects. The Bank ensures loans, assets available for sale, borrowed funds, and debt securities through interest rate derivatives. The main instrument used to hedge with ABSA bank is the interest rate swaps, a better tool to protect market interest rates, gains, and losses on hedging instruments and hedge items (ABSA Bank 2016). Given this background, the following questions emerged,

- Who are the beneficiaries of the profound growth of derivatives in the economy?
- Do derivatives play a critical role in the lending activities, and which sector is benefiting more from the growth of derivatives?
- Do banks, institutions, firms, and governments hedge against uncertainties in these continued demands of loan markets?
- In addition, is the increasing use of derivatives impact the non-financial firm in South Africa?
- Do derivatives have any role in the acceleration of global markets and trade?

Although the qualitative welfares underpinned derivative markets have received a thoughtful review, well known, and learned in qualitative financial theory, an excessive amount of philosophical scepticism remains (Geyer-Klingeberg, Hang and Rathgeber 2020). Numerous studies (Allayannis, Lel and Miller 2012; Ivilina and Betty 2014; Ayturk, Gurbuz and Yanik 2016a; Altuntas *et al.* 2017; Likitwongkajon and Vithessonthi 2020; Moding and Wahlgren 2020) noted

that empirical had been conducted primarily focused on the data from developed economies and emphasised derivative valuation, growth, and effectiveness of risk management. None of these studies analysed the practical impact of the growth of derivatives on firm value, bank lending, and their impact on economic growth in the context of developing economies such as in Africa.

Persistent structural and behavioural heterogeneity between firms in developed and developing economies results in diverging economic implications on a firm's fundamentals; thus, the current study analysed a single country South Africa (Vengesai and Kwenda 2018). Also, since firms in developed economies may behave differently from those in developing economies due to different market implications and conditions, it is worthwhile to investigate firms and banks in developing economies separately.

Furthermore, the present study contributes to several critical dimensions of the literature on derivatives and firm value, bank lending, and economic growth. First, it provides evidence not explored in Africa, a developing continent, particularly South Africa, a leading economy in Southern Africa. Second, the study differs from all other studies in that it assesses the banking sector lending proxied by aggregate loans and breaking lending into private, corporate sectors, and mortgages. Third, it does not distinguish which derivative instrument had a higher effect on bank lending activities than the other because of the economies of scale effect. Fourth, the few studies concentrate on developed economies using commercial and industrial lending as a proxy for bank lending. This study breaks new ground by rigorously quantifying the practical impact of derivatives on firm value and bank lending linked to economic growth using data from Africa. Fifth, the analysis exposes the misunderstandings attached to derivatives 'role in different economies and their increasing usage of these instruments in other financial markets. Finally, the study's outputs provide more insight into the importance of derivative instruments and further their role in promoting economic expansion and contributing to overall economic stability.

Furthermore, the study was carried out when OTC derivatives market regulation had made great inroads through the Dodd-Frank Act. In South Africa, through the Financial Markets Act of 2002, which came into effect, June 2013. The legislation propounded objectives for the regulation and supervision of the OTC derivatives market. The regulatory frame aimed to maintain a stable financial market environment, reduce systematic risks, promote fair, efficient, and transparent markets, and boost investors' confidence and protection. Most interestingly, banks are the major players in the OTC markets.

Furthermore, the study employed a dynamic panel data model estimated with system generalised methods of moments (GMM) and time series econometrics (Vector autoregressive (VAR) model). The GMM estimation technique is robust in controlling endogeneity, autocorrelation, unobserved

heterogeneity, and dynamic panel bias. Thus, to the best of the researcher's knowledge, this study contributed to the body of knowledge through the use of dynamic panel model and GMM to analyse the usage of derivatives and bank lending activities, utilising data from an emerging country which is in Sub-Saharan Africa, of which most of the studies done in this area were concerned with the developed markets.

1.3 RESEARCH PROBLEM

The financial system's derivative markets are the centre pivot because they provide vital economic benefits(Duc *et al.* 2019). Oliinyk *et al.* (2019)'s theoretical view considered that economic efficiency and economic growth are the crucial roles derivatives bring to the global economy, citing their exceptional growth in the world financial system. Furthermore, derivatives can effectively transfer risks, alleviate the moral hazards associated with information asymmetry, and reduce operating costs (Hong *et al.* 2019).

Globalisation and topical financial developments have increased financial exposure in the firm's management portfolio, ranging from adverse changes in interest rates and commodity and equity prices and liquidity crunches. The variations in the modern business strategies increased the overall riskiness and losses of firms and lower economic growth(Şendeniz-Yüncü, Akdeniz and Aydoğan 2018). Financial and non-financial firms are continually engaging the use of derivatives to deal with these risks. This hypothesis was strengthened by statistics, which recorded an astonishing rate of derivative usage. The Bank of International Settlement (2014) recorded US$630 trillion, which was supported with evidence from Bujari, Martínez, and Lechuga (2016), which tabulated US$592 trillion derivatives outstanding contracts. The International Swaps and Derivatives Association (2019) (ISDA)'s 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 end of the year 2018. These instruments have attracted a wide range of users in an economy which varies from financial institutions, government entities, corporates, hedge funds, and companies that manage assets (Prabha, Savard, and Wickramarachi 2014). Despite the growth in derivatives usage, these instruments have been blamed for several financial crises, including the recent 2007/8 global financial turmoil(Geyer-Klingeberg, Hang and Rathgeber 2020).

In the south African economy, derivatives were increasingly used in the banks, private sector, and the general economy, although the economy is exhibiting unsustainability and growing slowly. Therefore, there is high growth in derivatives, high lending, and low economic growth as intended. Given that there is an inverse relationship between derivatives growth and economic growth, this

led to the recent study to analyse the banking lending and firm value channels to the growth of the South African economy. Also, inconsistent empirical results in developed economies (Haiss and Sammer 2010a) and(Prabha, Savard and Wickramarachi 2014b) concluded a weak relationship on derivatives to the overall economic performance and more significant impact of derivatives on the economic performance, respectively. Therefore, this study examines the economic benefits of derivatives on economic growth through bank lending and firm value using South African data.

1.4 AIM OF THE STUDY

The study aims to analyse the impact of derivatives on bank lending and firm value and establish their impact on economic growth in South Africa.

1.5 RESEARCH OBJECTIVES

The aim of this study will be achieved through the following objectives.

i. To examine the impact of derivatives usage on firm value
ii. To determine the impact of derivatives usage on bank lending in South Africa.
iii. To establish the impact of derivatives on the South African economic growth through firm value and bank lending.

1.6 RESEARCH QUESTIONS

i. What are the effects of derivatives on firm value in South African listed non-financial firms?
ii. What are the effects of derivatives use on bank lending in South Africa?
iii. What is the impact of derivatives on economic growth through bank lending and firm value?

1.6.1 DESCRIPTION OF THE PROPOSED FRAMEWORK TO BE ADOPTED

The study followed a quantitative research approach and employed a generalised method of moment (GMM) and vector autoregressive (VAR) estimation techniques to test the causal relationships among the variables with the dynamic panel data models. The study assesses the impact of derivatives usage on economic growth through bank lending and firm value in South Africa using secondary data from 1996 to 2017. The period starting in 1996 was chosen because more derivatives instruments were introduced. In 1990, equities derivatives, 1995 commodities derivatives were introduced, and the current electronic platform of JSE was introduced in 1996, so it was good to start considering 1996 where trading was done electronically—assuming the

accuracy of data reporting and capturing than were done during the manual period. Therefore, the study considers data from 1996, considering that many reforms in the early stages of setting derivatives were fully completed, implemented, and automated.

1.6.2 HYPOTHESIS

H0: There is **NO** positive relationship between derivatives usage and firm value.
H1: There is a positive relationship between derivatives usage and firm value: Evidence from JSE listed firms.

H0: There is **NO** direct relationship between derivatives use and bank lending in the South African banking industry.
H1: There is a direct relationship between derivatives use and bank lending in the South African banking industry.

H0: There is **NO** positive relationship between derivatives and economic growth.
H1: There is a positive relationship between derivatives and economic growth.

1.7 SIGNIFICANCE OF THE STUDY

Faiza , Umara and Khalid (2013) highlighted that derivatives provide considerable trade and industrial benefits. If properly engaged, it boosts liquidity and mobilises the necessary capital for economic development. The capital market derivative instruments provide investors with an opportunity to redistribute and unbundle risks if dealing with variations in foreign exchange, interest rates, market, and default risks. Through their facility of allowing hedging and speculation, Derivative instruments permit cross-border capital inflows and, therefore, more portfolio diversification opportunities. According to Sill (1997), financial markets can operate more efficiently if there are derivative markets because they are successful institutions. Hence, derivative markets possess benefits, which can be traced in the risk management in corporate finance. In the capital market, prices are reviewed among the underlying instruments, making the capital market liquid. Therefore, the glittering coat on the derivatives allows firms and investors to move freely and simply from one investment to another. This means that credit extension and advances can occur at a lower cost. The homeowners can borrow from the mortgage markets at a lower cost. Raising funds for investments in the financial markets will be done at a lower cost and efficiently, thereby accelerating economic growth.

1.8 SCOPE OF THE STUDY

The study was confined to derivatives usage and economic growth in South Africa. South Africa was chosen because it has a robust and well-established derivative market in Southern Africa. The

study aimed to analyse the banking sector credit extension, firm value and derivative usage, and their impact on the South African economic growth from 1996 to 2017.

1.9.1 LIMITATIONS

The limitations for this study were mainly on data access since the institution does not have a Bloomberg terminal. There were delays in securing the much-needed data since the study mainly depended on secondary data sources. The findings of this study cannot be generalised across countries due to persistent behavioural and structural heterogeneity. Thus, the study's finding is limited to a single country, that is, South Africa.

1.9.2 DELIMITATIONS

The study used South African data for the period 1996 to 2017. The information was extracted mainly from the supervision department of the South Africa Reserve Bank situated at 370 Helen Joseph Street, Pretoria. In addition, information was obtained from the Bloomberg financial database.

1.10 GENERAL OUTLINE OF RESEARCH METHODOLOGY

This study is predominantly quantitative, using secondary data on bank lending, firm value, and economic growth to attain the research objectives. The results were estimated using the generalised method of moments (GMM) and vector autoregressive (VAR) estimation models.

1.10.1 Population

Richard et al. (2019) define a population as all members of the specified group. A research population is a well-defined, classified group of individuals or objects which have similar characteristics. This is because the individuals or objects which are assessed have common and binding traits. The population of this study constituted of all non-financial firms listed on the JSE and all the banks in South Africa. The JSE constitutes three hundred and ninety-nine (399) non-financial listed firms, seven (7) listed banks, and sixty-four (64) registered banks that are not listed on the JSE.

1.10.2 Sampling method

The sample was chosen purposively based on derivatives usage. In this respect, all banks and non-financial firms that participate in the derivative markets of South Africa were considered for the study. The final sample for estimation constituted of 150 non-financial listed firms, seven listed banks, and 64 non-listed but registered banks.

1.10.3 Data sources and issues

Secondary data were extracted from the published financial statements and call reports, which banks file with the statistics department of the South African Reserve Bank in the BD900 form. For non-financial firms and economic growth variables, data were obtained through the Bloomberg financial database.

The following variables were used to analyse the economic impact of derivatives on the economic growth of South Africa:

- Derivatives notional value;
- Derivative instruments – foreign exchange, interest rate, commodity, equity;
- Gross loans and advances (overdrafts, loans and advances to the public sector, private sector, and mortgage advances);
- Total assets, total equity capital, liquid assets, cash, net interest margin, and return on average assets;
- Firms' profitability – net profits to total assets;
- Leverage – long-term debt to total assets;
- Firm size – natural logarithm of total assets;
- Cash flows – cash flow to total assets;
- Liquidity – Cash and cash equivalents to current liabilities; and
- GDP annual growth.

1.10.4 Data analysis

The study employed a dynamic panel data model estimated with the generalised methods of moments (GMM) to attain its first and second objectives. To be precise, the third objective was spanned using time series econometrics, Vector autoregressive (VAR) model. This estimation technique was adopted to test the causality pattern between economic growth and derivatives in South Africa from 1996 to 2017. Variables considered for VAR include the real gross product (GDP annual growth) as a measure of the overall economic activity; bank lending measured as the average loans to households, government, and corporates of sample banks; and the average market-to-book value of non-financial firms listed on the JSE.

1.11 THESIS STRUCTURE

The study is divided into five chapters, as outlined below.

1.11.1 Chapter One: Introduction to The Research Problem

This chapter covered the introductory phase of the study, which highlighted the background of the problem, outlined the research problem, the objectives, research questions, the significance of the study, and the review of the procedure to be followed in conducting the study.

1.11.2 Chapter Two: Theoretical and Conceptual Framework

The chapter covered the theoretical aspects of the impact of derivatives on firm value, bank lending, and economic growth. The chapter also covered the literature on how firms and banks use derivatives for risk management, price discovery, and liquidity enhancement. On the other hand, the historical aspect of derivatives was cited globally and in South Africa as a nation. The conceptual framework aspect of the study was explained, highlighting the interlinks between bank lending, firm value, and economic growth through the use of derivatives.

1.11.3 Chapter Three: Empirical Review.

The study aimed to interrogate the impact of derivatives on bank lending, firm value, and economic growth. First, the analysis of derivatives and bank lending across the globe was explained. Also, the derivatives and firm value were explained in this chapter. Then, the empirical aspect of bank lending and derivatives usage was reviewed in this chapter. Firm value and derivatives usage empirically and how derivatives impact economic growth were also reviewed in this chapter.

1.11.4 Chapter Four: Methodology

Chapter four of the study is about the research methodology. The chapter firstly explained the research design, theoretical aspect of GMM, VAR models, model specifications, data sources and issues, post model diagnostics, and estimation techniques.

1.11.5 Chapter Five: Research Findings and Analysis

The chapter outlines how the objectives of this study were achieved and presents the results of the study. Descriptive statistics and model results' estimations and interpretations were explained in this chapter.

1.11.6 Chapter Six: Conclusions and Recommendations

A summary of the results and recommendations were outlined in this chapter.

1.12 CHAPTER SUMMARY

This study seeks to investigate the economic contributions of derivatives to the economic growth of South Africa. The benefits of holding and trading derivatives were extended to hedging exposure by non-financial firms so that they can carry out investment opportunities with internal and external funds. Funding growth with external finances, taking risk projects with certainty, predicting possible outcomes using derivatives, and ensuring their exposure. The justification of the study, objectives, and layout of the whole research was presented to guide the road to success.

The next chapter analyses the derivatives literature on bank lending, firm value derivatives, and economic growth. Again, theoretical and empirical evidence will help the study shape and contribute to the methodology provided in the next chapter.

CHAPTER TWO:
THEORETICAL AND CONCEPTUAL REVIEW

2.1 INTRODUCTION

The previous chapter provided the roadmap on which the study followed. It established that the derivatives are the engine that pumps the much-needed resources, making the financial system liquid. Therefore, it is a vital component of economic sectors' functioning and permits corporates to produce and add to economic growth.

This chapter established the theoretical roots underpinned the study and its empirical framework. In creating an inimitable theoretical domain for this study, this section explored micro-and macro-level approaches in analysing literature on derivatives and firm value, banking credit extension, and economic growth. Chapter two provided an outline of the historical background attached to the derivatives' theories and trends. Finally, the theoretical importance of derivatives to the financial world relating to the research is outlined in developing the main theoretical foundations of this study. The chapter is divided into three sections; that is first part explains the historical perspective of derivatives and derivative developments in commerce, the second section explains the theoretical background of the study, and the final section develops the study's conceptual framework.

The remainder of the chapter is organised as follows. Section two details the historical aspect of derivatives, development of derivatives in commerce, followed by derivatives hedging, derivatives and hedging theory, bank lending, firm value, and economic growth theories. And the last section explained the conceptual framework.

2.2 HISTORICAL BACKGROUND OF DERIVATIVES

According to professor of derivatives, John Hall (1946), derivatives are defined as financial assets with their value-driven from another more basically underlying asset/variable. Prices of financial assets traded on capital and over-the-counter (OTC) markets are the variables from which derivatives derive their value, referred to as underlying instruments. However, because of developments in financial theory, derivatives can derive their value from any variable. They are now active trading derivatives in electricity, weather, and insurance. Derivative instruments are traded on two distinctive markets, either through trading platforms (electronic platforms) like the Johannesburg stock exchange (JSE), which carries the phrase 'exchange-traded market' or trade through bilateral platforms OTC market (Hull 1946).

As early as 1848, the pioneer commodities exchange was formed in the United States. To alleviate the sources of credit defaults, the Chicago Board of Trade (CBOT) provided a platform for negotiations for the forward contracts. This led to the first exchange-traded derivative being listed in 1965 and forming the first futures clearing house in 1925. The Chicago Mercantile Exchange and CBOT formed the Chicago Mercantile Exchange (CME) group in 2007 (Prabha, Savard, and Wickramarachi 2014b).

In South Africa, the Rand Merchant Bank started trading in derivatives in 1987. In the same year, five (5) contracts were available for trading futures contracts. All trading was done telephonically. Moreover, a year later, in September 1988, twenty-one (21) banks and financial institutions established the South African Futures Exchange (SAFEX) and the South African Commodities Market (SAFCOM). In April 1990, SAFEX, a clearing company, took over clearing operations in South Africa to clear commodities on the JSE (Leibrandt 2014). As a result, the trading of contracts for futures settlement was made accessible on equity, debt instruments (long-term bonds), and short-term financial instruments traded on the money market. Derivatives in South Africa moved to the current electronic platform (JSE) in May 1996, and options on futures were listed in 1999 as Single Stock Futures (SSFs). The JSE purchased SAFEX in May 2001, and currency derivatives were introduced in June 2007. In 2009, the Bond Exchange of South Africa (BESA) was purchased by the JSE (Leibrandt 2014).

South African capital markets traded a variety of derivative instruments amongst the underlying assets. It ranges from equity derivatives (from companies' stocks) to interest-rate swaps (for market interest rate variations), basis swaps, forward rate agreements (basically for foreign currency hedging and insurance of market variables), forwards and futures commodity futures, and through exchange-based options on the JSE (Leibrandt 2014). In 2015, South Africa's most regulated exchange, the JSE, introduced interest rate swap futures derivatives based on the rate derived from the Johannesburg Interbank Agreed Rate (JIBAR), which is the South African Rand (ZAR) denominated (O'Malia 2015). The commodities derivative section on the JSE market listed various agricultural commodities traded for future delivery at prices agreed on a specific date to be delivered in the future. Commodities derivatives provide a tool for risk management and pricing benchmarks for regional producers of soya beans, yellow maize, sunflower seeds, and wheat (Tankiso 2014).

Traditionally, OTC derivatives were not regulated. The markets were operating at a lower degree of regulation until the financial calamity of 9/8/2007, which nearly brought the financial system to a

shutdown (Don 2014). Around 2010, the Dodd-Frank Act and the G20 Heads of States' reforms to bring transparency to OTC derivatives trading through implementing central counterparties clearing systems and trading OTC through exchanges and electronic platforms led to OTC transactions being executed over a regulated platform. Traditionally the market for OTC derivatives had minimum regulations. The laws regulate parties participating in trading but do not regulate the instruments traded in the market (Prabha, Savard, and Wickramarachi 2014b). Attention was ignited by the turmoil of the 2007/8 financial disaster, which led to new regulations that blurred the distinction between OTC and exchange-traded listed markets. The instruments for derivatives were tagged as the main culprit, and laws were proposed so that there was a need for them to be heavily regulated for the financial stability of an authority. In both the United States (the Wall Street Reform and Consumer Protection Act of 2010, commonly known as the Dodd-Frank Act) and Europe (the Regulation Act of the European Parliament and the Council on OTC derivatives, central counterparties, and trade repositories), regulations changed the characteristics of OTC markets (Don 2014).

Wooldridge (2016) states that central clearing made additional inroads in the second half of 2016 since it is the main component within which OTC instruments can be traded with maximum transparency. Consequently, it was possible to eliminate systemic risks in the OTC derivatives markets and the G20 summits on markets for derivatives. Comprehensive data collected by the Bank of International Settlement (BIS) Institute in the first half of 2016, ended June, showed that survey results for the central counterparties (CCPs) revealed that new central clearing platforms were mainly utilised through trading interest rate instruments for derivatives. Such as swaps and futures were less widespread in other OTC segments for derivatives (Bank of International Settlement 2015). In the final half of 2016, data collected depicted OTC derivatives trading through central clearing platforms, which are regulated and gaining importance, especially in interest rate derivatives, adapted in foreign exchange OTC derivative segments (Setlements 2017).

More advocates and pressure to make sure time-frames are met for central clearing are making inroads in the OTC markets for derivatives to ensure transparent platforms. As a result, in the market for credit derivatives, the cleared segment with CCPs showed great movements in the volume of transactions traded, from $4.9 trillion to $5.1 trillion within the period 201. reflecting that more measures are in place to regulate the OTC markets for derivatives, even though the notional amount of outstanding credit derivatives declined slightly (Wooldridge 2016). As a result, the proportion of outstanding credit derivatives cleared increased by 4% through the central counterparties (CCPs), with variations ranging from 51% to 55% between the end of June and

December 2017, as tabulated in the report presented within the BIS survey in December 2017 (Setlements 2017).

2.3 GROWTH OF DERIVATIVES IN COMMERCE

The main trading strategies used in derivatives instruments are hedging, speculation, and arbitraging (Oliinyk et al., 2019). Derivatives returns are paying handsomely; they pool more investors and traders in a market, thus creating liquidity for the financial system within an economy. Furthermore, this creates the vital lifeblood for the industry to carry out their production efficiently, thus increasing output, leading to economic growth (Oliinyk et al., 2019). Efficiency and the smooth running of the financial system have led to the ease with which firms, governments, and individuals raise the much-needed capital, which stimulates economic activities for the economy's growth. Derivatives instruments are an asset class of their own which is growing at an alarming rate, as shown by the Bank of International Settlement (BIS) statistics that as of 2014 were US$630 trillion, with $532 trillion recorded in 2017 and $595 trillion in 2018 and $640 trillion by the year ended December 2020 for the value of the contracts outstanding. The growth of derivatives trading and volumes is an indication that they are also increasingly used in commerce, and the way they are used, it seems the instruments are here to stay. Derivative instruments have impacted the way business is being done in modern ways.

Derivative markets have become the central contributor to the stability of the financial world, as highlighted by Shirvani (2016). Price unpredictability, the deregulation of markets, technological innovations, and discoveries in financial theories have a bearing on the extensive growth of derivatives use in commerce(Tejado, Pérez, and Valério 2018). The presence of derivatives begs the obvious question in commerce that requires an answer: what purpose do they serve? This is because other markets like equity and bond markets exist and usually performing well without derivative markets. It is possible that derivatives can improve the markets' performance of the underlying assets(Bartram 2019). Derivative instruments modelled opportunities that are beneficial to the business that does not exist in their absence. Furthermore, derivatives might act as an economic adapter that allows transfers of funds from the banking sector to industries and allows the smooth production of goods and services in a nation, which leads to an increase in the GDP.

Derivative instruments have endured remarkable growth in regulated markets, even over-the-counter markets (non-organised markets). Comparably, derivative markets offer higher returns than those offered in the bond and stock markets and provide investors with a risk-sharing mechanism (Giraldo-Prietoa et al., 2017). Bujari, Martínez and Lechuga (2016c) highlighted that the impact and significance of derivative markets in an economy could vary extensively. They range from

allowing banking to facilitate production funding through lending, and firms can carry highly returning projects using derivatives as hedging tools. Derivative markets have been reviewed and proved that they had beneficial contributions as risk-sharing mechanisms, providing firms with tools to hedge against eventualities and healthier information on financial markets. Even though they have real benefits, there are disadvantages attached to derivative markets and their role in drawing speculators, increasing instability in spot markets, and intensifying monetary disasters(Shen and Hartarska 2018). Derivative markets have undergone incredible growth in the past decades, although the gains from derivatives could be of high volume. Derivatives may also contribute to achieving an efficient allocation of risk in the economy. They are also helpful in enabling markets to provide new opportunities for investors in an economy.

According to(Shirvani 2016), financial markets can operate more efficiently if there are derivative markets because they are successful institutions. Direct benefits are noticeable in risk mitigation, price discovery, and liquidity enhancement. In addition, derivatives provide firms and individuals with financial flexibility as well as investment opportunities. This means that credit extensions and advances can occur at lower costs. For example, more proficient mortgage markets mean that homeowners can borrow at a lower cost.

Similarly, firms can raise funds for investment at a lower cost when financial markets are efficient. This, in turn, can lead to faster economic growth. If companies can raise the necessary funds to finance their operations, the value of goods and services will increase and be produced faster. Stats SA (2019) exhibits that the structure of the South African economy, which was mainly the service industry, is contributing more to the growth of GDP. Given that, it means derivative instruments are pivotal in the growth of economic activities in South Africa through the banking sector, using them to mitigate risks when intermediating and providing funding to various industries in an economy.

Faiza , Umara and Khalid (2013) highlighted that derivatives provide massive economic benefits if adequately engaged, and they enhance liquidity and mobilise the required capital for economic growth. Financial derivatives allow investors to unbundle and redistribute various risks such as foreign exchange, interest rate, and market and default risk. These help cross-border capital flows and create more opportunities for portfolio diversification. Despite the risks and criticism with which the derivative markets are commonly looked at and referred, these markets perform several economic functions vital for the development of economic activities. In South Africa, the manufacturing sector benefited more through derivatives to hedge foreign exchange, commodities, and interest rates. Donaldson (2011b)reported that industries could produce more to insure themselves against market uncertainties. The evidence recorded by Donaldson (2011b) revealed

that 68% of the sampled non-financial South African firms in the manufacturing sector are using derivatives for hedging purposes. This implies that derivatives have become an important risk management tool in corporate finance.

A developed financial market promotes economic and institutional stability. Likewise, a healthy financial system eases economic growth and development. The financial services sector is at the heart of the South African economy and touches the life of each citizen (Gordhan 2011). An economy that experiences sustainable growth is likely because of an active financial sector and high investment incentives. Moreover, a healthy financial system provides the effective structural linkages necessary for economic growth. Hence, there is a greater responsibility for the financial sector of an economy to mobilise the required capital to generate employment and income (Faiza, Umara, and Khalid 2013). For a healthy financial system to be functional and able to perform its role in an economy, the derivative market is an essential apparatus because it can alleviate the various risks propagated by the challenges of globalisation.

Prabha, Savard and Wickramarachi (2014b) highlighted that the use of derivatives would allow banking institutions to advance lending at minimum costs because derivatives alleviate transaction costs. This implies that home seekers can acquire properties at lower costs inefficient mortgage markets. If financial markets are efficient due to derivatives trading, it will enable firms to raise funds cheaply. Therefore, it will promote productivity and economic growth. From the perspective of costs reduction induced by derivatives, it will imply that intermediaries could make finances available at a lower cost. Therefore, production can be financed, and goods and services increase in an economy. Marozva (2014a) postulated that derivatives are valuable instruments in the financial system, improving capital markets and, eventually, economic growth. He insisted that financial institutions play a pivotal role in supporting economic growth. The size of the banking system determines that more capital can flow from savers to investors to influence financial development, finally leading to the greater economic growth of a nation.

The following sections revealed how derivatives instruments are used as tools for risk management in commerce. Financial derivatives are the main instruments used to alleviate foreign exchange risk, interest rates and are also used for price discovery in the market, as highlighted in the themes below.

2.3 .1 Risk Management

To design a framework meant to improve the understanding of why derivatives are widely used in commerce. The study narrowed it to explain the derivatives used in risk management in banking and non-financial firms. It was mainly concerned with managing interest rates, foreign exchange,

and how corporates use derivatives for information discovery in their pricing mechanics. The uses of derivatives in the business affect the overall economy, affecting firm values, investment opportunities, and credit availability in an economy.

Given the explosive growth of trade in commerce amongst markets across the globe and the complexities of financial activities, partakers are exposed to various risks resulting from adverse outcomes in the markets. Surviving and sustainability in these volatile markets, the derivative markets should be in the centre to support economic developments and make these risks controllable. Kimberly (2017) defines derivatives as an asset class in the financial system with its instruments depending on the value from an underlying security, which is the source of risk. Hence, the security can be oil, gasoline, gold, currencies, stocks, bonds, or interest rates. Derivative contracts are traded in the futures, forwards, option, and swap markets, either on the exchange or over-the-counter markets(Bartram 2019). The JSE capital market is an example of the exchange market where futures are traded and standardized contracts. It is an agreement between two counterparties, which is the buyer and the seller, to exchange an underlying asset in the future at an agreed future price and date. In this sense, corporates and banks trading in derivatives will protect themselves against losses and lock in prices at which a firm can sell or buy the underlying asset. The derivatives instruments allow two dealing companies to transact in the future at previously agreed prices using forward contracts and futures contracts (Froot, Scharfstein, and Stein 1993).

Derivatives can impact the economy by helping economic agents modify the risk they are willing to take on from a given transaction. For example, a bank can be asked to lend capital to a large firm but is uncomfortable taking on the entire credit risk embedded in the transaction. So instead, the bank will buy the credit default swap on this company and tailor its risk to the level that it is comfortable. From this illustration, derivatives will help a company get the finance it requires to grow and increase production, which leads to the growth of an economy through physical capital growth, employment creation, and goods and services produced (Froot and Stein 1998).

Agarwal (2018) highlighted that futures are essential instruments for hedging or managing diverse families of risks. Kimberly (2017) emphasised that 95% of the world's 500 largest firms use derivatives to lower risks. For instance, futures contracts promise the delivery of raw material at an agreed price today, in the future. In this way, companies are protected against price increases, which leads firms to generate more profit. If companies' profits are increasing, they may have the capacity to advance in technology and produce more or high-quality goods and services with the same raw materials, thereby increasing the economic growth of a nation. Firms also draft contracts to protect themselves from exchange rate movements and interest rate changes, thus protecting their expected incomes from foreign transactions, which are used to finance operations and increase

productivity. Kim, Papanastassiou and Nguyen (2017a) illustrate that the derivative instruments are essential techniques, which businesses can use to manage risks. Therefore, it is crucial to have derivatives in their corporate financial management strategies. Furthermore, the literature showed that usage of derivatives in companies' risk management portfolios generates positive cash-flows. To that extent, those derivatives are deemed to hedge against a firm's risks and to lead to an increase in the firm's value through acquiring physical capital stock which includes, buildings, machinery, and equipment that they are using to produce goods and services (Alam and Afza 2017b).

The advent of derivative markets helps firms, traders, and investors fine-tune risk levels to the desired level. In derivatives, the trader trades the risk alone, not trading the investment itself. For example, an investor in the derivatives market can sell futures, forwards, swaps, or buy put options to reduce exposure to a stock (Don 2014). From this perspective, derivatives serve an essential role in transferring risk between counterparties involved in the transaction that is in business. There are risk-takers and risk-averse, so the derivatives' role will be to exchange the risk between them. Furthermore, it is an improving mechanism for allocating risk within the markets and the entire global economy. In the financial world, derivatives serve to obtain more effective risk management techniques within firms (financial and non-financial) and the entire economy.

Risk management has become one of the most critical business drivers (Ayturk, Gurbuz, and Yanik 2016a), especially after the 2007/8 global financial upheaval. Ayturk, Gurbuz and Yanik (2016a) disclosed that they must implement risk management systems for businesses to focus on their main operating activities. In addition, more non-financial firms have been using derivatives intensively to manage their financial risks (Ayturk, Gurbuz, and Yanik 2016a). It implies that risk management is an essential aspect of the globalised economy for firms and organisations to effectively produce and be productive if they ensure their expected cash flow from foreign investments and transactions denominated in foreign currency.

Shirvani (2016) highlighted that the need for hedging risk with derivatives has increased and is not expected to fall anytime soon, given the liquidity, volatility, and market and political risks in every economy. Moreover, derivatives assist in completing the markets, providing firms and individuals with financial flexibility and investment opportunities. The South Africa Reserve Bank Working Paper (2013) expressed that derivatives are the most innovative and fastest-growing capital markets segment locally and globally. In addition, derivatives have the potential of being the wealthiest and most significant source of information for policymakers, especially on interest rate expectations and volatility.

The International swaps and derivatives association (2014) reported that many firms used over-the-counter (OTC) derivatives as a crucial risk management strategy to reduce exchange rate risk and interest rate movements. OTC derivatives promote global corporates to reduce the chances of exchange rate movements in foreign currency gains. Hence, firms need to lock in the price movement cash-flow earnings. Moreover, pension firms need to protect their funds against inflation and fluctuations in interest rate risk for pension liabilities. Derivatives permit users to offset the perils they encounter and allow firms to be sure about their financial performance. Suppose firms can ensure their balance sheets. In that case, corporates can use more assets to generate future earnings confidently, employing more people to contribute to economic stability and growth. If firms employ more people, the economy grows since the labour force is an essential determinant of economic growth because derivatives act as a catalyst for new entrepreneurial activity.

Derivatives have a history of attracting many bright, creative, and well-educated personnel with an entrepreneurial attitude. They often energise others to create new businesses, new products, and new employment opportunities. The benefits thereof are of great importance to the economy, leading to economic growth (Parkin et al., 2010). In the long run, derivatives promote investments and savings. Furthermore, derivatives allow companies to transfer risks, enabling market participants to expand their volume of activity, thereby increasing the production of goods and services (Baluch and Ariff 2007).

According to the International Swap Derivative Association (2014), governments and corporates are significant players in OTC derivatives. The government participates with their objectives of issuing debt in foreign currency, gaining new investors, knocking cheaper funding rates, eliminating interest rates and currency mismatches using cross-currency swaps. Corporates that participate in global markets need to convert foreign currency revenue into domestic currency at a pre-agreed rate to lock in a value to eliminate earnings uncertainty. In corporate finance, the practice of risk management has taken on a pivotal role, as when a company announces significant losses from trading, lending or operations, stories abound about how poorly these companies managed risk. Such news draws media attention, but they are missing the point that risk management does not guarantee that significant losses will not occur. Instead, risk management is the process by which an organisation or individual defines the level of risk it wishes to take, measures the level of risk it is taking and adjusts the latter to equal the former. As noted, derivatives make it easier to manage the risk (Ahmed and El-Masry 2006).

2.3.1.1 Foreign Exchange Risk

The accessibility of foreign financial markets and more trade across borders becomes open as technology reduces the costs of international trade transactions. That drift raises the demand for foreign exchange derivatives to hedge currency risks as international banks, foreign dealers, and multinational companies multiply their vulnerability to exchange rate risk. This had seen a dramatic increase in the notional volume of foreign exchange derivatives traded (Prabha, Savard, and Wickramarachi 2014b).

The foreign exchange rate derivatives market becomes the most active financial instrument used by corporations to manage the movement of exchange rates. According to Harper (2018), 'exchange rate risk' adversely affects the results of firms. It can be called currency risk or exchange rate risk. Currency risk can also be referred to as the financial risk of an investment's value variation due to volatility in the exchange rates (Zhou and Wang 2013). It can also take the form of the risk an investor faces when they need to close out a long or short position in a foreign currency at a loss due to an adverse movement in the exchange rate. This type of risk mainly affects firms that export and import their products or services or suppliers and investors that practice investment in international markets (Clicks Group 2017). Exchange rate movements cause investments to increase or decrease in value if investors need to convert the money to another currency. From the economic structures of South Africa, statistics show that the manufacturing sector was declining in importance due to the openness of the economy, which saw locally manufactured goods decline in demand more than imports (Stats SA 2018). This implies that trade with the rest of the world has imported more goods, exposing companies to currency risk and increasing foreign exchange derivatives in South Africa. The JSE market profile (2018) shows that foreign exchange derivatives increased in percentage change year-on-year. For futures, open interest recorded 75.51%, and options were 62.35%. This shows that hedging with derivatives is in high demand in the South African market.

A currency derivatives market allows the exchange trading of currency futures and options. If firms are fundamentally uncertain about their operations, they use derivatives. Mabilesta (2016) noted that the use of currency derivatives reduces risk by protecting an existing portfolio against adverse currency movements. Hedgers have an impact on the underlying currency and use futures as a way of preserving their performance. From the above notion, it can be noted that derivatives are essential elements in the modern globalised village because firms can make future cash-flows more predictable and permit accurate forecasts of earnings through the use of futures contracts (Bank of International Settlement 2015). Paligorova and Staskow (2014) showed that a 15% turnover in

foreign exchange derivatives in Canada is for non-financial firms. In addition, the use of exchange rate hedges shields a firm from a temporary exchange rate shock, which forestalls a pass-through of the temporary exchange rate volatility to import prices.

According to Zhou and Wang (2013), the primary source of uncertainty in multinational companies is the exchange rate movements, which lead to the possibility of increasing exchange losses under unfavourable foreign exchange conditions. Many multinational companies resort to financial derivatives to reduce the adverse effect of foreign exchange rate exposures in their value enhancement activities. In South Africa, Correia, Holman and Jahreskog (2012) documented that foreign exchange risk is the highest risk being hedged using derivatives in South Africa, followed by interest rate risk. Firm value is achieved through firms able to sustain in the turbulence of market variables such as foreign exchange risks which might affect their business operations, especially with foreign affiliates.

Even though there are vast benefits of international diversification opportunities, as articulated by literature, portfolio investments are exposed to foreign exchange risks. Investors who hedge their currency risk using foreign exchange derivatives improve their risk return profile (Thapa, Neupane, and Marshall 2016). Foreign exchange risk is one of the most hedged risks in South Africa. Donaldson (2011b); Correia, Holman and Jahreskog (2012)concur that currency risk is the most hedged risk amongst the largest listed non-financial firms in South Africa. Non-financial firms are the most crucial player in the derivatives market. They use derivatives to hedge their market risks caused by adverse exchange rates, interest rates, commodities, and equities prices. In addition, with derivative instruments, firms can deal with the effects of cash flow volatilities in the markets.

2.3.1.2 Foreign Exchange Derivatives

In the financial industry, banks create the market platform for trading foreign currency. In the derivative markets, banks are either end-user or counterparts in trading foreign exchange derivatives. The foreign exchange derivative markets are populated with exchange rate-related contracts. The principal instruments are futures, options, forward, and swaps. In the banking sector of South Africa, as depicted in the table below, the markets trade forward foreign exchange contracts, currency futures, currency swaps, and currency options. A forward foreign exchange contract is a future transaction agreed upon today. The seller will deliver the specified quantities of foreign currency at an agreed rate, date, and time. The banks trade foreign exchange derivatives and create a market for trading these instruments. For example, the forward exchange contract is used when a firm needs to hedge against foreign exchange risk.

A typical example is drawn from the retail sector. For example, South Africa has the Pick n Pay group, which has stores in Botswana, Namibia, Zambia, and Zimbabwe. The branches in these different countries must send their revenues to the parent company in South Africa for consolidation. Hence, to secure their cash flow, they engage in forward foreign exchange contracts for hedging purposes and guard against foreign exchange rate movements. If Pick n Pay Botswana expects to send 2 million Pula three months from now to the mother company in South Africa, Pick n Pay head office will receive Pula after three months from now. Still, there is no guarantee that exchange rates will remain the same when they get the money. For Pick n Pay to be safe and secure their expected cash flow, a currency forward contract is a valuable tool in this situation because it will enable the firm to lock in the exchange rate at which it will sell the Pula and buy rands in three months when they receive their cashflow. Pick n Pay will do this by going short the forward contract, meaning that it goes short the pula and long the rands.

This example was illustrated to understand the use of derivatives in hedging better; Pick n Pay goes to ABSA bank and asks for a quote on the currency forward for 2 million pula in three months. ABSA bank quotes a rate of R0.825, which would enable Pick n Pay to sell the pula and buy rands at a rate of R0.825 in three months. Under this contact, Pick n Pay knows it could convert its 2 million pula at 2 000 000 * R0.825 = R1 650 000. Under the contract, the bank can also state that settlement will be in cash or call for Pick n Pay to deliver the pula to the bank and be paid R1 650 000. This is how the firm hedges the foreign exchange risk using a currency forward hedge. If three months later, the spot rate for pula is R0.820, Pick n Pay simply delivers the pula to ABSA bank and receives R1650 000 at the agreed exchange rate of R0.825. However, even if the rates rose, Pick n Pay would still have to deliver the pula and accept a rate of R0.825. The example is a practical application of derivatives in commerce where companies can protect their expected cash flows from adverse outcomes due to market movements.

Donaldson (2011b) revealed that forward currency contracts are the most used derivative instruments in South Africa, especially amongst the manufacturing industries, which implies that the South African economy imports more of its raw materials, as shown by a high rate of the use of foreign exchange derivatives for hedging purposes. Correia, Holman and Jahreskog (2012) support the notion that forex risk needs to be hedged the most amongst the largest listed non-financial firms in South Africa. Among the banking industry's traded foreign exchange derivative instruments, there are also currency swaps and payments paid periodically between two currencies until the principal amounts are exchanged at a future date.

Another set of foreign exchange derivatives traded in the banking market is the currency option. Under this class of derivatives, the buyer has the right but not the obligation to purchase or sell a

fixed quantity of a currency at a specified exchange rate on or before a date (Haiss and Summer 2010). In trading, the options currency derivatives, the contract writer is paid a premium as a deposit to guarantee the assumption of risk (George 2016). Table 2.1 below summarises the trading of foreign exchange derivatives in the South African derivatives market. Table 2.1 depicts the statistics of foreign exchange derivatives for the period 2013 to 2016. It is an extract from the JSE market profile.

Table 2. 1:Turnover on the JSE currency derivative markets

	Month ended Nov 2017	**Year to date 2017**	**Year to date 2016**	**% change year on year**	**2016**	**2015**	**2014**	**2013**
Futures								
Trades	5872	59 154	62 913	-5.97%	66 920	57 891	43 500	39 077
Volume	2 656 250	41401 950	31 786 534	30.25%	34293431	33917069	3394642	2458464
Value (Rmil)	38 518	566 302	486 617	16.38%	522 169	446 203	388 071	24258464
Open interest	1 935 672	1 935 672	1 192 282	62.35%	1 090 978	1 414 841	1 705 921	247 049
Options								
Trades	1051	3794	3127	21.33%	3271	2622	3439	2009
Volume	2 605 518	15461 525	13 483 856	14.67%	1403089	11251621	10687313	10027182
Value (Rmil)	39 430	218 500	204 476	6.86%	212 036	157 773	128 124	87 508
Open interest	4 656 660	4656	2 653 275	75.51%	1 240 499	1 917 456	1 839 022	799 456

Source: JSE market profile (2017)

Table 2.1reflects that the JSE derivatives market experienced a slight decrease in the year-on-year trade of futures currency derivatives by a negative 5.97% for 2016 and 2017. However, statistics show that the foreign exchange derivatives gradually increased in use from 2013 to 2016. Specifically, the trading of foreign currency derivative instruments progressively increased in volume at 30.25% in futures and 14.67% in options. Reviewed literature supported that banks are the major players in foreign exchange derivatives by creating markets and intermediaries. As depicted in Table 2.1, foreign exchange derivatives trading is gaining greater demand, as reflected by the rapid increase in the volume of trades each year. As a result, foreign exchange derivative instruments are the most prominent traded instruments on the JSE in terms of turnover, compared with other traded derivative instruments previewed in the following sections.

Banks used foreign exchange derivatives for hedging foreign exchange exposure from net investments in foreign operations to reduce the risk of decline in net assets value held in foreign investments, which are brought about by changes in foreign exchange rates. Non-financial firms

like the Clicks group indicated that they trade foreign exchange derivatives because they impact the value of expected company inflows either locally or internationally. Clicks (2017)reflected that since the group participates in international business, their merchandise imports are affected by the movements in prices of exchange rates; therefore, they consider foreign exchange derivatives as a shield to their expected cash flows. To secure their exposure of exchange rates, the group employs forward exchange contracts to protect both committed and anticipated exposures. The technique matched the anticipated future cash flows with the forward exchange contracts in mitigating the risks. In South Africa, foreign exchange derivatives are beneficial to commerce because their application helps in corporate finance. Spreading the risks among risk-takers in the market and promoting smooth running leads to company growth. The instability of market variables is referred to as market risk, and it is the peril that companies face in business due to changes in prices. This can be in interest rates, equity prices, and foreign exchange rates, affecting the group's income.

2.3.2Interest Rate Risk

Banks' earnings or profits are derived from the interest growth earned from advances compared to interest paid from deposits. If banks fail to balance the maturities between assets and liabilities, they will be prone to interest rate risks. The danger of collapse can be avoided if banks can manage interest rate risks to be financially healthy. Therefore, banks should incorporate interest rate derivative instruments in their risk management portfolio to ensure sustainability in the interest rate risk environment. In an earlier theoretical model by Diamond (1984), (Donaldson 2011b) explained that banks could reduce the chance of failure if they hedge interest rate risk using derivatives contracts. The technique uses the interest rate derivatives to link mismatched maturities in their management, reduce monitoring costs and promote efficient lending by banks. The building blocks of the Diamond model empirically supported by (Brewer III, Minton and Moser 2000; Purnanandam 2007; Brewer III, Deshmukh and Opiela 2014; Si 2014; Zhao and Moser 2017; Akhigbe *et al.* 2018b)proved that hedged banks provide intermediation more efficiently than unhedged institutions.

Moreover, their growth in loan portfolios is booming. The same theorists concluded that the size of an institution played a key role in utilising the derivatives as large financial institutions are the predominant participants in these markets. Based on the theory by Diamond (1984), costs associated with financial distress have positive effects on banking hedging decisions. Banks with higher financial distress manage their interest rate risks better by engaging in higher derivative activities. In South African banking, interest rate risk was hedged using the interest rate to manage

market interest rates on the loans, debt securities, and assets available for sale and borrowed funds (ABSA Bank 2016).

There is a segment of interest rate instruments on the derivatives market traded on either exchange regulated market. The interest rate derivatives market is a financial platform where participants exchange instruments related to interest rates. South Africa's most robust capital market trades many interest rate related derivatives. Which vary from futures on state debt and parastatal debt to short-term interest rate futures, JIBAR, futures, and long-term interest rate futures called swap futures. Traditionally, the most dominant risk bank holding companies face was interest rate risk in intermediation activities, which currently secured a proportion in the derivative markets(Akhigbe *et al.* 2018b). The authors alluded that it is innate within bank holding companies' structure by exposing both the asset and liability sides of their balance sheets to interest rate changes due to the deadly impact of mishandling of interest rate risk.

2.3.2.1 Interest Rate Derivatives

Derivatives are traded on two district platforms which are either the regulated exchange market or the informal OTC market. Therefore, interest rate derivatives are traded on the interest rate market, found on both platforms. Different contacts are written on the interest rate derivatives whereby participants can exchange options and futures interest rate derivatives. In South Africa, they are listed on the JSE, which is a regulated electronic platform. The following interest rate derivative instruments are traded on the JSE capital market. The long-term interest rate futures are swap futures (LTIRs), short-term interest rate futures (JIBAR), state-owned company debt, government debt, bond futures, bond options, and index futures. Through reducing credit risk, which is created by the failure of the counter-parties to execute their obligations, all exchange-traded interest rate derivatives are margined and cleared by the JSE clearing house (Johannesburg stock exchange 2018).

The primary interest rate derivatives listed and traded within the banking sector ranges from interest rate swaps, forward rate agreements, basis swaps, caps, floors, and swaption (ABSA Bank 2016).

An interest rate swap is a series of payments between two traders, one paying fixed rates and the other paying floating rates. It agrees with two parties to make periodic payments based on a notional principal amount and interest rate defined in the loan contract (Standard bank 2018). In some instances, the swaps transaction can unify the interest rates and foreign currency swaps, which the counterparties cannot or can exchange the principal amount (Clicks Group 2017). The interest rate derivatives constitute the forward rate agreement, an extremely useful instrument in

hedging the market's interest rates volatility. The forward rate agreement involves two counterparties who agree to settle a contract in the future between the agreed rate and the future interest rate at which the lending was initiated (ABSA Bank 2016). In the interest rate derivatives, market cash-flow, hedges are primarily used to hedge the exposure to cash-flow variability from interest rates of variable rates in which loans were issued to customers. Interest rates derivatives designated as fair value hedges primarily hedge the interest rate risk of fixed rate borrowings in issue, fixed rate loans to banks and customers, as well as investments in fixed rate debt securities held (ABSA Bank 2016).

Table 2.2 below is a summary of interest rate derivatives extracted from the JSE market profile to give an insight into the statistics of derivatives trading in the South African market. These statistics provide evidence of growth and increasing usage of interest rate derivatives in commerce. The trading of interest rate derivative instruments in the South African economy is increasing at an astonishing rate. Their residues extended to economic growth through their use by various industries to fix the floating future cash flow.

Table 2. 2: Turnover on the JSE interest rate derivatives market

	Month ended Nov 2017	Year to date 2017	Year to date 2017	% change year to year	2017	2016	2015	2014	2013
Futures									
Trades	1142	12376	14259	-13.21%	12 791	14410	9505	10571	6946
Volume	1 305 932	11 766 157	9 142 934	28.69%	11 946 44	9 230 179	5 344 460	4 834 077	3 419 070
1VALUE (R mil)	132 548	1 311 085	1 065 316	23.07%	1 329 270	1 073 119	698 663	441 235	513 920
Open interest	1 025 621	1 025 641	807 290	27.05%	1 021 723	802 030	621 382	418 464	332 819
Options									
Trades	119	688	824	-16.50%	809	825	1013	683	295
Volume	34 036	243 904 2	205 489	18.69%	307 322	205 539	348 297	197 474	246 576
Value (R mil)	2941	22 142	21 982	0.78%	29 060	21 987	37 202	15 321	515 922
Open interest	84 661	84 661	37 005	128.78%	97 761	36 955	76 609	34 866	47 546

Source: JSE market profile (2017)

Table 2.2 reflects the interest rate derivative turnover from the JSE market profile for 2013 to 2017. It reflects that there is more activity in this market. The growth rate per year is increasing drastically because of the importance of these instruments in the financial world. Banks specifically are taking more significant proportions in interest rate derivative instruments because they require

them to hedge movement of interest rate on lending issued to other banks and customers, as well as variability rate debt securities (Akhigbe *et al.* 2018a)

According to ABSA Bank (2016), in the South African banking industry, the banks hedge to secure the variability of interest rate risk on loans, debt securities, available-for-sale assets, and borrowed funds. Statistics reflect that the volume of trades is growing at 28.69% for futures and 18.69% for options year-on-year, for the period 2015 to 2017respectively. Table 2.4 shows that on the JSE derivatives market, the interest rate derivative market is the second largest in terms of turnover, with foreign currency derivatives the first as explained in preceding sections. From these perspectives, lending activities might be the primary cause of this market being dominant in terms of the participation of players. Growth of the interest rate derivatives market might lead to growth in lending activities in South Africa to productive sectors of the economy because banks will be able to insure themselves against credit risks. Clicks Group (2017) indicated that they enter interest rate swaps for a cash-flow hedge to fix the interest rate risk on loans. In South Africa, interest rate derivative instruments are used economically to hedge cash-flows and net investments in foreign operations, which increase the production of goods and services for the economic growth of a nation.

2.3.3Price Discovery

Based on the model developed by Black and Scholes (1973) and Merton (1973), it is assumed that markets are perfect. That is, trading of derivatives cannot review any unincorporated market information when capturing the pricing of the instruments. If markets are perfect, the spot market information cannot affect the derivatives market. They should reflect the same market information at the same time. In the market, the prices information embedded in the derivative instruments is used to predict the future cash market prices, which is critical information used in the policy formulation and decision making in commerce when managing risks (Prabha, Savard, and Wickramarachi 2014). Hence, if markets are not complete, traders with the information may prefer to own options instead of the underlying assets, revealing new information about prices (Hull 1946).

Most previous studies show that the futures markets lead the spot markets, and therefore, serve as a focal point for price discovery (Prabha, Savard, and Wickramarachi 2014b; Kryzanowski, Perrakis and Zhong 2017), contrary to a study done in Mexico on price discovery for the exchange rate, which revealed that it is the spot market that leads the futures market in price discovery (Martinez and Tse 2017).

Derivative markets in the modern world are valuable tools in commerce. Don (2014) emphasised that another necessity of derivatives in an economy or financial landscape is discovering information. Since derivative markets might need less capital to take part in the trading, a lot of information is transmitted into the derivatives market before it gets vital in the spot market. Although the difference might be a few seconds and it can give astute traders an edge. Therefore, derivative markets can carry trading information not expounded in spot markets. Through the futures market, derivatives convey another simple piece of information. It can help to determine what price can avoid uncertainty. Derivatives, specifically futures, forwards, and swaps reveal the price that an asset holder could take to avoid risk (Don 2014).

2.4 DERIVATIVES TRADING IN SOUTH AFRICA

In South Africa, banking sector trend statistics show that derivatives financial instruments held by banks as assets and liabilities depicted a 35.9% and 25.5% growth (Table 2.3), respectively in January 2018, following a downslide of negative 39% and 33.6%, respectively, in 2016 (Bank Supervision Department 2018). Table 2.3 reflects the monthly statistics of derivatives financial instruments held by South African banks as assets and liabilities. In addition, the table shows the trends for January to illustrate the volume of derivatives held by financial firms in South Africa.

Table 2. 3: Derivatives in the banking sector (South Africa)

Derivatives' financial instruments	**Ended-January 2018** **Rbn**	**Ended-January 2017** **Rbn**	**Ended-January 2016** **Rbn**
Assets	279	205	337
Liabilities	350	279	420

Source: Reserve Bank of South Africa (Bank supervision DPT) (selected South African banking trends) (2018)

Derivatives financial instruments are extensively used in the banks in South Africa, as indicated by the BA350 form, which each bank files to the Reserve Bank, which tabulates the types and values of derivative instruments in which it is trading. Banks enter into derivatives contracts in the ordinary course of their operations to mitigate the root cause of risks. They also enter into derivatives contracts for trading purposes and also as a means to put insurance to businesses against adverse outcomes. Market variables fluctuations are the leading causes of an adverse outcome in all sorts of businesses. For instance, changes in the foreign exchange rates cause exchange risk, movement in the interest rate causes banks to suffer interest rate risks, and in the production sector, the instability and unpredictability of commodities outcome lead to commodities prices risks and equity exposures. According to toABSA banks, financial reports, it is the fair value changes of

derivatives that banks are using for hedging interest rate risk(ABSA Bank 2016). The change is reported in the profit or loss account as net interest income. This information will be used to assess the increasing importance of derivatives uses in the banking sector in South Africa, which leads to the growth of the lending facility. Theoretically, the interest rate determines the demand for loans from bank customers, and they need to borrow if the rates are low because they repay less.

2.4.1 Bank lending in South Africa

Table 2. 4: Loans in the banking sector (South Africa)

Years	Ended-January 2018 Rbn	Ended-January 2017 Rbn	Ended-January 2016 Rbn
Gross loans and advances	3801	3726	3674

Source: Reserve Bank of South Africa (Bank Supervision DPT) (*selected South African banking trends 2018)*

The table above shows a snapshot of lending activities in the banking sector of South Africa. It is an extract from the Reserve bank of South Africa in the 2018 and 2017 one-month comparable. From the extract of Table 2.4, gross loans and advances issued depicted a growth trend of 2% in 2018 and 1.4% in 2017. Table 2.4 shows the monthly statistics of loans and advances to the domestic and commercial sectors in South Africa. The statistics imply that there is a progressive demand for advances for both domestic and commercial loans. The evidence proves an increase in lending from R3 674 billion in 2016 to R3 801 billion in January 2018. In finance, a theory is argued that individuals, governments, and companies borrow to finance their operations, investments opportunities, and fund capital expenditure as a basis for supplementing their capital. Steadily, banks' explosive use of derivatives, as illustrated above, and overwhelming borrowing trends in South Africa have brainstormed the impact of derivatives on banks' lending activities. According to ABSA Bank (2016), financial reporting note 52.8, the bank utilizes derivative instruments to hedge against adverse effects. The bank insures loans, assets available for sale, borrowed funds, and debt securities through interest rate derivatives. The main instrument used to hedge with ABSA bank is the interest rate swaps, a better tool to protect market interest rates, gains, and losses on hedging instruments and hedge items (ABSA Bank 2016). For the cash-flow volatility, ABSA stated that they employ cash-flow hedges to secure the bank against interest rate risk, making it prone to numerous floating rate instruments, ranging from loans, advances, and issued debt.

A cross examination of reported financial results of the leading commercial banks of South Africa (Absa, Nedbank, Standard Bank) showed that they held distinct types of derivative instruments for

trading and hedging purposes. In South Africa, banks participate in derivatives financial instruments when they carry out their daily operations and manage various risks emanating from the market. The strength of derivative instruments contracts is dependent on the appreciation or gain in the value of one or more of the underlying financial instruments or indices in which the contract derivatives are traded (Hull 1994). Many types of derivatives are traded and held for hedging purposes in the South African banking sector. The banking sector is actively trading swaps, forward rate agreements, futures, options, and a combination of these instruments, which primarily affect the banks' net interest income, net trading income, net fee, and commission income, and derivative assets and liabilities (Standard Bank Group 2017). In South African banks, it is articulated that derivatives are either held or traded for fair value hedging through the reported financial statements. Also, the instruments to protect against interest rate risk and foreign exchange risk and as cash-flow hedging instruments and hedges of net investments in foreign operations (ABSA Bank 2016).

The banks' reported financial statements analysis shows that the derivative instruments principally used in the banking sector include interest rate swaps, foreign exchange contracts, and forward rates agreements. These instruments were used to protect against movements of interest rates and foreign exchange rates so that their fair value of financial instruments is secured and protected in the future. The following sections will provide statistics of different types of derivatives traded and held in the banking sector and end-users (non-financial firms) in South Africa.

2.4.2 Credit Derivatives

Credit derivatives are another critical class of derivatives traded in the banking sector specifically to protect the risk of default from the borrower. In the South African banking industry, the banks are trading credit default swaps and total return swaps. According to (Batta and Yu 2019), the credit risk of an asset is transferred to the seller of the credit, who will take the risk in the event of default. The technique involves the seller receiving premium or interest rated payments in return for taking the risk to protect the buyer as it is stipulated in the credit event. Credit events typically include bankruptcy, payment default, or downgrades by a rating agency (Hirtle 2009). A total return swap in banking allows the seller of protection to receive the total amount of the asset, which includes both the income and change in the asset's capital value. The buyer of the protection, in return, receives a predetermined amount (ABSA Bank 2016).

2.4.3 Equity Derivatives

Equities derivatives are contracts in which the underlying assets are equities and equities index (Don 2018). The equities derivatives are traded on both exchanges traded and over-the-counter markets. According to ABSA bank's financial statements (2016), the South Africa banking sector listed equities derivative instruments: equity and stock index swaps and options. By analyzing the reported financial results, banks trade equity swaps as an agreement in which two parties agree to exchange a series of payments based on the notional principal amount. One party pays a fixed interest rate, and the other pays a floating interest rate. Also, the other party of the contract will pay based on the stock or stock index (Thapa, Neupane, and Marshall 2016). Don (2014) shows that the holder of equity options gives the buyer the right but not obligation through paying a premium to the seller to purchase or sell the basket of stocks at a specified price before a mature date. Absa's financial reports exhibit that banks also engage in fund-linked derivatives (swaps and options), ranging from mutual funds, hedge funds, indices, and multi-asset portfolios as underlying assets in the equities derivatives (ABSA Bank 2016). Table 2.5 below is an extract from the JSE market profile, which shows the statistics of equities derivatives traded in the South African market from 2013 to 2017.

Table 2. 5: Turnover on the equity derivatives market

	Month ended Nov-17	**Year to date 2016**	**Year to date 2015**	**% change year on year**	**2016**	**2015**	**2014**	**2013**
Futures								
Trades	244 559	2 932 391	3 335 874	-12.10%	3 591 024	3 526 147	3 167 060	2 682 897
Volume (000)	8 961	252686017	325183 113	-22.29%	432 277	432 277	210 421	161 800
Value (Rbn)	354	5 282	6 022	-12.29%	6 619	6 619	5 958	5 029
Open interest	24 425 365	24425 365	42 435 282	-42.44%	60646619	60646119	22036181	13839 86
Options								
Trades	1443	22 581	19 424	16.25%	22 261	19 921	20 811	22 726
Volume (000)	1 494	17 181	13 906	23.56%	15 373	15 764	41 957	55 672
Value (Rbn)	3	39	40	-2.35%	47	28	24	33

Source: JSE market profile (2017)

Table 2.5 above shows the two main types of derivatives in which equity derivative contracts are traded on the JSE: futures and options. Statistics show that traded equity derivatives on the JSE declined by a negative 22.29% year-on-year in volume for the futures. On the other hand, the

volume of equity options increased by 23.56%. The most common types of equity derivatives in the South African market are individual stock options and index options rather than index futures, as reflected by the statistics above. Equities are claims from a company's assets and are amongst the actively traded underlying assets created by derivatives (Haiss and Summer 2010). Thus, theoretically, there are two equities in which derivatives can be traded: individual stocks and stock indices.

In individuals stocks, the derivatives created are primary options(Don 2014). From the above statistics, options derivatives on equities traded on the JSE are increasing in volume with a 16.25 % change year on year. This suggests that companies frequently use options on stocks as compensation and incentives for their executives and employees. Furthermore, equity derivatives are very useful in the modern world, especially in investment management, because managers can use them as asset allocation strategies by increasing or reducing exposure to an equity market or sector without trading the individual securities (Thapa, Neupane and Marshall 2016).

2.4.4 Commodities' Derivatives

Commodities are natural resources such as gold, oil, metals, or agricultural outputs like yellow and white maize, sunflower, beans, and corn, which humans use to sustain life and support economic activities (Don 2014). The commodities market is extensive and subject to an almost unimaginable array of risks. From this perspective, the commodities derivatives market was established to speculate and manage the risks of commodity price movements. Although forwards and swaps, the most common commodities, are traded on the futures market, options are also trading commodities in their index.ABSA Bank (2016) reveals that in the banking industry in South Africa, commodity derivative instruments range from swaps, options, forwards, and futures. On the JSE commodities derivatives segments, the market participants traded agricultural commodities and precious metals. Commodities derivatives market in South Africa traded the following commodities: yellow maize, white maize, sunflower, soya, gold, platinum, crude oil and corn contracts. Table 2.6 below summarises statistics of transactions executed in trading of commodities derivatives and volumes of contracts. Table 2.6 is an extract from the JSE market profile for 2013 to 2017 to provide a snapshot of trading derivatives in the South African economy.

Table 2. 6: Turnover on the commodity derivatives market

	month ended Nov 2017	Year to date 2017	Year to date 2016	% change year on year	2016	2015	2014	2013
Futures								
Trades	39 227	323 086	322 959	0.04%	343 265	319 935	277 392	274 898
Volume (000)	309	2 541 852	2 798 678	-9.18%	2 955	2 956	2395	2482
Value (Rmill)	66 617	531 785	899 101	-40.85%	943 312	736 984	487 818	486 903
Open interest	128 092	128 092	65 109	96.73%	65 553	89 089	75 388	66 338
Options								
Trades	4211	28 236	40 936	-31.02%	43 815	42 966	31 365	30 380
Volume (000)	31	274 121	450 315	-39.13%	471	544	335	307
Value (Rmil)	308	3040	14 034	-78.34%	14527	12 378	2724	3557
Open interest	47 200	47 200	30 099	56.82%	36 968	87 294	57 806	52 069

Source: JSE market profile (2017)

An analysis of the Table 2.6shows that the commodities derivatives turnover volume was not as great as interest rate derivatives and foreign currency derivatives. Future commodity derivatives provide a platform for manufacturers and suppliers (raw material) to protect themselves from price risks, such as changes in the prices of raw materials and prices of products (ABSA Bank 2016). Statistics show that the commodities derivatives market year-on-year volume of contracts is declining, as shown by a negative 9% growth rate implying that firms are not much into resource production and trading locally. The implication coincides with the growth of foreign exchange derivatives, which supports the notion that South Africa relies more on imports than locally produced raw materials; therefore, there is an increase in the foreign exchange rate derivative to hedge foreign exchange risks. Both types of commodities derivatives traded on the JSE are growing negatively, which compels the researcher to hypothesise that the manufacturing sector is declining in South Africa. Because these commodities are the primary raw materials for production, which may suggest that more goods are imported from foreign markets, reducing the volume of commodities derivatives used to secure raw materials(Donaldson 2011b).

2.4.5 Notional Amount

Derivatives are created and traded on two general classes, which are forward commitments and contingent claims. Derivatives instruments are indexed in the value of company claims (equities), on the fixed income securities, market variables such as interest rates, currencies, and physical

assets, which are commodities. Furthermore, derivative instruments are embedded in various underlying conditions such as weather, electricity, and disaster claims (Don 2014).

The summary of all the traded derivative instruments in a marketplace is measured as a gross notional value. The notional value is the addition of all the instruments traded on the JSE capital market and is reflected in absolute values (ABSA Bank 2016). The statistics in Table 2.7 of the notional amount are summaries of derivatives traded in the banking sector of South Africa; it reflects what is being traded more with other instruments for the period 2009 to 2017.

The notional amount statistics in Table 2.7 is an extract from the ABSA bank financial statements for the specified period (2009-2016), which was analysed to assess the credit exposure arising from the contracts extended. The absolute values reported in the table below are for all the contracts. It is also not indicative of the bank's net exposure to or a position in any markets in which the bank trades (Hull 1946).

Furthermore, the summary reflects the types of derivative instruments in which banks are trading and holding for hedging cash-flows and net investments from foreign operations and hedging fair value against interest rate and foreign exchange rate risks in South Africa. From the analysis in table T.7, there is evidence that interest rate derivatives are the most traded instruments within the banking industry. The rankings are led by forwarding rates agreements and interest rate swaps in the interest rate derivatives market. The banking industry also exhibits that foreign exchange rate derivative instruments, mainly forward, futures, swaps, and options, are essential in their business, as witnessed by their exponential growth. From a comparable point of view, the least held and traded derivatives in banking are commodity derivatives and credit derivatives (ABSA Bank 2016).

The statistics of derivatives summarised below in Table 2.7 are traded on the JSE capital market, which is a highly robust exchange in Africa, ranked number 17 in the world, with a $1 230 977 million market capitalisation, market turnover of $46 507 million and year-to-date liquidity of 31.06% with monthly liquidity of 40.61% as at December 2017 (Johannesburg Stock Exchange 2017).

In the South African economy, statistics show that derivative instruments are extensively used within the firms and banks, especially for risk management, creating strategies and payoffs which are challenging to execute with the absence of derivatives. Therefore, the derivatives market is essential in any jurisdiction because it provides relevant trading information on spot markets, alleviates transaction costs between traders. Therefore, they reduce the amount of capital required, facilitate easier ways for underlying assets to go short, and improve spot markets' efficiency, which will increase economic activity in South Africa (Taillon 2015).

Table 2. 7:Summary statistics of derivatives in banks

Types of derivative instruments	2017	2016	2015	2014	2013	2012	2011	2010	2009
Foreign exchange derivatives	**522968**	**608971**	**878769**	**688879**	**550007**	**717251**	**833386**	**637723**	**479375**
Forwards	46150	29075	36740	33596	41651	50058	57159	22703	303205
Futures	137150	213162	138941	173000	88263	97174	248545	285747	121618
Swaps	293946	338551	604247	414988	366996	534508	500798	310804	10232
Options	45519	28183	98841	67295	53097	35237	26844	18469	17042
Interest rate derivatives	**4429644**	**4498864**	**3735135**	**4430318**	**4186777**	**2782209**	**3334592**	**2826499**	**2863098**
Forwards	2887692	3006259	2244296	2483475	2076796	1281461	1693452	1316018	1217162
Futures	34329	35759	37565	-	27095	7647	4681	10904	10880
Swaps	1465065	1450754	1294415	1916895	1847814	1122885	1253696	1176896	1149922
Options	42559	6092	158859	12855	25445	109669	208010	158715	270239
Other options	-	-	-	7483	-	-	2159	296	643
Equity derivatives	**117728**	**114215**	**166366**	**98969**	**105723**	**53205**		**95415**	**127474**
Forwards	9052	3263	8849	4433	52894	48816	60119	11606	13785
Futures	26158	49914	73539	39929	52828	3361	17195	5936	230
Swaps	22116	9279	19213	9834	-	-	2287	48519	10782
Options	23858	26838	38839	27940	6103	8331	-	-	-
Options exchange	7535	7812	8006	11800	41847	30505	11210	-	-
Commodity derivatives	**34377**	**12790**	**11866**	**17318**	**22543**	**7507**	**8887**	**19870**	**-**
Forwards	8777	11291	10651	15765	8121	361	332	104	-
Swaps	312	605	968	1199	13587	4768	5767	-	-
Options	25288	894	257	354	21771	5289	295	-	-
Credit derivatives									
Default swaps	9390	10318	29564	25749	7212	4327	6236	-	-
Credit derivative written	-	-	-	-	23805	11865	9743	-	-

Source: ABSA Bank derivatives accounting notes (2017- 2009)

The above is a snapshot that summarises and gives an insight into derivatives in the banking industry of South Africa. For instance, the reported financial notes in the financial statement noted that hedging cash flows are initiated with interest rate swaps to protect the potential variability in cash flows. The risk emanates from banks being exposed to floating rates from banking instruments such as credit extensions, financial assets available for sale, and on debts issued (Standard Bank

Group 2017). For banks to be secure and realise their income, they need to fix floating future cash flows by entering interest rate swaps contacts. Statistics in Table 2.7 exhibit that interest rate derivatives are highly traded derivatives in South African banking in terms of value. The trend reflected that the dominant value is the interest rate swaps amongst the interest rate derivatives in South Africa. Also, banks participated in foreign exchange contracts to protect themselves against changes in foreign exchange rates which affect their potential cash-flows in transactions in foreign currency (ABSA Bank 2016).

The overview of the derivative markets in South Africa revealed that the market is populated with derivatives indexed in foreign currency rates, derivatives that proxy the interest rates. Derivatives with physical assets traded on the derivatives market like commodities and company claims are also indexed as equity derivatives on the JSE capital market. From the statistics tabulated above, there is evidence that derivatives have gained momentum in the modern world of business execution. Therefore, the survey, which was empirically conducted in South Africa to investigate the effects of derivatives, yielded that non-financial firms reported a decline in derivatives usage in corporate finance (Holman *et al.* (2013). The analysis shows that interest rates, currency, equities, and commodities are the main hedged risks in South Africa. In a comparative studyCorreia, Holman and Jahreskog (2012)propounded the assumption that it can be the effect of the sample used, which only considers large companies; therefore, the results could not be biased make conclusions. Therefore, the current study incorporates every company listed on the JSE, and even the smallest company was included in the study. The study also further interrogates the firm size and derivative use, which indicates a positive relationship between the variables in South Africa.

2.5 THEORETICAL FRAMEWORK

The use of derivatives on bank lending and firm value impacts economic growth through different channels. To explain the use of derivatives in bank lending and firm value has been made through developing the theoretical framework which revealed hypothesis raised in the literature. In corporate finance, derivatives are used to lock the prices of commodities and equities to deal with the cash flow volatilities. The theoretical framework explained how the theory says how derivatives are used for hedging strategies, how the banks use derivatives to lend more to the productive sectors, and how non-financial firms are using derivatives for firm growth. Lastly, the impact of derivatives through bank lending and firm growth was theoretically linked to economic growth.

2.5.1 Derivatives and hedging theory

In finance, hedging is a strategy used to manage risks. Hedging involves using derivative instruments, which can be either, futures, forwards, currency exchange, and options contacts. Hedging offsets losses businesses face in their operations by locking the prices for future trading, thereby reducing production costs and increasing potential profits (Bartram 2019). Typically, hedging operates similarly to insurance because if businesses think of hedging, they protect against the adverse outcomes of their finances through derivatives in the financial markets. In corporate finance, firms use hedging techniques to lessen their exposure to different types of risks. Hedging involves strategically employing derivative financial instruments to offset the adverse price movements and fluctuations of cash-flows (Giraldo-Prietoa et al., 2017). Hedging strategy is a pool of techniques used to reduce the sources of risks that affect the value of assets and liabilities in business(Jin and Jorion 2006). In the current era of globalisation, derivatives have gained momentum in commerce through lessening cross-border risks. That is, corporates that have foreign sales are utilising currency derivatives as hedging tools. Many international businesses have the most practiced strategy to deal with many currencies (Mabilesta 2016).

Hull (1946) refers to futures derivative instruments as tools controlled by hedgers whereby these financial players aim to lessen the exposures they encounter using futures markets. The jeopardies that corporates might face in business can be reduced using derivative markets through hedging. For example, changes in oil prices, foreign exchange rates, variations of stock prices, or any other market variables might affect the positive outcome of business decisions. Hull (1946) elaborates that the perfect hedge in the market should eliminate the danger. However, in practice, it is difficult to eliminate risk. Hull further argues that many corporations in business usually specialise in their mission. For instance, the manufacturing sector management is more concerned with turning raw materials into output and meeting international standards without the proper skills and knowledge in envisaging adverse outcomes associated with the movement of interest rates, foreign currency, and commodities prices using hedging instruments. Correia, Holman and Jahreskog (2012) indicate that OTC forwards derivatives are used more to hedge currency risk.

Furthermore, interest rate swaps dominated interest rate risk management. Also reflected is that the changes in the foreign exchange rate are the highest risk being hedged using derivatives in South Africa, followed by interest rate risk. Studies by Donaldson (2011a) highlighted that in South Africa, the manufacturing sector has a higher proportion of derivatives hedging strategies. Hull (1946) stated that it is prudent for businesses to hedge sources of risk emanating from the adverse movement of variables in the market as they arise. Businesses focus on their core corporate

activities in which their expertise and skills are rich. In corporate finance businesses, unwanted shocks are evaded through hedging, such as steep rises in the price of a commodity are managed with derivatives hedging strategies using commodities derivatives instrument (Smith and Stulz 1985)

A hedger is defined as a dealer in the commodity market trading physical assets who needs "insurance" and locks in the price risks that they receive in the future or at a later date without changes (Johnson 1960). Adam, Fernando and Salas (2017)illustrated that if a hedger bought units of assets today (at spot price) and expects the prices to move either upwards or downwards before they sell to the next person. The result could be a capital appreciation (gain/loss) depending on the price movement, either up or downwards. The profit that the holder of an asset receives depends on the rate at which the price of merchandise moves. Johnson (1960) explicitly shows that to guard against an inventory position of underlying assets from price fluctuations, hedgers simultaneously sell enough futures contracts to cover the delivery of numbers of units(underlying assets), which they resell as inventory.

Furthermore, Johnson (1960) states that a hedger can simultaneously liquidate their position through the use of futures contracts either, by holding the same number of contracts to cover the delivery of a position in the expected futures. Thus, the same principle of purchasing the same number of contracts (of the same future) as before can be used as an alternative. There should be a net change in the spot price (the price of an asset given today must be equal to the net change in its future price). If the asset price movement is parallel, then the gain in one market offsets the loss in the other market. In the end, one would be left with only one's normal merchandising profit and with a residual capital gain or loss (Johnson (1960).

Hawtrey (1940) expressed the role of the speculator in the futures market as taking risks that hedgers are willing to shade off and eliminate from their trading books. Because of the latter, the derivative instruments traded in the futures market are "visualised as convenient mechanisms through which sources of risks can be transferred from one group to another." Hawtrey (1940) described the hedger as an unsophisticated participant in futures contracts who deals with the movement of the financial securities direction. In hedging strategies, Hicks (1930) inferred a theory of "normal backwardation" in which he explained that hedgers are willing to pay a "risk premium" so that the movement of market variables is not in their favour; that is, they are secured against price risk. On the other hand, speculators, those who hold an asset with the view that the prices will increase in the future, are only hedged with futures contracts if they expect to collect a premium.

Judge (2002) argued that theoretical firms hedge under the perfect assumption does not add value to the shareholder's wealth. Theories of hedging question the validity of the perfect market

assumptions and show that their relaxation leads to different conclusions about the value of hedging. He elaborates that hedging reduces the expected corporate tax liability for a firm in a convex corporate tax schedule; loan hedging if there is a probability of the firm encountering financial distress, which in turn lowers the expected costs of financial distress; reduces the risk imposed on the firm's managers, employees, suppliers and customers; and controls conflicts of interest between bondholders and shareholders. Thus reducing the agency costs of debt and facilitating the financing of investment projects using internal funds decreases the reliance on costly external financing.

Haiss and Sammer (2010a)reiterated that derivatives in the capital markets are proper instruments because they facilitate one to alleviate risk to market participants who might need risks. Derivative instruments are used to build up the exposure in assets. Therefore, they can be cost-efficient in price and market inefficiencies by arbitrage strategies. Haiss and Sammer (2010a) explained that derivatives possessed vast opportunities that investors could use to secure and profit with their investment vehicles at any price. Therefore, derivatives can provide payoffs platforms that cannot be obtained with the existing assets alone.

2.5.2 Bank lending

lending can also be called financing. It occurs when two parties agree to exchange money, property, or any other asset given by the lender to the borrower to expect the borrower to return the asset or repay the lender(Altunbas, Gambacorta and Marques-Ibanez 2009). In simplified ways, the lender gives a loan that creates a debt that the borrower has to settle in a given time.

The banking sector's stability is vital for the development of the economy as there are sources of liquidity in the economy. The banking institutions can mobilise the deposits from surplus sectors and distribute them to the deficit units by issuing loans and advances to productive sectors such as agriculture, manufacturing, and various industries (Sharpe and Acharya 1992). According to Murray (2020), lending is the principal function of banking institutions. Loans are categorised according to their purpose: real estate, commercial and industrial, agricultural, loans to individuals, and financial institutions. In banking, loans account for half or more of the bank assets and about half of their total revenues. Murray (2020) defines commercial and industrial (C &I) loans as loans issued directly for business use, not for individuals' purposes. It can be either to an individual but intended for commercial, industrial, and professional purposes. Under the C&I, loans exclude loans secured with real estate, financial institutions, and agriculture loans. C & I loans are the only way businesses can receive financing, but they are the most accessible options.

C &I loans have been used as a proxy for bank lending in empirical research (see (Brewer III, Minton and Moser 2000; Wen 2014; Zhao and Moser 2017), citing its functions of linking productive sectors of the economy and credit channels. However, it has explained that C & I loans are for businesses, and it excludes agricultural loans, reals estate, and other financial institutions loans which the current study wish to include in the lending proxy, through incorporating additional loan types which could be a good measure for lending activities in an economy.

Literature in bank lending was extended by assessing the impact of derivatives on the total loans, which is measured as aggregate lending in an economy that adds to the private sector, public sector, and mortgage lending. The analysis to observe the growth of lending with derivatives, much of the empirical research was concerned with the interest rate derivatives citing that interest rate was the primary derivative instrument held by banks and tested interest rate derivatives on commercial and industrial loan growth.

2.5.2.1Derivatives and bank Lending theory

In an ancient theory of risk management, Froot, Scharfstein and Stein (1993)argued that hedging is a tool used to limit the under-investment problem if corporates are exposed to growth opportunities and can thus reduce the cost of external financing. It frees the hands of managers to pursue optimal investment strategies and higher growth objectives by generating enough internal funds. Credit extension is likely to benefit banks' shareholders and bondholders by lowering risk-based capital requirements and deposit insurance premiums in the banking industry. This is aligned with the beliefs of Elaine (2016), who stressed that hedging allows firms to use more external sources of finance, and they depend more on bank loans and bonds to finance their investment opportunities.

Hedging utilising derivatives instruments permits banks to lessen their exposure to various risks associated with lending activities. For example, volatility in interest rates and changes in foreign exchange rates allow banks to be secured on their cashflow value and costs attached to bankruptcy and financial distress (Deng, Elyasiani, and Mao 2017a). Moreover, hedging through the employment of derivative instruments by banking institutions is regarded as a risk allocation technique, which could increase channeling loans to productive sectors of the economy. Generally, there is an increase in total risks in the imperfect capital markets, allowing hedging and promoting financial intermediaries to reduce their exposure to tradable (homogeneous) risk. Therefore, in the end, that will yield low or no economic rents. On the other hand, financial institutions are exposed to interest rate and exchange rate risk and simultaneously increase their exposure to credit risk (lending). Therefore, they have a comparative advantage and can earn higher economic rents (risk allocation effect) if they use derivatives to hedge these risks.

According to Deng, Elyasiani and Mao (2017a), 'market imperfections such as taxes, agency costs, information asymmetry, regulatory burden, and costly financial distress provide a rationale for banks to manage their risk exposure'. Akhigbe *et al.* (2018b) show that banks use derivatives for hedging to protect the banks' assets and liabilities and involve trading securities, deposits, and loans. To hedge, banks use cash-flow and fair value hedges as risk management tools. The authors' study revealed that fluctuations in the liabilities and assets value are protected by fair value hedges using interest rate derivatives.

Berger and Sedunov (2017)asserted that if banks are taking part in hedging, their aim is not to reduce risk as claimed by theorists, but they are using derivatives in the hedging strategy as a tool to allocate risk. Thus, it will mainly shift from tradable risk, which offers no rent, to credit risk, which is their niche and allows them to extract rents from their clients.

According to the International swaps and derivatives association (2014), Western economies measure the ability of banks and their capacity through the borrowers who need to buy properties for a particular period. This is because they assess the health of an economy and banking institutions by using the housing market as a key barometer. Therefore, the outstanding mortgage debt is gigantic. By the end of 2018, the US had $8.77 trillion, and the European Union had £6.28 trillion. For banks and building societies to sustain lending in the mortgage market, they had to hedge risks posed by fixed rate mortgages, raise funding and free up statements of financial positions(Callahan and Hairston 2020). Mortgage lenders mitigate risks through hedging by using derivatives such as swaptions, caps, and floors, and interest rate swaps. From this perspective, it is theoretical that if banks and building societies do not hedge risks, they will likely fail to allow fixed-rate mortgage pre-payments. Deng, Elyasiani and Mao (2017b) expressed that derivatives hedging is associated with overall lending and banks take on greater credit risk in lending. They further asserted that the funding flexibility enjoyed by banks using interest rate derivatives allows these banks to provide a smoother and higher level of intermediation, leading to more stable loan growth and more excellent economic stability. Banks, while taking positions in derivatives markets to mitigate their risk exposure, also make markets in these instruments meet the risk management needs of their corporate customers. In return, they generate fees and other revenue from this trading and cover their cost of funding

2.5.3 Firm value

Modigliani and Miller's (1958) (M &M) theorem proposed that corporate financial decisions do not influence firm value if the markets are perfect. The information flows efficiently and is therefore

reflected in all the prices made with market information. In their proposal, M & M theory capsizes that if the capital markets are perfect, the risk management is not applicable with any strategies; therefore, firm value is not achieved through hedging. These propositions were violated with the modern world markets imperfections and globalisation, which requires business management to be innovative for firms to sustain and survive turbulent market conditions. M&M theory states that the value of a firm is estimated with the future earnings discounted into the present time and the assets it holds.

Later, Diamond's (1984) model intruded the existing theory through stressed that derivatives add value to the firm if it incorporates hedging strategies into their financial decisions. Furthermore, it was supported by Smith and Stulz (1985) and Froot et al.'s (1993) paradigm of risk management, which suggested that derivatives use is a tool that lessens the volatility of cash flows and promoting investment opportunities and can reduce the costs of financial distress and to increase capital raising capabilities thus adding value to the firm. Another critical aspect revealed was incorporating more debt in the firm's capital structure with the help of hedging to benefit from debt tax shields without exposing the company to various risks. Through hedging, firms are maximising expected returns and therefore increasing their market value. Evidence extracted from current studies reveals that firms derive value through holding and trading derivatives in their daily business Kim et al. (2017) and Nguyen et al. (2018).

In literature, the firm value was proxied by Tobin Q.Tobin Q. Manufacturing firms mainly employed it to measure four aspects of a diverse corporate environment. Firstly, it was incorporated to cater to cross-sectional differences in investment and diversification decisions. Secondly, it was also to mirror the relationship between managerial equity and firm value. Thirdly, it measured the managerial performance and tender offer gains, investment opportunities, and tender offer responses, and lastly, it was considered into financing, dividend, and compensating policies (Chung and Pruitt, 1994). Tobin Q is a ratio that proxy the firm's value from an investor's perspective. It is defined as the ratio which takes the market value of the firm's assets and the replacement value of those assets (Hirsch and Seaks 1993), as illustrated below.

$$Q = (MVS + MVD) / RVA$$

Where,

MVS = market value of all outstanding stock

MVD = market value of debt

RVA= replacement value of all production capacity

The firms with high Q or Qs > 1 are better firms with a better investment opportunity, greater growth potentials, and exhibit good management in assets management. Given this, it has been proven true for firm value to be proxied by Tobin Q and stands its applicability in empirical reviews (Tobin & Brainard, 1968; Tobin, 1969). Therefore, this study employed the Tobin Q to represent the dependent variable to measure the firm value.

2.5.3.1 Derivative use and Firm Value theory

The hedging theory postulated bySmith and Stulz (1985) shows that hedging decreases a firm's cash-flow volatility and, at the same time, lowers the expected financial distress and bankruptcy costs. This, in turn, results in a lower cost of debt. Correia, Holman and Jahreskog (2012) added that using evidence from South African large non-financial firms, hedging using derivatives can create market value for firms if financial distress and bankruptcy costs are reduced. In addition, if income streams volatility is reduced, hedging can help firms improve their capital raising abilities and finance new investment opportunities using derivatives as hedging strategies. However, according to Correia, Holman and Jahreskog (2012), they explained that non-financial firms their primary hedging strategy was based on contractual obligations, and that is, companies do not hedge by taking a view on the market movement.

According to Judge (2002), firms that hold more of their assets in cash balances are less likely to hedge, but a business with higher expected costs of financial distress is more likely to hedge. This is in agreement with the theory hypothesised byElaine (2016), which asserts that "hedgers hold less cash as a share of their total assets than non-hedger." This is because firms actively in hedging are managing their balance sheets to finance highly returning investments opportunities. Paligorova and Staskow (2014) stated that financial markets, due to turbulences of markets, are not perfect, and hedging is a strategy that can affect firm value through securing the cashflows from erosion. They argued that the economies of scale effect are a significant impact because large and mature corporations with the ability to trade and hold derivatives tend to hedge more. Theoretically, the use of derivatives is more pronounced for large firms than for smaller ones. Firms that tend to hedge are more mature, with an average age of 20 years instead of 12 years for non-hedgers (Paligorova and Staskow 2014). The primary reason supporting this argument of large firms that tend to be the more active hedger is that most derivatives users are more prominent firms. They are also significant hedgers since derivative instruments are the tools for hedging strategies in corporate finance.

Kim, Papanastassiou and Nguyen (2017a) emphasised that in hedging theory, businesses derive value through their ability to ensure and protect the sources of financial risks that adversely affect

cash flows received from international entrepreneurship. Their argument was based on the positive association between firm value generation and the use of derivatives. Value generation will be created in the sense that a firm can lock the value of its assets. For example, suppose the firm is expecting an inflow from their debtors in foreign sales. In that case, the company can purchase the futures contract to receive their cash flow at the exchange rate agreed today for future delivery. This means that if there are fluctuations in exchange rates that either fall or rise, the company will receive its agreed-upon rate. Thus, the cash-flows are secured and not affected by changes in exchange rates. That relationship depends on the degree to which derivatives are positively used and how they successfully rectify volatilities in market variables, such as interest rate risk and foreign exchange risks (Smith and Stulz 1985).

Phan, Nguyen and Faff (2014)brought a new dimension of hedging by disclosing that for a resource producer that has revenue-based commodity prices and exposures, hedging is most (least) financially beneficial, at least in the short-run when commodity prices fall (increase). Indeed, the notion that firms should hedge more of their revenue-based exposures when prices fall and hedge less when prices increase is the central tenet of the body of literature investigating the degree of selective hedging undertaken by firms.

2.5.4 Economic growth

Economic growth refers to the growth rate in the value of goods and services produced in a country for a comparable period. It is measured in nominal or real (adjusted for inflation) terms (Agarwal 2019). For a nation, its aggregate economic growth is measured in terms of gross national product (GNP) or gross domestic product (GDP), whereby GDP is the value attached to all the goods and services produced within an economy from one period to another. An economy can be growing and productive if it makes more goods and services than before (Chappelow 2019). In actual terms, value is not usually measured in quantity because some goods are more valuable than others. For example, a new BMW model is more valuable than a pair of shoes, so the value should be considered when measuring GDP other than quantity only (Tejado, Pérez, and Valério 2018).

Economic growth is driven by the productivity and efficient production of national resources within the industries, households, government, and the nation with the rest of the world from one period to another. Real GDP reflects the flow of output and income in an economy. It can be expressed in income bases as the total amount earned in an economy by companies, government, and households(Ross 2019a). Mathematically, it is the annual percentage (%) chance of the real GDP or annual change in the real per capita GDP. Increases in real GDP for a particular period reflect how the rate of an economy is expanding (Pettinger 2019). In a country, the standard of living is

reflected by the per capita GDP, which is the real GDP divided by the population for a given period. It also determines the ability of an average person to buy goods and services within a country (Ross 2019b)

2.5.4.1 Economic Growth Theory

Theoretically, the co-fathers of economic theories: namely Adam Smith, David Ricardo, and Robert Malthus who defined the classical economic growth as it depends on the steady state of gross domestic product (GDP), and any deviation will resume to its fundamentals of returning to its normality (Pettinger 2019). They also postulated that economic growth is directly related to population growth, whereas it constrains the GDP. As a result, the nation will suffer the scarcity effect on the resources because, with many people, it means more resources are needed.

Furthermore, the neoclassical growth theory, the Solow-Swan (1956), contributed to the determinants of economic growth theory by highlighting that capital, labor, and technological advancement are the three main anchors in stimulating the growth of a nation. Their main contribution was stressed on the advancement of technology which they refer to as the core factor. If the technology is advancing, then the other factors like capital and labour will automatically adjust accordingly. The neoclassical growth theory postulates that in the short run, economic equilibrium is a result of labour and capital, which have a pivotal role in the production process. The economic growth theory outlined three main factors which are essential for a growing economy. Although it was more concerned with the short-term or temporary equilibrium, it is different from the long-term equilibrium without these three factors. The production function in the neoclassical growth model claims that if the capital is accumulating in an economy and if the people are using it efficiently, it is essential for economic growth. They also cited that it is the relationship between capital and labour that determines output in an economy.

Furthermore, technological advancement, arguments labour productivity, this is because labor efficiency will be increased. Thus, the Solow-Swan neoclassical growth model is used to measure an economy's economic growth and equilibrium. The general production function in the neoclassical growth model takes the following form.

$$Y = AF(K, L)$$

Where,

Y -the economy’s gross domestic product (GDP), K- capital, L- it measures the amount of unskilled labour in an economy, and A -it is a proxy of the level of technology. Therefore, the

present study adopted the neoclassical growth model to assess the impact of derivatives on economic growth.

Another essential economic growth theory was postulated through endogenous forces, that is, economic growth is generated internally in the economy, not through exogenous forces(Polat et al., 2015a). The theory contrasts with the neoclassical growth theory model, which trusts external factors such as technological advancement as the primary sources of economic growth. The endogenous growth theory claims that the government policies can determine and raise the economic growth rates if their policies are directed towards enforcing more market competition and helping stimulate innovation in products and processes(Rousseau and Wachtel 2011). Also, they cited that the private sector investment in research and development brings more or be the primary source of technological progress for the economy.

The modern-day theories posit that economic growth is the increasing growth in the production of goods and services. Thus, economic growth is defined as the increase in the production of goods and services within an economy over some time (Agarwal 2019).

It has been advocated that financial system elements promote economic growth through the seminal works of Schumpeter (1911). The emphasis was that for economic growth to be achieved and sustained, an economy needs a well-functioning financial system (Levine and Zervos 1998a). Haiss and Sammer (2010a) also reinforced through their 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, this is why derivative markets have attracted media attention as a pandemic that had caused more benefits than danger in the financial system.

2.5.4.2 Trends of Economic Growth

In South Africa, two main methods measure real GDP: production and expenditure (Stats SA 2019). In the production method, the formula involves adding the aggregate value of the services and goods produced for a particular period, and the expenditure method incorporates the total spending that has taken place in an economy. The economic structure of South Africa comprises ten main industries that contribute to economic growth (GDP). They range from mining and quarrying industry; personal services; agriculture; general government services; transport, storage and communication; manufacturing; electricity, gas and water; construction; trade, catering and accommodation industry; and the finance, real estate, and business services industry (Agarwal 2019). These are the main sectors that contribute to the GDP of the South African economy. Increases in the value of the goods and services they produce determine the economic growth of

South Africa. The following chart shows each sector's contribution to the growth of the South African economy. It reflects the percentage contribution of each industry to the GDP from 1994 to 2017, the period under study.

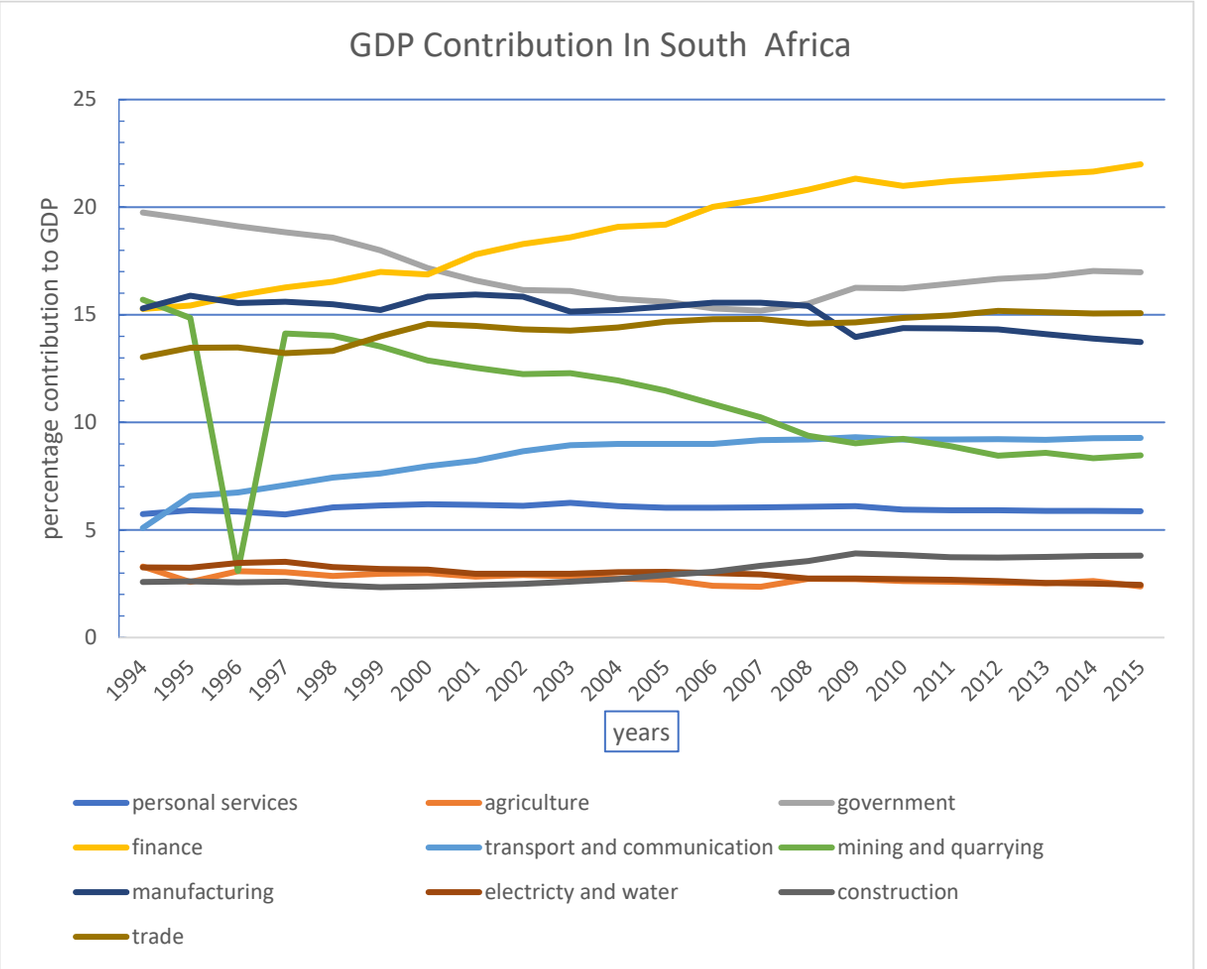


Figure 2. 1: South Africa's economic structure: Industrial contributions to GDP growth

Source: Statistics South Africa, 1994 -2017 quarterly statistical release

Figure 2.1 above reflects how the industries of South Africa contribute to the GDP of South Africa. It shows that the structure of the South African economy has changed over time. Generally, the South African economy depends heavily on the tertiary sector, which contributed approximately 69% of the country's GDP in 2012, up from 1994 (Agarwal 2019). The trend in Figure 3.1 shows that finance, real estate, and business services dominated the tertiary sector, which has reflected strong growth in terms of their importance in contributing to the GDP. According to the statistics, the finance industry accounted for close to 22% of the overall contribution to GDP from 2015 to

2017, up from a 12 % share in 1994. The industry contributes more to GDP because it is driven by a robust banking system in South Africa. The growth of the finance sector means that more South Africans have access to financial services, can do banking, have bank accounts, and more citizens are buying bonded houses, investing, taking on more loans. In addition, more businesses are supplying services to other businesses (outsourcing) (Pettinger 2019).

Additionally, the tertiary sector in the trade industry, which comprises retailing, wholesale, and motor trade, and catering and accommodation, has made some significant gains in their contribution to the growth in the GDP of South Africa. Statistics reflect that in 1994, it was close to 13% and was growing slowly in its contribution to the growth in GDP by approximately 15% from 1999 to 2017. Thus, the trade industry steadily maintained its importance to the economy of South Africa. Another vital service sector industry is transport, which comprises transport, storage, and communication. They have shown steady growth over the years, from close to 5% in 1994 to nearly 10% from 2005 to 2017. This is mainly due to the removal of sanctions against South Africa, which led to people traveling to the countries being allowed to trade with South Africa (Parkin et al., 2010). It ass led to the openness of the South African economy and the surge in trade with the rest of the world. The harbours and airports are being used frequently, which leads to growth in the importance of this sector and the growth of GDP in South Africa (Agarwal 2019).

In the secondary sector, from the trend in Figure2.1, it is observed that the sector was decreasing in its contribution to GDP. In 1994, it contributed 27,7% but dropped to 19% in 2012. The dominating industry is manufacturing in the secondary sector. It is the fourth largest sector in the South African economy in terms of GDP contributions (Stats SA 2019). From 1994 to 2008, the manufacturing sector contributed approximately 15% to the GDP, as depicted by the flow chart above. However, from 2009 to 2017, there was a slight decline. It contributed on average 13 % per year to GDP, which decreased compared to the previous years. The factors that might have caused the decline in the manufacturing industry were an increase in trade with the rest of the world, which led to more goods being imported and less demand for locally manufactured goods. This affected the importance of this sector to the economy of South Africa. Moreover, such a trend depicted that the manufacturing industry in South Africa is facing a highly competitive global environment, which needs the government to put efforts into the re-industrialisation of the economy (Quantec standardised industry 2019).

In the South African economy, the mining and quarrying industry has the most significant decline in the importance of all the industries. It had dropped from close to 15% in 1994 to approximately 8% in 2017. A variety of factors have led to a sharp decline in the importance of this sector, namely: increased costs of operations (due to mines becoming more profound and more dangerous

and expensive to mine); power supply problems; mine safety and labour unrests. These have contributed to the decline in the mining industry in South Africa (Quantec standardised industry 2019). On the other hand, although relatively small, the construction sector has played an essential role in boosting the economic growth of South Africa. As a result, in 2010, there was an increase in the proportion of the GDP contribution by this sector, rising from 2% in 2009 to an approximate 4% contribution in 2010. This was mainly due to the soccer world cup hosted in South Africa, which saw massive infrastructure projects being undertaken to enable the country to host the event (Pettinger 2019).

Additionally, the demand for residential properties and non-residential construction has escalated from 2003 to 2007 (Ross 2019b). Another interesting observation from the chart was that the electricity sector, which comprises gas, electricity, and water, declined its contribution to GDP. Especially from 2008, when ESKOM started its loading shedding, electricity has dropped over the years, partly due to the price increases and reduced demand for electricity by businesses since there was more efficient electricity use after load shedding (Agarwal 2019).

There was a slight decline in the government sector's importance to the economy of South Africa. In 1994, the government contributed 19.75%. It declined to 16.97%, which was viewed as a good thing because the economy cannot be dependent on government spending but rather on the various business industries (Quantec standardised industry 2019). The above explanations were a review of the South African economy and the economic growth of South Africa through assessing the pillars of the economy which drive the economy of a nation and lead to the growth of goods and services produced in an economy.

An essential indicator of a healthy economy is an increase in the rate of growth of the GDP because it impacts the national income and the level of employment, which have a bearing on the standard of living for the people in a country. If GDP increases, it means more production, more investments, more people get employed, which leads to the increased wealth of a country and its people. If a nation's economic growth is increasing, it means extra income for government spending. The government can use the money to finance the development of the economy. This perspective implies that economic growth is driven by the nation's industries, households, and government departments. For the production of goods and services, the main important factor is financing. To increase productivity and efficiency in production, firms need funding. It is a crucial element to fund production, operations, investments, and the capitalisation of all the industries within a country. At the centre of an economy, a financial system comprises banking institutions and financial markets. The banking institutions are the main sources of funding in an economy through providing loans, facilitating financial instruments such as bonds, trade credit, and

outsourcing. The financial market is a platform that firms, individuals, and governments can raise the needed capital.

For banks to smoothly provide lending facilities, they need to ensure that their loan portfolios are secured, hence the importance of derivatives markets as hedging tools to lessen interest rate and credit risks. Hereafter, the building blocks for derivatives' hedging theory pinned its roots in the financial literature. The theory of derivatives hedging reveals that bank lends more when are using derivatives and instruments for hedging in its lending fraternity. If banks advance more loans, funding is readily available for production and, therefore, increases GDP. Moreover, for industries (firms) to produce goods and services, the GDP needs to secure their cash-flows to be profitable and sustain market variations. Therefore, there is a need for modern risk management strategies which require the use of derivative markets. In this study, the derivatives are at the pivotal centre, which is to be investigated, if they impact the economy's growth through bank lending and firm value.

2.6. CONCEPTUAL FRAMEWORK

The use of derivatives by banking institutions and non-financial firms impacted economic growth indirectly and through different channels. In non-financial firms, derivatives are mainly used as a toolkit for risk management. The hedging strategies using derivatives benefited non-financial firms by securing expected cash flows, information discovery on pricing policies, and cost reduction, hence firm value. In the banking sector, banks are using derivatives to protect themselves against interest rates, credit, and other market risks, which will improve the health of a financial institution if these risks are mitigated. Therefore it explained why stronger banks could offer loans to the private sector through dealing with market variabilities through derivatives use. A positive relationship has been found through the survey done by(Zhao and Moser 2017).

2.6.1 Derivatives Use and Firm Value

Many non-financial firms participated in the OTC derivatives markets primarily to eliminate currency mismatches and interest rate risks. Eradicate these risks, the corporates use cross currency swaps to source cheaper finances or issue debt denominated in foreign currency to attract new foreign investors (Bank of International Settlement 2016.). ISDA's survey confirmed that for the period under survey for the past ten years, trades between dealers and non-financial clients fluctuated between 5.1% and 10.8% within the OTC derivatives market(International swaps and derivatives association 2014). Specifically, non-financial firms were more concerned with their revenues if they were participating in international trade, where they would need to convert the

proceeds into their home currency. Still, there is an issue of exchange rates fluctuations. To protect themselves, companies enter into forwards and futures contracts to convert their earnings at a rate they initiate on the day of the contract, thus removing uncertainties in the earnings. The derivatives markets make international trade simply through securing exchange rates movements; companies will agree at the exchange rate today for future delivery.

Furthermore, governments take part in interest rate swaps to hedge the issuance of new bonds from interest rate risk. The derivatives' main advantage is to make sure the transactions are secured for the imperfect market movements. The primary objective of non-financial firms participating in derivative markets is to alleviate risk, raise certainty in cash-flows, reduce balance sheet precariousness, and enable firms to venture into new business opportunities with greater confidence (International swaps and derivatives association 2014).

Paligorova and Staskow (2014) hypothesise that non-financial firms interested in derivatives usage are characteristically more extensive and performing well financially. Firms with derivatives in their corporate finance management had minimal earnings turbulence compared to their counterparties not using derivatives. Firms that use derivatives for hedging tend to generate more wealth and lower the chances of erosion in their income streams. In their analysis, Paligorova and Staskow (2014) revealed that derivatives held firms in hedging, and hedging facilitates a firm's capital to grow through guard its downside erosion, thereby raising competencies that enhance better investment decisions. Companies with minimum cash-flow instability might raise the firm's credit rating level and acquire debt at a minimum cost, which is expected to be reflected in debt contracts. If the company manages to raise its creditworthiness, it will borrow at lower interest rates and have fewer investment restrictions attached to debt obligation(Hirtle 2009). Therefore, these factors lead to significantly higher levels of investment, which will increase the net worth of firms. Paligorova and Staskow (2014) view hedge businesses can raise more external financing and have more sophisticated balance sheet management. Through hedging, businesses will increase their net worth on the markets because their book value grows since their asset values are secured with derivative instruments.

In commerce, hedging instils confidence in a firm to use more bank loans and bonds to fund investment opportunities because companies will be able to lock in fluctuations in the costs of funds through the use of derivative instruments(Geyer-Klingeberg, Hang and Rathgeber 2020). In Canada, non-financial firms that hedge prefers not to hold cash in their books of total assets than a comparable firm that is not hedging (Paligorova and Staskow 2014). The motivation for hedging reduces idle cash in the business, which will equip the management to actively manage their balance sheets to finance profitable investment opportunities, transmitting wealth accumulation.

The use of derivatives in the corporate world enriches businesses of all firms with the ability to operate confidently and, therefore, produce more goods and provide more services. Given the derivatives usage as a toolkit for hedging strategies will empower firms to move to higher returning investment opportunities and investments in innovations. Therefore, it will increase the efficiency of production and lead to the growth of GDP and economic growth of a nation.

Zhou and Wang (2013) accentuated that the use of derivative securities widens the strategies in corporate financial management as tools for risk management. This is because it is new and more effective in innovations in finance to finding alternatives and helping achieve desirable cash-flow patterns. Moreover, in corporate risk management, firms encounter risks in operations that derivative instruments can quickly alleviate, leading to the reduction of risk to a level they can accept (Zhou and Wang 2013).

Market risk is a major concern of many corporates. If alternatives to reduce these risks are found, like derivatives, firms will produce more goods and services and boost economic activities. Employment is created if production levels increase, and therefore, standards of living improve, which is the primary yardstick of economic growth. In South Africa, market risks affect non-financial firms to produce to capacity (Clicks Group 2017). According to Clicks Group's reports, it shows that the risks encountered by their company are due to changes in the capital structure and market variable movements. The ranges include currency risk, interest rate risk, price risk, credit risk, and liquidity risk, which affected their business. To alleviate foreign exchange risk, the Clicks Group indicated that it is committed to engaging with forward exchange contracts to cover anticipating exposure. In addition, by engaging in derivatives contracts, the company can fix the exposures which hinder them from achieving their objectives.

Ayturk, Gurbuz and Yanik (2016a) argued that the value generation with derivatives is prosperous and diversified. They further stressed that value could be measured using financial leverage as a proxy of the firm value with derivative usage. The notion can be strengthened by including hedging as an explanatory variable in empirical models to assess the impact of the derivative on firm value. This increases the market value of firms through the use of derivatives. Moreover, if firms acquire more capital goods, there is an increase in economic activity, more people are employed, which improves the production of goods in the economy and economic growth.

According to Dinh, Hoa and Robert (2014), firm value has its source in their analysis. It is determined by assessing the corporate cash flow growth and the cost of capital concerning the hedging impact on cash flows using derivative instruments. They hypothesized that through hedging, the firm enhances value by securing operating cash movements and costs affected by the volatility of cash flows, including taxes, underinvestment, and costs of financial distress. If

corporates can hedge all sources of financial risks and finance their investment opportunities, it means growth in the value of market goods produced. This is how companies improve the economic growth of nations. Economic growth is achieved if an increase in goods and services produced by non-financial firms in a nation. An increase in production can be achieved by using derivatives to secure funding sources to purchase capital expenditures to produce more advanced goods and services.

Hassan and Afza (2016) noted that corporations exposed to exchange rate risks are motivated to participate in the foreign exchange derivatives to secure the company's expected inflows. An increase in firm value is realised through growth in the market book value of the company by untapped cash flows in its investments. Pakistani non-financial firms can maximise their firm value by employing foreign exchange derivative instruments for hedging exchange rate exposure. Firms can expand their operations to international markets and can secure their cash-flows using derivative instruments. Thus, derivative instruments have reduced the fear amongst firms to participate in global markets because they can use foreign exchange derivatives to trade and receive their sales without erosion of their income by fluctuations in exchange rates(Seok *et al.* 2020). Forward foreign exchange contracts can be used to secure the exchange rate through agreeing with the contact today on specified quantities of foreign exchange currency at a specified date to be exchanged. This type of derivative allows corporates to agree today so that their transactions are not affected by the movement in the exchange rates. Correia, Holman and Jahreskog (2012) show that the most used derivative's instrument for hedging foreign exchange risk was forwards in South Africa, hence if the derivatives instruments are incorporated in business within the non-financial firms. The present study selected Johannesburg listed non-financial firms to assess the impact of derivatives on the firm value to observe if the relationship exists in the Southern African context.

Additionally, currency options are another type of derivative instrument used to manage currency risk. The use of currency derivatives allows the trader to buy or sell a specified quantity of foreign currency at maturity. The trader has rights but not obligations to execute on the options market (Block and Gallagher 1986). The option writer receives a premium to grant the buyer the rights, making the writer liable to deliver the agreement at maturity. Firm value is generated by reducing the sources of risk that affect the inflows of a company that is hedging foreign exchange risk using derivative instruments. Lau (2016)discloses that hedging activities induce the firm to undertake highly paying new projects and arising opportunities in investments with certainty with the help of mitigating strategies in derivatives. The derivative markets allow firms to achieve growth opportunities and enjoy economies of scale. If properly engaged, they allow cross border capital inflows and enable the firm to diversify, implying more significant investments (George 2016).

Suppose the capital markets are not perfect, where information concerning trading is not smooth flowing. In that case, the management feels it safe to participate in hedging activities which minimises their lifetime utility to return high on firm value (Alam and Afza 2017b). In the long run, this will increase total output for the firms, which will add to the GDP of a country, and therefore, economic growth incomparable years.

Smith and Stulz (1985) alluded that the chances of some firms with more debt in their capital structure to default is high. Therefore, their fixed repayment obligations and cash flow will be more volatile than firms that finance with equity. Therefore, this increases their likely bankruptcy and distress costs, and the value of the firm decreases. More importantly, if this is the case, derivative instruments will fix interest rates payments, meaning that movements in the floating rates are secured, and chances of defaults are reduced. Therefore, when variations in the markets are considered, it means hedging will permit more leverage on the external financing, which increases the firm's growth through the shield in the interest taxes and, at the same time, reduces the risk of bankruptcy and financial distress (Diamond 1984).

Mabilesta (2016) added that companies are influenced into derivative use by their firm size, leverage, and liquidity. For example, if a company is big, it might engage in international trade to protect its expected inflows. Additionally, firms seek to lock in profits and sources of funds. Holman *et al.* (2013) had also supported the notion that the primary characteristic distinguishing between users and non-users of derivatives is company size; big companies dominate derivatives users.

Ivilina and Betty (2014) supported that OTC derivative market innovations have essentially made progressive platforms for financial firms to deal with the risks emerging from market variable volatilities smoothly. These developments in commodity, currency, and interest rate derivative instruments and the subsequent risk management techniques allow US firms to go international and be globally competitive. From this perspective, these firms become successful and can meet their business strategies and goals despite market instabilities. Suppose firms meet their operational efficiencies and can operate at capacity. In that case, they promote economic growth since there is an increase in the value of goods and services in an economy.

Ivilina and Betty (2014) acknowledge that derivatives help reduce non-financial firms' cost of capital for either debt or equity, which have a bearing on the value of an enterprise. The victory of non-financial firms in mitigating risks leads to stability in the macro-economy and lowers systemic risk. A global survey done by Ivilina and Betty (2014) reveals several important reasons that motivate non-financial firms to use derivatives for hedging and show how hedging might raise the firm value. Firms hedge for the following reasons: lessening due taxes, lowering expected costs of

financial distress, dealing with the costs that lead to under-investment opportunities, and lowering agency costs as proposed by the theorem of Smith and Stulz (1985). By reducing risks, corporates can increase their productivity and produce for a nation, leading to a growth in the gross domestic product (GDP).

Ivilina and Betty (2014) revealed that hedging added value to firms and emphasised that OTC derivative instruments had significant relevance in the macro-economy through non-financial firms in the US. The same study shows that there is a relationship between risk management and firm value. They illustrate this using the example of foreign currency derivatives hedging foreign exposure. Correia, Holman and Jahreskog (2012) indicate that in South Africa, currency risk is the leading risk being hedged using OTC forwards. Swaps derivatives are used to hedge interest rate risk amongst the largest non-financial listed firms on the JSE. Capital investment can shrink due to reductions in cash flow. Ivilina and Betty (2014) add that firms with reduced cash flow cannot carry capital investments. Firm value, shown by increases in capital investments, also benefits any economy because of increased GDP. Ivilina and Betty (2014) believe that any regulatory shifts that might affect a firm's hedging effectiveness by non-financial firms are more likely to reduce firm value. And harm economic growth, meaning reducing the value of goods and services produced in a particular period.

2.6.2 Derivative Use and Bank Lending

Financial institutions generate profits through charging service fees; issuing advances to their clients or even non-clients who need finance to fund their growth prospects, investment opportunities, and capital expenditure. The main source of finance in an economy is the banking sector; therefore, institutions, corporations, individual households (homeowners), government, and even other banks approach banks to borrow funding for their capital expenditure and large projects. Those in deficit are willing to pay a cost of money (interest expense), and those in surpluses will receive a cost of money as their income (interest income). Banks generate profits from the difference between interest income and interest expense. All these transactions occur in a market with its operating environment, which cannot stay stagnant. The market's volatility and unpredictability led to the business community's discovery of hedging and speculation in commerce to protect themselves from the risks associated with market imperfections. From this perspective, there is a need for sustainability and survival in these markets. Therefore, financial and non-financial institutions find it helpful to participate in derivative markets. To sustain and do business with certainty, they engage with derivative instruments to lock in the unpredictability of interest rates, foreign exchange rates, and the cost of raw materials. Banks use derivative instruments to

hedge and manage mismatches in their loan books to raise business loans. Lending provides liquidity in the capital market, which lubricates the economy for the proper function of productive sectors and funds productivity in a nation. The banking sector plays a pivotal role in the economy because it transmits funds from one geographical location. The ability of the banking sector to lend improves economic activities through the corporate borrowing used to fund investments and growth opportunities, which facilitates economic growth. The explosive growth of the derivative markets was influenced by price volatility, market globalisation, technological advances, and innovations in finance theory(Berger and Sedunov 2017).

Sandu and Vanut (2014) argued that profitability within the banking system might be increased through incorporating derivative instruments into their trading. Commercial banks make profits from the loans given, and financial institutions receive interest from borrowers. The revenue generated is the difference between interest rates paid and received from deposits. The fact that banking assets are generally placed in long-run tools while banking liabilities are placed in short-run tools leads to the erosion of profits. In contrast, the interest rate in the short-run increases, as happened during the 1970s and the beginning of the 1980s (Sandu and Vanut 2014). The difficulties experienced by banks regularly in their business have led to the need for finding new sources of profits by adopting derivative product transactions, either as dealers or individuals, and banks have increased their potential of obtaining profit (Sandu and Vanut 2014).

According to Ekinci (2016), productive financial institutions that earn high profits strongly influence economic growth. Banks serve as the main financing source for corporations. Therefore, the banking sector should have a smooth credit channel for companies to access funding at a low cost without interruption. Banks can hedge their risk exposures by using derivative instruments such as interest rate futures and options, options, and futures of foreign exchange currency, and credit derivatives swaps (Mayordomo, Rodriguez-Moreno and Peña 2014; Sinha and Sharma 2016) as a way of developing an efficient lending strategy. Derivatives provide banks with a platform for hedging and risk management techniques to smoothly lubricate the market through credit extension to essential arms of the economy. The trend has been observed that derivatives have an economic impact on bank lending to productive sectors of the economy and help banks protect themselves from interest rate movements, foreign currency rate variations, and credit default risk. However, the aspect of extending derivative benefits to propel the economy through lending has not been examined in the literature, and several studies were more concerned with the impact of derivatives on loan portfolio growth.

The participation of banks in derivative contracting and lending has gained much attention as late as 2000. During the periods of the1980s and 1990s, derivative instruments, primarily interest rate

derivatives, provided banks with diverse exposure to mitigate interest rate movements and create revenue outside their daily routine banking operations. For a better appreciation of bank lending and the use of derivatives, the notable research by Brewer III, Minton and Moser (2000) cannot be spared for its fundamental contribution with its building blocks for topical models in the use of derivatives and lending growth. Their work was done during the period 1985-1992, whereby they set up the relationship between bank lending and their participation in the contracting of derivatives. They noted that as far back as 1985, commercial banks were active players in trading, executing, and contracting derivative instruments with interest rates underlying either as intermediaries or end-users. The study results revealed that banks contracting and trading interest rate derivatives achieve a bigger expansion in the loans given to industries and commercial businesses than banks not trading these instruments. Their results satisfy the model developed by Diamond (1984), which proposed that the use of derivatives allows banks to increase reliance on their primary areas of expertise and the use of commercial and industrial loans channel funds to firms for growth opportunities and finance investment.

2.6.3Derivatives Use and Economic Growth

It has been advocated that financial system elements promote economic growth through the seminal works of Schumpeter (1911) and the emphasis that for economic growth to be achieved and sustained, there is a need for a well-functioning financial system in an economy (Levine and Zervos 1998a). Haiss and Sammer (2010a) also reinforced through their 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 had 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). As a result, derivatives returns pay handsomely; therefore, the pool more investors and traders, creating liquidity for the economy's financial system. Furthermore, this creates the vital lifeblood for the industry to carry out its products efficiently and leads to economic growth (Oliinyk et al., 2019). Thus, efficiency and the smooth running of the financial system have led to the ease with which firms, governments, and individuals are raising the much-needed capital, which stimulates economic activities for the economy's growth.

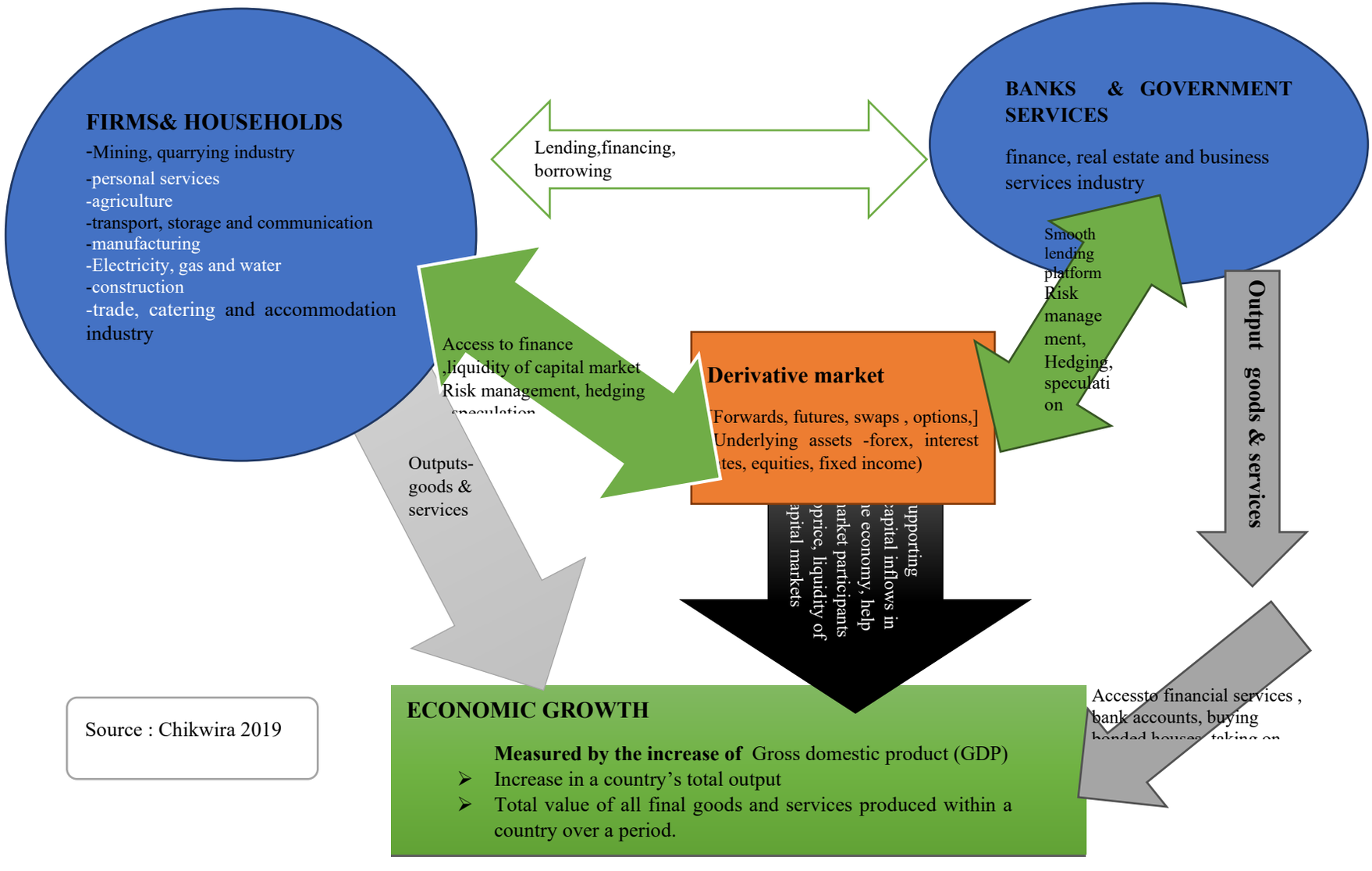
Haiss and Sammer (2010a) used Merton and Bodie’s (1995) financial function approach to investigate the influence of derivatives on financial market integration and economic development. The advent of derivative markets had influenced the key financial segment’s ability to foster

economic growth by providing markets to exchange instruments and mobilize the much-needed liquidity in the market. According to Haiss and Sammer (2010a), a derivative market is an innovative asset class with its abilities different from a traditional segment of the capital markets. It hAs a result, and it influenced the financial system. At the same time, the financial sector contributed positively to the overall growth. Haiss and Sammer (2010a) alluded that the net effects of derivatives emanating from risk allocation reduction in transaction costs and improved information efficiencies benefited the economy.

Economic growth determinants persistently attract relevant and exciting topics in economics. Policymakers are striving to have stability in their economies and sustained growth for a steady future. Therefore, it is crucial to have a positive connection between finance and growth (Polat *et al.* 2015b). This view has accelerated the rate at which research in this area has increased. Financial development is defined as the rate of change of funds among savers. That is, it can be from savers to investors through the banking fraternity in an efficient way.

2.6.4. CONCEPTUAL FRAMEWORK MODEL

The interrelationship among derivatives in bank lending, firm value, and economic growth.



Source : Chikwira 2019

The framework above depicts the model that shows how the lateral relationship exists between firm value, bank lending, and the growth of the South African economy using derivative instruments. The South African economy is anchored on firms, households, banks, and government services (dark blue circles) that utilise the derivative markets (orange rectangle) to mitigate the exposures which affect the production of more goods and services that lead to economic growth (green rectangle). Economic growth is measured by the increase in the real gross domestic product (real GDP). And real GDP is the rate of change in the value of the economy's total production measured in the prices of a single year, that is, the value of the final goods and services produced in a given year (Parkin et al., 2010).

The South African economy had a strong financial system with a robust capital market and the JSE capital market, which allows the trading of derivative financial assets, the most growing segment of the financial markets in South Africa (Johannesburg stock exchange 2018). Derivative markets brought many benefits to commerce. That is, they allow investors to discover information, firms, and institutions to raise capital smoothly (liquidity enhancement), hedging their exposures, speculating, and finding new techniques for managing all kinds of risks in business (Sill 1997).

Firms and households

According to Statistics South Africa (Stats SA), the structure of the South African economy is made up of firms, households, and government services (dark blue circles). Their outputs are goods and services, which increase the real GDP of South Africa (Stats SA 2018). The output that these industries produce adds to the gross domestic product (GDP) of South Africa. Economic growth refers to an increase in the market value of goods and services produced by a country over a particular period (Agarwal 2019). The economy of South Africa is made up of the ten main sectors, as depicted by the blue circles above, which contribute to economic growth (GDP). Stats SA specifies the sectors like the mining and quarrying industry; personal services; agriculture; general government services; transport, storage and communication; manufacturing; electricity, gas and water; construction; trade, catering and accommodation industry; and finance, real estate, and business services industry (Stats SA 2019). The main thrust of the framework above is to show the importance of derivatives to economic growth through firm value and bank lending in South Africa. And also to explain the lateral relationship between derivatives, bank lending, firm value, and economic growth.

Derivatives market

Derivatives market (orange rectangle) listed the following contracts, futures, forwards, swaps, and options. They are traded on the capital market. For instance, in South Africa, these are traded on the JSE platform and through the OTC markets. These derivative instruments are used by firms and banks (blue circles) to drive the economy, which leads to an increase in the real GDP, that is, economic growth (green rectangle). Derivative markets are essential tools in any economy because they serve an important and useful purpose in commerce. They provide companies with the ability to lock in a price at which one might buy or sell the underlying asset at an agreed future date (Don 2014). Derivative instruments force firms, either producers or suppliers of raw materials, to transact in the future at a previously agreed-upon price. Derivative instruments also can be used to create strategies that cannot be implemented with the underlying asset alone. For instance, a company or investor can go short, thereby reaping from the underlying asset's price value decline.

Additionally, derivatives can provide investment opportunities because they are relatively known for having a high degree of leverage, meaning that investors can invest only a small amount of their capital relative to the value of their underlying asset. A small movement in the underlying will lead to fairly large movements in the amount of money made or lost in the derivative instruments, which increases the economic growth of a country (Bujari, Martínez and Lechuga 2016c). Trading derivative instruments on the capital market provides liquidity whereby firms will trade their equities and raise the necessary capital requirements to finance investment opportunities and increase economic activities. In an economy like South Africa, derivative markets support capital inflows, which will be made available for companies to fund the production of goods and services that lead to the economy's growth. Derivatives benefits are shown by the green arrows pointing to the firms and banks, meaning that they are used to unbundle and transfer risk and determine the pricing of their goods and services. At the same time, firms use derivatives to self-insure against the volatility of capital inflows, thereby enabling them to do business with certainty.

Derivative markets (orange rectangle), which is the market for trading financial instruments, derive their value from the performance of the underlying assets (Hull 1946). Underlying assets are claims from the companies (equities), physical assets from agriculture or mining (commodities), currencies, and market variables (foreign exchange and interest rates). Derivative markets are the instruments that have brought new techniques of risk management

(hedging). For example, a firm can reduce the risk of fluctuations in foreign exchange rates by entering into a foreign exchange forward exchange contract to protect their expected inflows against losing value (Tejado, Pérez, and Valério 2018). If firms and corporates secure these risks, they will concentrate on their main business and thus increase the value of goods and services produced in an economy. In an economy, derivatives are useful instruments, as shown by the green arrows (hedging, information discovery, and speculation), allowing the smooth flow of resources within an economy and facilitating new goods and services to be produced, increasing economic growth.

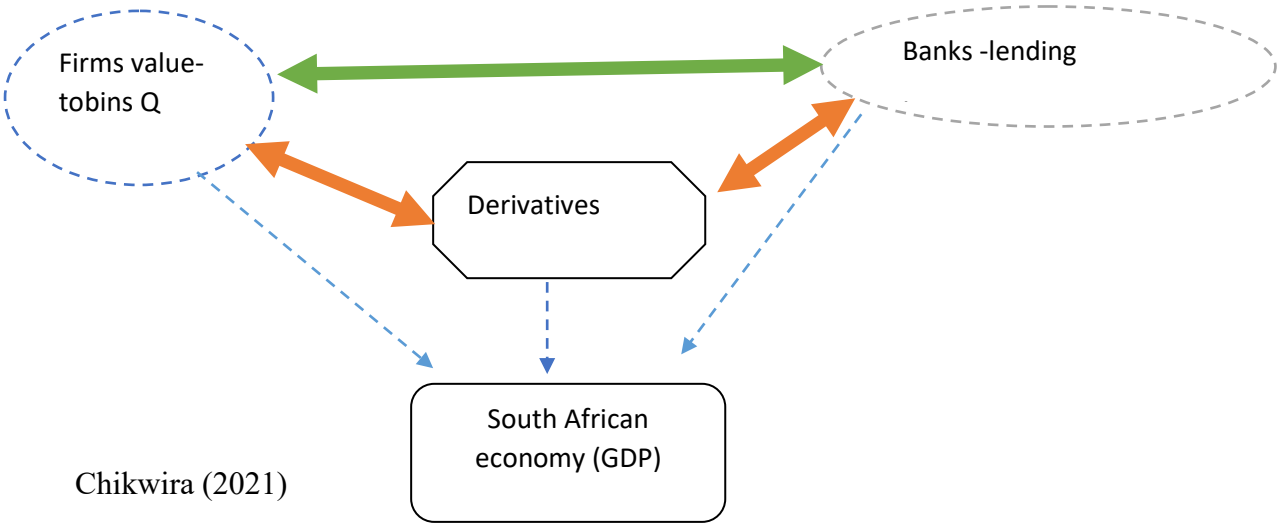
Economic growth

The economic growth of South Africa (green rectangle) is the increase in the value of goods and services produced within a period by the firms, households, and government services (blue circles). The growth of an economy is observed when there is a change in the real GDP of previous years to the comparable period (Ross 2019b). For firms, households, and the government to increase their production. More new goods and services need cheap funding, increased disposable income in households, government increasing investments in welfare benefits, and well-functioning financial system support with liquidity in the capital markets. The South African economy has a well-regulated capital market (Johannesburg Stock Exchange) with robust derivative markets that attract more investors to participate in the JSE market, thereby increasing the liquidity of the capital market (Johannesburg Stock Exchange 2017). If the capital market is liquid, it will be easy for firms to find buyers and sellers of their assets when they need to raise capital for capital projects and investment opportunities. Therefore, the presence of derivatives markets in the South African economy has a great bearing on the growth of its economy. This study aims to find out if derivative markets influence firm value and banks' credit extension, which leads to the economic growth of South Africa. The linkage amongst these variables leads to the development of a model used to determine economic growth.

In South Africa, GDP is measured using two methods, the production method and the expenditure method. GDP is measured as the total value in the production method, adding all the goods and services produced for a particular period. The expenditure method measures GDP using total spending that has taken place in an economy (Stats SA 2018). In this study, the researcher shall employ the production method in the methodology to estimate the impact of derivatives on economic growth, represented by Y_{it} (real GDP over a time series)in the modelas ameasure of economic growth.

The framework above summarises the economic benefits of derivatives to the growth of the South African economy, which have led to the development of the generalised growth model which assesses the impact of derivatives on bank lending and firm value, which facilitates the economic growth of South Africa as depicted by the framework above. The relationship, modelled by the framework above, illustrates that derivatives are the adapter for economic growth, which feeds the banking sector and industries to produce and increase goods and services in an economy, which leads to the economic growth of South Africa. The model will be estimated using the vector autoregressive model (VAR). The chief reason is to establish the causal relationship between the following variables: firm value, bank lending, and economic growth (Arellano and Bover 1995).

2.6.5 Conceptual Framework Summary



Chikwira (2021)

As highlighted above, South Africa's economy comprises ten major sectors, and their functions and outputs determine economic development and growth. For funding and finances, they depend on bank loans (bank lending). For the banks to provide lending efficiently and smoothly, derivatives are important to secure variabilities of interest rates and exchange rates risks. The blue dotted arrows are the by-products transmitted to the overall economy due to the growth of derivatives.

There are the derivatives markets at the centre of modern finance, and it is the fastest-growing segment of the capital market. Specifically, derivatives' main purposes in the capital market are risk management, price discovery, and reduction in transaction costs (Bartram 2019). From the framework above, the thick arrows show the flow to and from derivatives.

That is, the banks are traded and hold derivatives mainly for hedging and speculative purposes. And the banks are making a market for non-financial firms and financial firms in the risk management process. Also, derivatives contribute to a bank's capital adequacy, profitability and reduce the probabilities of a bank's collapse through mitigating interest rate risk.

On the other hand, the arrows flow from and to the firms. The firms comprise all the sectors in an economy except the financial sector, where derivatives are being traded to secure adverse business outcomes and speculative purposes. The firms' equities and other company claims are used as underlying assets to create derivative instruments from the derivatives perspective.

Banking sectors are providing loans to all sectors of the economy as the main source of finance. Loans are categorised based on the sector borrowing and the purpose in which the loan is given. For example, agricultural loans are advances to fund the agricultural sector. Empirical literature shows that the studies were analyzing commercial and industrial loans studies (Brewer III, Minton and Moser 2000; Purnanandam 2007; Brewer III, Deshmukh and Opiela 2014; Wen 2014; Zhao and Moser 2017). The authors cited that C &I loans as the finances funding the productive sectors of the economy. At the same time, Murray (2020)dismissed that claim by defining the commercial and industrial loans as monies for commercial and business purposes only, excluding loans made to real estate and agriculture even though they contribute greatly to economic growth. Thus, the current study extends the financing and banking literature by assessing all loan types to all sectors of the economy. It is a good proxy for bank lending, which truly reflects the liquidity channel in an economy. The summary framework above interlinks the non-financial firms, banks, and the economy with the derivatives as the engine that drives the economy that impacts firms and lending activities, thereby facilitating more economic activities. Derivatives allow and permit firms to carry huge capital projects as a hedge toolkit, in the end, and it leads to economic growth.

Banks lend to all the ten sectors in an economy through various loan types. Firms use derivatives to secure fluctuations in interest rates, adverse market outcomes, hedge investments, capital projects, and produce for the nation. Banks use derivatives to hedge loans to various sectors, provide funding to all those sectors, and avail liquidity in an economy, therefore economic growth. Thus, firms' outputs add to economic growth (GDP). The summary above leads to the development of the growth model, which follows the neoclassical growth model, whereby derivatives are assumed to have an equilibrium with economic growth in the long run. The impact of derivatives on the economy through the firm

value proxy function of the private sector and bank lending proxied the aggregate lending to the private sector, public sector, and mortgage loans. The variables used are GPD which measures the economic growth of South Africa. The firm value, which measures the performance of the private sector growth. And bank lending, which measures the funding of the private sector and the liquidity channel in an economy and derivatives, is the major variable of interest that measures the growth of derivatives in South Africa.

2.6.6 Theoretical and Conceptual literature Summary

The framework summarised theoretical and conceptual literature on the impact of derivatives on bank lending, firm value, and economic growth. At the centre of the study, the issues were based on the growth of derivatives usage in commerce, that is, in the banking sector and non-financial firms but with an inverse growth rate related to the economy of South Africa. Despite that, derivatives were theoretically revealed to be the engine of business growth and linked to economic adapters. There were also allow transmission of resources to productive sectors for economic growth; that relationship was not observed from the growth of derivatives use in the South African economy with the real GDP growth rate. From this perspective, it motivates the current study to evaluate the impact of derivatives through bank lending and firm value to find which sector is solely benefiting from the growth of derivatives in commerce, if not the whole economy.

The present study incorporates new channels that might be the sources of derivatives growth in the model to assess their linkage to economic growth: bank lending with total loans as a proxy for bank lending. Also, the major players in the derivatives markets are banks, non-financial firms, individual investors, governments, and non-banking financial institutions (assets managers, pension funds, hedge funds, insurance companies, and mortgage servicers). These players' outputs or products are the components that are used to measure economic growth. If they are producing more, it means the economy is growing and therefore creating jobs for the societies; hence, the standard of living is improving for the citizens. In addition to using derivatives for hedging purposes, these players also use them for speculation and arbitrage. The framework summaries the impact of derivatives on the overall economic activities through bank lending and firm value as articulated and laid out in the empirical strategy in the methodological section.

Banks are the major players in the derivatives markets both on the exchange platform and over-the-counter markets. The Banking institutions take positions in the derivatives when hedging exposures to interest rate and credit risks. They are also intermediaries by matching

the counterparties in a contract between the dealer and trader, taking the counterparty's position as a dealer, and making markets for derivatives trading. The economic impact of derivatives in the banks is traced to the increase in bank lending to allocate financial resources to productive sectors of the economy.

Non-financial firms are the end-users of the derivatives instruments either through hedging the risks from operations to reduce the cost of capital, financial constraints, and earnings volatility. These had an economic impact through the increasing firm value that is expanding investments and capital stocks.

Government and investors are taking part in the derivatives market through hedging risks. The trading derivatives will lessen the borrowing and enhanced portfolio management, promoting economic activities essential for economic growth.

While there are other channels in which derivatives impact the overall economy, this study was focused on bank lending and firm value through utilising system GMM and time series econometrics models. Thus, the study combined bank lending and firm value to assess the impact of derivatives in the South African economy; in this view, literature was extended in the corporate finance field by fusing two major variables important in the economic growth development: firm value and bank lending.

2.7CHAPTER SUMMARY

Theoretical derivatives have proved to be among the critical assets in the financial market from the literature reviewed. Statistics provide evidence that derivative instruments are increasingly used and are making strides in commerce. It asserts that the financial system with derivative instruments had better liquidity markets and information flows faster and provided corporates with a very static risk management strategy in corporate finance. The reviewed theory shows that derivatives allow financial markets to operate more efficiently, facilitating stability and increasing economic activities. The inclusion of derivatives in the capital market brings more benefits to an economy, which are noticeable in risk mitigation, price discovery, and liquidity enhancement and made available with these successful instruments. Derivatives allow firms and individuals with financial flexibility as well as an investment opportunity. Non-financial firms use hedging techniques to improve their cash flows and carry capital expenditure, which increases the GDP for a nation, thus increasing economic growth. Derivatives are used to allow corporates and banking institutions to use interest rate sensitivity sources of funds to finance their investment opportunities, growth prospects and venture into risk projects.

Countries' inclination to have stable and sustained economic growth has put pressure on policymakers to determine which determinants need more attention to be given priority for the development of nations. Moreover, the need to have sustainable economic growth has resulted in exponential growth in research in this field of economic growth (Polat *et al.* 2015b).

The next chapter explains the empirics of the derivatives to firm value, bank lending, and derivative usage and the extent of derivatives to economic growth through bank lending and firm value.

CHAPTER THREE

EMPIRICAL REVIEW

3.1 INTRODUCTION

In chapter two, the theoretical and conceptual framework of the study concepts was developed, reviewed, and exhibited that derivatives facilitate hedging and allow firms to venture into profitable projects with higher returns because of insurance against uncertainty. Thus, theoretically, derivatives show a vast economic benefit that helps financial systems distribute wealth to productive channels to promote investments and raise business activities, leading to economic growth and financial stability.

Chapter four unveils empirical research covering derivatives' use and increase in the volume of lending portfolios in the banking sector; non-financial firms' hedging activities using derivatives. The chapter is organised as follows, section one explains the literature on derivatives and bank lending, followed by section three, which examines derivatives and economic growth.

3.2DERIVATIVES USE AND FIRM VALUE EMPIRICAL ASPECT

The theorem of Modigliani and Miller (1958) emphasise that risk management strategies are inappropriate if the capital markets are perfect. Thus firm value is not achieved by hedging as was claimed by the Diamond (1984) model. However, numerous academics, including Dinh, Hoa and Robert (2014), Nguyen and Liu (2014), Sandu and Vanut (2014), Kim, Papanastassiou and Nguyen (2017a), Tanha and Dempsey (2017), and Nguyen, Kim and Papanastassiou (2018), tried to find out if firms derive value if they trade and hold derivatives. These academics suggested that the Modigliani and Miller (M &M) theory was applicable before the discoveries of modern techniques of hedging tools, primarily through the use of derivative instruments. Their studies disclosed that the use of derivative instruments could add value to businesses by reducing costs and risks brought about by the market, reducing costs of financial distress; reducing costs associated with under-investment opportunities, and reducing agency costs.

Paligorova and Staskow (2014) examined non-financial firms in Canada. They confirmed that one-third of publicly-listed firms in Canada reaped massive benefits with trading and contracting swaps related to interest rate derivatives, future-forward options, and swaps. They were related to foreign exchange rates to smother their earning streams for the period 2006 to

2013. Their empirical evidence showed that firms are using derivatives to hedge exposures (interest rate, exchange rate, and commodity price) to reduce their volatility in earnings. Paligorova and Staskow (2014) noted that in Canada, trading and holding of derivatives contracts was growing in all sectors of the economy amongst the non-financial institutions and was increasing during periods in which corporates are focusing on adverse outcomes from their operations. They further exposed that corporate hedging utilising derivative instruments enhances the value of their organisations compared to those who either trade or contract in any form of the derivative instrument. It is evidenced by higher profits and lower earnings volatility than non-hedgers because of their ability to lock in the value of their cash-flows as soon as they receive them. Canadian corporates contracting hedging derivative instruments revealed that they are actively managing their balance sheets through holding less cash and having the capacity to access external financing in capital markets with the confidence of hedging instruments in their books.

Dinh, Hoa and Robert (2014) revealed that large corporations from both the western and eastern worlds have been using derivative instruments as tools to protect their indirect exposure, such as price movement, cash flow volatility, and exchange rate fluctuations. They empirically examined the oil and gas exploration firms in the US. They discovered a negative and meaningful relationship between hedging and firm value if mining companies hedge their sources of risks associated with their exploration industries. When oil and gas prices increase, Dinh, Hoa and Robert (2014) showed that hedging the variables relates to lower firm value. In contrast, when oil and gas prices decline, their results confirm that hedging and firm value are unrelated. Their finding coincides with (Ayturk, Gurbuz, and Yanik 2016a) with a Turkish dataset.

Empirically, trading and contracting derivative instruments in non-financial firms appear to have gained much ground. Batta and Yu (2017b) examined credit default swaps (CDS) to determine if they influence firms' growth in investments and assets in the US. Batta and Yu (2017a) study found out that the net debt issuance falls following the introduction of CDS. A survey-based data analysis study found that movement of foreign currency rates managed with derivatives related to foreign exchange rates in the UK's non-financial firms and revealed that in London, the growth of international transactions and entrepreneurship led to the explosive use of hedging techniques using financial derivatives. Firm value was realised in the UK's non-financial firms through hedging business activities in international markets and capital costs.

According to Hassan and Afza (2016), increased globalisation and market turbulence led corporates to exchange rate exposures. Hassan and Afza (2016) empirically tested 181 Pakistani non-financial firms over the period 2004-2010. Their sample considered listed non-financial corporates on the Karachi stock exchange. They analysed firms trading and contracting derivatives related to foreign currency instruments on firm value and confirmed that businesses with foreign sales enhanced their firm value by using forex derivatives. Tobin's Q was used as a proxy of firm value in their model, and they concluded that firms gained 6.5 % growth in their value by trading foreign exchange derivative instruments in their operations. They also revealed 43.9 % achieved as an extent of foreign exchange derivatives is used as a hedging tool in Pakistan. The authors proved that even though the derivative market in Pakistan was illiquid, firms were drawing beneficial advantages from foreign exchange derivatives as a hedging technique.

Kim, Papanastassiou and Nguyen (2017a) analysed derivative instruments in East Asia from 2003 to 2013. Their sample comprised 881 non-financial firms pooled from eight East Asian countries. Derivatives trading within domestic firms and domestic multinational corporations (MNCs) during their day-to-day business were found to be generating more value through protecting cash-flow streams from international transactions (Kim, Papanastassiou and Nguyen (2017a). The authors also highlighted that derivative instruments held within MNCs from foreign affiliates had an insignificant effect on revenue generation through their research. In East Asia, non-financial firms in their home country derivatives reward through holding and trading derivative instruments for hedging purposes with a higher value. The same applies to domestic MNCs, especially if the corruption level is limited in their business culture. Statistically, hedging premiums in East Asian countries confirmed that domestic firms had a higher value for derivatives users (9.01 %). Domestic MNCs also had a positive hedging premium, but the hedging premium was 0.3% for foreign MNCs affiliates, implying that derivatives did not affect value enhancement. Kim, Papanastassiou and Nguyen (2017a) sought to address why corruption levels can lead to the massive use of derivative instruments and generate value for domestic MNCs and domestic non-financial firms within East Asian countries.

Lau (2016) used data and a sample of 680 non-financial firms listed on the primary market of Bursa Malaysia. In their model, Tobin's Q was used as a proxy that measures the value of firms. The study revealed that derivatives allow corporates to improve their return on assets (ROA) and (return on equity) ROE, which are the key drivers of firm market value. Trading derivatives contracts allow businesses to hedge sources of financial risks, enabling the

smooth flow of income streams from international transactions and generating more revenues to ensure financial volatilities that could adversely affect their operations. The study results by Lau (2016) confirmed that in Malaysia, corporates operating with lower income margins tend to contract derivative instruments in their operations to lock in already low margins that germinate from financial risks arising from their day-to-day operating activities. They documented that corporates could improve the ROA and ROE with outstanding contributions to operating income margins (Kim, Papanastassiou and Nguyen (2017a).

Tanha and Dempsey (2017) examined a sample of 224 publicly traded non-financial firms from the Gulf Cooperation Council consisting of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates by utilising the panel and cross-sectional data logistic approach. Tanha and Dempsey (2017) advocated that sources of risks emanating from foreign currency rates movements, changes in interest rates, the turbulence of commodity prices, and market forces of equities are the fundamentals that motivate businesses to incorporate hedging strategies within their risk management portfolios. The Gulf Cooperation Council, results show that firms frequently utilise exchange options, contracting swaps, futures-related to interest rates, and forwards on the OTC markets. Statistically, it was confirmed that firm size significantly affected firms' hedges with derivative instruments. In addition, the leverage ratio revealed that if firms are more levered, the chances of hedging are higher than unlevered corporates (Tanha and Dempsey (2017).

Bachiller, Boubaker and Mefteh-Wali (2021) investigated the relationship between financial hedging and firm value, used a meta-analysis, and concluded that the use of derivatives for hedging impacts the firm value. Also, reveal that hedging premium is significant, but it depends on the nature of the derivative instruments used in the hedging process. Also, derivatives are of great importance in common law and advanced economies than in emerging economies.

Ayturk, Gurbuz and Yanik (2016) analysed the influences of derivative contracting within non-financial firms in Turkey. Their study was more concerned with derivative instruments related to exchange rates, interest rates, and underlying commodity effects on the firm value of non-financial firms. Their study found that 36.41% of the investigated companies use derivatives to hedge fluctuations in currency rates, interest rate changes, and commodity price turbulences. Ayturk, Gurbuz and Yanik (2016) used the panel data model using Fama-French three-factor time series analysis and single sector analysis to estimate the model, with Tobin's Q as a measure of firm value. Ayturk, Gurbuz and Yanik (2016) highlighted that their

research failed to depict a significant hedging premium or discount for all Turkish non-financial firms, except after utilising system GMM estimators. Their study ignited the need for a re-test to determine if derivatives influence firm value. This recent study produced unfinished work, with mixed perceptions of derivative's benefits to commerce because their results were unclear.

Furthermore, their overall conclusion was that derivative instruments do not affect firm value in Turkey (Ayturk, Gurbuz, and Yanik 2016). Their findings coincide with (Dinh, Hoa, and Robert 2014) on the US's gas and oil exploration production companies, which concluded that hedging and firm value are unrelated when oil and gas prices decline. Tobin's Q ratio analysis with system GMM estimators reveals a positive relationship between the use of derivatives and firm value. They cited other contradictory results that non-financial firms in Turkey might be using other risk management tools instead of derivatives.

Firmansyah and Purnama (2020) research aim were to investigate the relationship between derivatives instruments and firm value in Indonesia. Their results exhibited that the is no association between derivatives and firm value. In Indonesia, investors do not consider derivatives ownership because they are harmful and not for investment impact.

Geyer-Klingeberg, Hang and Rathgeber (2020) investigated the corporate hedging effects on firm value using a meta-regression analysis. They concluded that firm value effects are higher for firms that hedge with foreign exchange hedgers than the interest rate and commodities hedgers. In addition, the study believes that articles published in higher ranked journals and with models that take fixed effects of firms in the model have a small hedging premium. Overall, they predict a hedging premium of 1.8% for foreign currency hedgers and a firm value discount of -0.8% (-0.6%) for interest rate (commodity price) hedgers.

Moding and Wahlgren (2020) analysed manufacturing firms in Sweden for the period 2004 - 2012. Their results reveal that derivatives had no significant impact on the firm value. The analysis showed that derivatives usage in Sweden does not significantly affect the firm for the whole period. Even though the coefficient sign exhibited a positive relationship, the authors concluded that firm value could not be caused by the growth and increasing use of derivatives.

Evidence from the South African empirical analysis reveals that non-financial firms are more concerned with the fluctuations in a market variable through the trading of forwards exchange contracts to hedge foreign exchange risk. For example, Donaldson (2011a),

analysing South African non-financial firms, reported that 40.54% of the firms used derivatives and cited that highly capitalised firms are the predominant users compared to smaller firms. Firms, mainly in the manufacturing sector, trade derivatives in South Africa to secure and ensure the pricing of raw materials and their commodity prices. From the Donaldson (2011a) study, 62.89% of the sampled manufacturing companies are using derivatives. Furthermore, it was observed that transportation, storage, and telecommunication industries are using derivatives to hedge their international receipts to receive their inflows with value using futures and forward contracts.

Correia, Holman and Jahreskog (2012) also interrogated derivatives and non-financial firms using the South African context. They exhibited that increasing usage of derivatives in corporate finance is mainly for risk management. In South Africa, non-financial firms are hedging foreign currency risk, followed mainly by interest rate risk. They also show that firms in production are hedging raw material fluctuations using commodities derivatives to secure the prices of inputs at an agreed rate for future delivery. Furthermore, the survey highlighted that the most used instruments for hedging are forward rate contracts and interest rate swaps (Correia, Holman, and Jahreskog 2012). They used a questionnaire to find out how the large listed firms in South Africa are using derivatives. Correia, Holman and Jahreskog (2012) indicated a high rate of derivatives usage among the non-financial firms, which shows that 90% of the sample is using derivatives and indicates that derivatives use increasing in South Africa, especially the hedging of interest rate risk using swaps. South African firms responded that derivative instruments hedge more than one type of risk in their operations. Correia, Holman and Jahreskog (2012)concluded that the most used derivative instrument for hedging foreign exchange risk was forwards, and interest rate swaps dominated the interest rate risk. In South Africa, non-financial firms reveal that their primary hedging strategy was based on contractual obligations, and companies do not hedge by taking a view on the market movements.OTC forwards derivatives are used more to hedge currency risk and interest rate swaps was dominant in the interest rate risk management. The study also reflected that in South Africa the foreign exchange risk is the highest risk being hedged using derivatives followed by interest rate risk. As compared to previously published results, Donaldson (2011a)asserts that more companies are making strides in derivatives hedging strategies. This study was more concerned with the foreign exchange derivatives and interest rate derivatives, nothing was cited in their survey on the commodities derivatives.

Holman *et al.* (2013) employed the reported financial statements review approach to analyse South African non-financial firms and indicated that 54% of the firms in South Africa are

using derivatives for hedging purposes. Their study is aligned with studies by Donaldson (2011a) and Correia, Holman and Jahreskog (2012), which indicated that currency risk is the leading risk being hedged using OTC forwards derivatives and swaps derivatives to hedge interest rate risk. This study revealed a declining use of derivatives compared to other studies. Correia, Holman and Jahreskog (2012) analysed the largest companies only while the current study incorporates every company listed on the JSE; even the smallest company was included in the study. The study further interrogates firm size and derivative use, which indicate a positive relationship between the variables in South Africa. The analysis shows that interest rate, currency, equities, and commodities are the main hedged risks in South Africa.

Empirically, there are significant variations from the results presented on the derivatives usage and firm value mainly because of the research methodology used. There are two approaches used to investigate the corporate use of derivatives which are survey-based through questionnaires (Correia, Holman and Jahreskog 2012; Glen Holman *et al.* 2013) and also an analysis of a company's financial results (Allayannis and Simko 2009; Bartram, Brown and Conrad 2011; Allayannis, Lel and Miller 2012; Holman *et al.* 2013; Ayturk, Gurbuz and Yanik 2016; Hassan and Afza 2016). The survey approach had many limitations that affected the study results: non-response bias, poor response rate, the untrustworthiness of the respondent, or interpretation issues. Specific requirements of reporting financial instruments in the international financial reporting standards (IFRS), IFRS 7, and international accounting standard (IAS) 39, which improved the disclosure of the uses of derivatives in the annual financial statements, were recommended. They made it easy to analyse the uses of derivatives by the non-financial firms and extract derivative use from their reported accounts. The use of annual financial statements can improve the study's objectivity. However, it can have a scope of limitations but can improve the analysis of the use of derivatives by firms than the survey approach (Holman et al., 2013).

This study will need to elaborate on the effects of derivatives on firm value using non-financial firms listed on the most robust exchange in Southern Africa, the JSE. The research done in Turkey did not reveal satisfactory results on the effects of derivatives on firm value because the following questions remain unanswered: Do derivatives increase firm values? Do derivatives influence growth in firm assets, cash flows and investments, and capital market of firms? These questions will be addressed in this study.

3.3 DERIVATIVES USAGE AND BANK LENDING

Brewer III, Minton and Moser (2000) investigated commercial institutions with assets above $300 million insured with Federal Deposit Insurance Corporation(FDIC) to ascertain if there is a relationship between the use of derivatives and the growth of the loan portfolio. Their study employed the times series estimation technique, which pools quarterly data across banking institutions. To determine the derivative's influence on lending in America, they considered swaps, the total value of futures, and forwards types of derivatives. However, many types of derivative instruments, such as foreign currency derivatives, might significantly impact lending activities. Therefore, they incorporated currency derivatives into the analysis to picture how derivative instruments influence credit extension in the banking sector.

Brewer III, Minton and Moser (2000) proved that loan growth is higher amongst banks trading and holding interest rate derivative instruments in their trade books. Interest rate derivatives permit financial institutions room to switch financing sources within the market and provide many options to choose amongst various sources of available funding. Therefore, banks no longer depend on less interest rate sensitive sources but can also use susceptible sources of interest rate risks. This capacity of having various options to source funds provides potential channels through which hedging with derivative instruments is of paramount importance to bank lending. Therefore, banks participating in interest rate contracts are exposed to more flexible financing channels and, subsequently, smooth funding opportunities.

Earlier studies identified the process of credit extension as a vital function of banking institutions in the financial services sector. Banks can have less access to financing sources that are more sensitive to interest rates due to uncertainties in interest rates (Brewer III, Deshmukh, and Opiela 2014). Brewer et al. (2014) proposed that banks can lessen the chances of systematic exposures by using derivative contracts. Financial institutions can trade contracting instruments in the interest rates market to reduce the adverse effects of interest rate ambiguity. Thus, banking institutions can be permitted to increase their degree of intermediation as measured by lending. Brewer III, Deshmukh and Opiela (2014) reviewed listed and unlisted bank holding companies in the US from 1986 to 2007, with a sample of 4 404 banks. In analysing interest rate derivatives, they assumed that the assets and liabilities of banks respond more to unexpected movements in interest rates, given the primary focus of intermediation activities. The results were strengthened by Akhigbe *et al.* (2018b), who stated

that the most critical risk that bank holding companies encounter is interest rate risk, which is intrinsic in the structure of institutions, to put the assets and liabilities into danger due to fluctuations of interest rates. To better understand the growth of commercial and industrial loans, they explored interest rate derivatives only. Their assumption postulated that if there is interest rate ambiguity, financial institutions are expected to use financing sources that are comparatively interest rate sensitive. From this perspective, they further argued that bank loans are chiefly financed by core deposits that are not affected mainly by interest rates. Using interest rate derivatives to reduce systematic risk exposure and mitigating interest rate risk movement will allow banks to increase their degree of intermediation, as is depicted in the lending activities.

The study results by Brewer III, Deshmukh and Opiela (2014) confirmed that trading and contracting in derivatives related to interest rate instruments might diminish bank holdings and their effects on loan portfolio growth and core deposit increases. Overall, they concluded that the usage of contracts in interest rate derivatives allows the reduction of banks' systematic risk to interest rate uncertainty, which will lead to a lower sensitivity of loan growth to core deposit growth. In addition, Brewer III, Deshmukh and Opiela (2014) brought to light that banks can freely choose various sources of funds if they use interest rate derivatives. As a result, they are protected from interest rate sensitive sources, thereby enjoying more extensive funding flexibility, low chances of funding restrictions, and increased lending activities.

Wen (2014) examined the Chinese banking sector's key characteristics, which affect lending because of the growth of the interest rate derivatives market in their financial system. The study showed that in Chinese banking, trading in derivatives positively affects lending volumes. The use of the VAR model shows that interest rate derivatives are bi-directional Granger causal with bank loan growth. Furthermore, he concluded that 20 percent of variations in bank advances derivative transactions in China cause growth. From 2007 to 2014, monthly data was used in China to analyse how interest rates allow credit extension. His finding showed that the use of derivatives improved intermediation efficiency and increased the ability of banks to make more lending activities.

Wen (2014) suggested that banks, when managing loan portfolios, should decide how much to lend; the conditions involved by which loans must be made; and how to mitigate the associated risks. The use of derivatives for hedging permits banks to advance more credit to borrowers who might face excellent credit risk. However, the study also found out that even during financial turmoil between 2007 and 2009. even hedging with significant positions did

not permit banks to increase the loan amount to promote their commercial and industrial loans (C & I) or advance money with high credit risk. The results of Wen (2014) study highlighted that commercial banks in China hedge their marketable risk (that is, interest rate risk) to facilitate their intermediation activity and alleviate a greater level of defaults.

(Purnanandam 2007), consistent with previous studies, big banks that show growth and hold fixed assets are practicing more hedging activities using derivative instruments. From his inconclusive discoveries, the study fails to reveal if trading in derivatives could substitute lending or complement balance sheet hedging since the results are sensitive to the economic specification used in the analysis. Derivative instruments can make banks' lending policies efficient to insure against shocks in the macro-economic environment, thereby permitting banks to realise high revenues in bad areas of the world.

Deng, Elyasiani and Mao (2017a) showed that banking institutions increased their lending activities and endured credit risk in the financial technology era. Their ability to contract and trade derivative instruments for hedging becomes the best risk management strategy for most institutions. Their analysis further stressed that banks need to incorporate interest rate derivatives in their trading to enjoy funding flexibility. To offer a smoother and higher level of intermediation in lending processes to achieve stable loan growth and more excellent economic growth stability. Li and Marinč (2014) alluded that the uses of derivatives contracts are positively and statistically significantly related to bank holding companies' systematic risk exposure. They concluded that small banks participate in derivatives primarily to hedge against sources of risk.

Prabha, Savard and Wickramarachi (2014b)analysed the effects of derivatives on bank lending using American data. They concentrated on price discovery, risk management, and cost in which derivatives influence the banks' lending activities. Studies that pay attention to interest rate derivatives conclude a robust association between the growth of loan portfolios and interest rate derivative instruments. In their work, Prabha, Savard and Wickramarachi (2014b) examined exchange-traded derivatives with a sample of 1 286 US banks with assets over $500 million from 2003 to 2012. In their methodology, banks with less than $500 million assets were excluded from the sample on the assumption that they were not trading derivative contracts. They revealed that the use of derivatives by banks in America allows more credits to be channelled to the private sector. The use of derivatives in commercial banks contributes to the quarterly real GDP by around $2.7 billion. Fluctuations in interest rates and currency values allow banks to use derivative instruments to hedge risks caused by market turbulence. A robust financial position and profitability give banks more chances of

promoting more lending volumes which necessitate the growth of industries across the country. Prabha, Savard and Wickramarachi (2014b) documented that banks use derivatives to guard against the chances of defaults emanating from the banks' debtors who might put borrowed funds into investments that are uncertain and could fail to repay their loan obligations.

Furthermore, they reported that US commercial banks' amounts of derivatives jumped from $71 trillion to $227 trillion for the years 2003 to 2012, respectively. Besides the growth in the volume of trades, the number of participating banks in the derivative markets was also booming because banks obtain extra protection against credit defaults and insure against sources of interest rate risks and other market variable movements, strengthening their financial position. This finding was supported by (Purnanandam 2007), who revealed that stronger banks provide more lending to the private sector.

The study undertaken by Prabha, Savard and Wickramarachi (2014b) in the United States of America evaluated the impact of the overall derivatives traded in the banking sector. Their methodology employed the VAR estimation technique. Keffala, de Peretti and Chan (2013) examined the impact of derivatives on bank performance. Their studies highlighted a gap in the literature since only two studies had dealt with the topic (i.e., studies by Said 2011 and Rivas *et al.* 2006) on the use of derivatives on banking performance. Therefore, it is not known if derivatives positively or negatively affect bank performance. For bank performance and the use of derivatives, there is a need for further inquiry on the impact of derivatives on banks' profitability, liquidity, and capital formation.

Zhao and Moser (2017) investigated the trading of interest rate derivative instruments to determine if they affect bank lending activities using FDIC-insured commercial banks from the US. Their sample included banks with assets ranging from $300 million and above with commercial and industrial loan (C & I) portfolios. Their objective was to inquire if derivatives substitute or complement credit extension for the period 1996 to 2004. From their analysis, there are different approaches in which commercial banks deal with interest rates uncertainty, such as employing interest rate derivatives. Their study showed that the use of derivatives by banks had significantly increased from $27.88 trillion in December 1996 to $62.78 trillion by 2004. A study by Zhao and Moser (2017) found that using interest rate derivatives by US banks led to the growth of commercial and industrial loans. Inexact interest rate futures, interest rate options, and interest rate forwards allow commercial banks to lend more to risk credits and expand the loan portfolio. Their results tally with earlier research by Brewer III, Minton and Moser (2000), who studied the use of derivatives and credit extension

using a sample of commercial FDIC-insured banks in the US for the period 1985 to 1992. They revealed a positive relationship between lending and the use of interest rate derivatives in the US, which strengthens the Diamond (1984) model that alluded that hedging of derivatives and credit extension are complementary activities. Their methodology employed pooled cross-sectional data with quarterly panel data to estimate time series regressions to analyse the effects of interest rate derivatives on the growth of commercial and industrial loan portfolios. Their study found that the capital ratio has a significant positive association with C&I loan portfolio growth and is aligned with the preceding empirical evidence that banks with high capital adequacy can create more lending.

Literature on bank lending and the use of derivatives has received far-reaching attention, more specifically from developed markets or western countries (Brewer III, Minton and Moser 2000; Purnanandam 2007; Brewer III, Deshmukh and Opiela 2014; Zhao and Moser 2017). Based on their findings in the United States, these authors concluded that banks using derivatives take part more in lending activities than those banks that do not contract in derivatives. Their business loan portfolio also booms at an astonishing rate compared to other competitors. However, literature from emerging economies on bank lending and derivatives is limited. This study seeks to fill the gap using data from an African country to investigate the association between bank lending and the use of derivatives. The study will use all derivatives traded in the banking sector to determine if they influence banks to extend credit to the private household sector and the public sector of the South African economy.

3.4 DERIVATIVES USE AND ECONOMIC GROWTH

Bujari, Martínez and Lechuga (2016c)assessed the effects of the derivative markets' impact on the economic growth of six major world economies. They employed a dynamic panel data model estimated with a generalised method of moments (GMM) estimation technique to analyse six of the world’s major economies and concluded that, empirically, derivative markets positively impact economic growth. The European Union, United States, Japan, India, China, and Brazil showed that the development of derivative markets influenced their economic growth. Bujari, Martínez and Lechuga (2016c) posited that if more attention is given to the development of derivative markets, it will help enhance economic activity and increase the prosperity of society. They also articulated that for economic development and an enhanced welfare economy, the governments should establish derivative markets to boost the growth of their economies. In studying the economic growth, the analysis considers the volume of derivatives traded in US dollars and the derivatives index as a proportion of the

GDP. The study has the following drawbacks, which the current study seeks to address. First, they focused on the World's largest economies, leading to a biased analysis of derivatives use. Secondly, derivative markets' economic influence is silent in their study; it is unknown how derivatives help economic growth, and channels leading to economic growth are unclear. Finally, their results did not reflect the actual influence of the use of derivatives in the economy. The study of the six largest world economies led to a generalised conclusion and did not reflect the impact of each country's derivatives. Therefore, this present inquiry investigated the impact of derivatives on the economic growth of a single country (i.e., South Africa) through credit extension and firm growth.

Therefore, a study by Polat *et al.* (2015a)was carried to determine financial development if there are linkages between trade openness and economic growth. The study utilised a South African dataset with the Cobb-Douglas production function to model the impact of financial development on the economy's growth. Their findings articulate that the South African financial sector is well developed with solid banking institutions. In reinforcing their notion, the findings of several authors, Schumpeter (1912), Goldsmith (1969), McKinnon (1973), Shaw (1973), and Levine (1997), hypothesise that a high rate of economic growth is achieved with a well-functioning financial system. However, from their analysis, Polat *et al.* (2015a) concluded, based on the preceding theory, that financial development facilitates economic growth in South Africa. The findings oppose Haiss and Sammer (2010a), who found no evidence of a correlation between financial development and economic growth. Although, Levine(1997) and Beck and Levine (2004)found a positive and robust relationship between stock market development and economic growth. Polat *et al.* (2015a)further stressed that capital adds to economic growth, and trade openness impedes economic growth.

They further invented support to policymakers to encourage financial innovations in the South African banking sector so that economic growth can be attained. They argued that trade openness facilitates financial development. This perspective tends to differ slightly because how can trading goods and services internationally improve the financial system? If not, the firms and investors are utilising derivatives to hedge their foreign sales and transactions. Therefore, the current study ought to investigate the impact of derivatives on the economy, which will capture the notion of trade openness in the firm value variable. The introduction of derivatives markets in the capital markets has a crucial role in developing financial markets. By facilitating the easy trading of securities in the capital market, derivatives enhance capital markets' liquidity, thereby allowing the smooth flow of funds from one trader to the next.

Additionally, derivatives facilitate banks to carry out their intermediation role efficiently. All these lead to economic growth. There is a similarity in their model with Haiss and Sammer (2010a)which they assume that financial development facilitates capital formation in an economy, which leads to economic growth. It only differs in what causes the development of the financial sector. Polat *et al.* (2015a)argued that it is trade openness that causes economic growth. At the same time, the current study assumes that derivatives are the economic adapters in the economic growth of South Africa. Derivatives pool many investors into the capital market, thereby making the market liquid and allowing banks to smoothly lend required capital to firms to invest in capital projects, which leads to an increase in the GDP, hence the growth of an economy. Polat *et al.* (2015a) model lack the most vital base for determining financial developments because they consider only credit to the private sector as a measure of financial development. However, the current study compares all banks' lending sectors using derivative instruments to measure financial development.

Vo, Huynh and Ha (2019)investigated derivative markets with a selection of four economies. The study concluded that derivative markets in China do not cause short-run economic growth. On the other hand, the US, India, and Japan derivatives affected the financial development and economic growth of the four countries they analyzed. Their investigation was based on trade openness, and interest rate effects on economic development and economic growth increased by derivative markets. In analysing the four countries, they used time series econometrics to test the relationship between the variables from 1998 to 2017. The use of high-income economies to analyse the effects of derivative markets on economic growth will not fully address the economic impact of derivative markets because of the economies of scale. Derivatives had many benefits for an economy, but their overall impact was indirect since the economy needed different channels to assess its influence on the development of the financial system. The effects of the indirect channels of derivative markets to be analysed, there is a need to investigate their role in the bank credit extension to risk borrowers and hedging firms' capital projects.

South African derivative markets and economic growth analysis were examined by Marozva (2014a) with the use of autoregressive distribution lag (ARDL)-bound test and Granger causality test. Marozva (2014a) was worried about derivatives and capital market development and derivatives and economic growth from 1994 to 2012. The study confirmed that derivatives impacted the development of the capital market, but that influence does not extend to the development of the economic growth of South Africa. The research did not highlight the channels through which derivatives are causing the capital market growth,

which might directly or indirectly be linked to the economic growth. Theoretically, Levine and Zervos (1998b) explained that the efficiency of a financial system is anchored on the liquidity of the capital market. The capital market of a country symbolises the lifeblood of the economy. Sill (1997) that derivatives induce liquidity in the financial markets and improve trading within the country. Thereby economic growth can be achieved. From this perspective, there is a need for a retest of the effects of derivatives in South Africa through developing a model which caters to the liquidity and functionating of the financial system, through providing funding for the economy (bank lending and derivatives use) and performance of the private sector(firm value and derivatives usage).

Bekale (2014)also researched to find out if the trading of derivatives could enhance economic growth in South Africa through employing three estimation techniques: generalised method of moments (GMM), vector error correction method (VECM), and generalised Autoregressive Conditional Heteroskedasticity(GARCH), even though the results exhibit no evidence of derivatives' influence on economic growth in South Africa for the period 1979 to 2012. Bekale (2014) analysis produced a contradicting ideal with the theory, which suggests that since their results fail to exhibit evidence of economic growth through the development of derivatives. It means that the financial development proxies which exhibit statistically insignificant growth in South Africa reveal that the developments 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 byBekale (2014) generated a gap that needs to be filled with more recent data that incorporates the OTC derivatives. The proposed model in the current study incorporated the bank lending variable that measures liquidity, which captures the function of the financial system. .through the use of derivative instruments for carrying out intermediation functions that promote funding of companies, individuals, and government to produce for a nation and lead to economic growth. The variable captures the liquidity enhancement by the derivatives in the capital market through lending and allowing investors to efficiently raise capital and finance investment opportunities that boost the economic activity, such as South Africa.

Mulei (2019b)studied the trading of derivatives and economic growth in South Africa utilising GMM, VECM, and GARCH estimating techniques for the robustness of the results. As a result, the study revealed no statistically significant relationship between derivatives and economic growth in South Africa for the period 1970 to 2017. However, Mulei (2019b)states that the study only utilises a fraction of the available data, which might affect the quality of the results because of the exclusion of OTC derivatives data in the analysis, which caters to

the highest volume of transactions in the derivatives market of South Africa (Bank of International Settlement 2019). Therefore, their study exhibits a negative and insignificant relationship.

Derivatives usage and its impact on the economy in South Africa yielded a negative relationship (Bekale 2014; Marozva 2014b; Mulei 2019b). While in high-income markets such as the United States (US), China, Brazil, India, and Japan, derivatives are directly linked to the development and growth of their economies (Prabha, Savard, and Wickramarachi 2014b; Bujari, Martínez and Lechuga 2016a; Oliinyk *et al.* 2019; Vo, Huynh, and Ha 2019; Vo *et al.* 2019b).

All empirical studies on the derivatives growth-nexus have yielded negative results in South Africa or, at the best insignificant impact irrespective of different models and sample period. At the same time, the opposite is true for studies conducted in developed countries. These findings are robust for obvious reasons that the derivatives market in South Africa is still not yet developed to a threshold where it can benefit the economy decidedly. In developed countries, derivative markets are mature, and such results are expected. Therefore, the question emerged, who are the beneficiaries of the profound growth of derivatives in the economy? If not, the whole economy is benefiting? Therefore, a new model is needed to conduct the study using a new set of variables, including bank lending, firm value, and economic growth, to be tested in middle-income countries such as South Africa.

The derivatives variable incorporates exchange-traded, and OTC derivatives data; other empirical studies in South Africa did not include the OTC data. Thus, the first hypothesis tested was derivatives' impact on economic growth inclusive of the OTC data. The second hypothesis was to test the 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. Finally, the third hypothesis was to test the firm value and economic growth using derivatives.

3.5 EMPIRICAL LITERATURE GAP ANALYSIS

The casual analysis of derivatives markets and economic growth, mainly in developed market economies, reveals that these variables tend to move together over time. What remains thorny to researchers is the question as to why such a relationship exists. Is it pure coincidence, wealth effect, or is the derivatives market a ‘mirror’ or a leading indicator of the economy, or does the derivatives market drive the economy or the reverse? This study aims to answer such

questions regarding South Africa by examining the impact of derivatives on bank lending, firm value channels, and economic growth.

Starting with, in empirical literature reviewed, it has been observed that the impact of derivatives on the economic growth through the liquidity channel was not given much attention. Even though theoretically, it was explained that derivatives bring to the financial system more liquidity through attracting more investors on the market. Various studies did not assess the liquidity channel through derivatives to economic growth (Marozva 2014b; Polat *et al.* 2015a; Bujari, Martínez and Lechuga 2016b; Duc *et al.* 2019; Mulei 2019a). In literature, theoretical it was hypothesised that derivatives make capital markets more liquid. However, empirical literature of derivatives through liquidity channels in an economy either directly or indirectly was scarce. Therefore, the current study proxies the liquidity channel of the financial system through the use of bank lending variables. Lending creates funding and finance available to all sectors of the economy. Hence its incorporation in the model captures the liquidity channel in an economy with the use of derivatives.

Liquidity is a vital channel in which it improves the economy through the efficiency of the financial system. Empirical literature was more concerned with credit to the private sector as a measure of financial development. This study mainly contributed to the banking and financing literature by incorporating the bank lending variable that measures the liquidity channel, which captures the funding activities in the financial system. The bank lending variable used captures all loan types in the market. The analysis firstly assesses the impact of derivatives on the aggregate loans, breaking down the loan types into private, public sectors lending and mortgage as proxies of bank lending. The present study extended the existing bank lending proxy, which used commercial and industrial loans to measure bank lending in literature.

Although, bank lending is the primary channel through which financial resources can be transferred from surplus to deficit units in an economy. The analysis assesses the impact of derivatives on the bank's functions of intermediation that promote funding of companies, individuals, and government to produce for a nation and lead to economic growth.

In addition, in the empirical literature, there is up to now no consensus about the relationship between hedging and firm value that is, (Adam, Fernando and Salas 2017; Firmansyah and Purnama 2020; Firmansyah *et al.* 2020; Likitwongkajon and Vithessonthi 2020) confirm negative effect and no significant in firm value impact of derivatives. And also (Callahan and Hairston 2020; Bachiller, Boubaker, and Mefteh-Wali 2021) review positive effects on firm value, therefore findings are mixed and do not show off a clear-cut conclusion. The lack of

consistent evidence in the empirical hedging literature might be explained by several factors, including data (period and nature of risk), model specifications, methodologies, and country-specificities. The significance of the results of various studies differs across countries and over time due to microeconomic factors, education, infrastructure, technology, and human capital. Also, the other problem that might yield mixed results is the issue of endogeneity. The significant difference in risk measures and corporate value between the firm value and derivatives use could be omitted variables (Bujari, Martínez, and Lechuga 2016c). Therefore, in the empirical assessment of the study, the system Generalised Method of Moment (GMM) estimator was used, which is robust in controlling the endogeneity problem through data transformation by differencing the regressors and at the same time removing the fixed effects. Also, the system GMM is handy in controlling endogeneity by introducing instruments to dramatically improve the efficiency of the estimator's heteroscedasticity and transform the instruments to make them uncorrelated with the error term. Thus, the current study results can explain a different view with the conflicting results in empirical literature.

Finally, the empirical evidence suffers cross country growth regressions that is (Duc *et al.* 2019; Vo, Huynh and Ha 2019; Tejado, Pérez and Valério 2020); the regression analysis assumed that the observations are drawn from the same population yet vastly different countries, which required a single country analysis. Also, conceptually the study used a single country, South Africa, because countries change policies regularly, economies experience business cycles, and governments rise and fall. Thus, the study solves the problem of conceptualisation because if the cross country analysis were used, the coefficient of the regressions must be interpreted cautiously. Moreover, when averaging over long periods, the countries are affected by any changes that might not occur simultaneously, as highlighted above. Therefore, aggregation blurs important aspects and events, and differences across countries. So, the study deals with the issues to do with statistical and conceptual problems by examining a single county using a time series relationship between derivatives and economic growth. Also, a single country analysis resolves the issue of causality as compared to a cross country analysis. Furthermore, in the empirical analysis, there were more concerns with the functionality of the interest rate derivatives in the current study; all derivatives were considered.

3.6 SUMMARY

Theoretical derivatives have proven to be the most important instruments in the financial market from the literature reviewed. Literature asserts that the financial system with derivative instruments had better liquidity, a faster flow of information, and a very static risk

management strategy for corporates. The reviewed theory showed that derivatives allowed financial markets to operate more efficiently to facilitate stability and increase economic activities. Direct benefits are noticeable in risk mitigation, price discovery, and liquidity enhancement, which are made available with the presence of these successful instruments. Derivatives provide firms and individuals with financial flexibility as well as investment opportunities. Non-financial firms use hedging techniques to improve their cash-flows and carry capital expenditure, increasing GDP for a nation, increasing economic growth. Derivatives are used to allow corporates and banking institutions to use interest rate sensitivity sources of funds to finance their investment opportunities, growth prospects and venture into risk projects.

Theoretically, derivatives had economic benefits for the overall economy through facilitating banks to increase their lending(Brewer III, Minton and Moser 2000), thereby providing capital to corporates, government, and households to fund their investment opportunities, which increases the GDP. In the financial markets, derivatives increase stability through transferring menaces amongst market participants from risk-averse investors to risk-oriented investors(Tejado, Pérez, and Valério 2018). Banks participating in derivative markets had their lending activities boosted compared to institutions that do not participate in derivatives trading(Zhao and Moser 2017). Firms that hold and trade derivatives increase their value by reducing capital costs, increasing their cash-flow through hedging, taking high profit capital expenditures, and funding their investment opportunities using external finances(Batta and Yu 2019). Through bank lending and firm value, Derivatives and economic growth had limited empirical evidence in South Africa. The studies by Marozva (2014b), Bekale (2014), and Mulei (2019b) examined derivatives and economic growth and exhibited a negative relationship and an insignificant relationship between the two variables.

The next chapter will discuss the research design of the study; population, data sources and issues, model specifications, and explanation of the independent and dependent variables.

CHAPTER FOUR
METHODOLOGY

4.1 INTRODUCTION

The literature reviewed in the preceding chapter establishes that derivatives are vital growth engines in developed and developing countries. However, empirical justification of this hypothesis is still scarce in developing countries due to the lack of data on derivatives. For example, the derivative markets in Southern Africa are still shallow, serve South Africa. With derivatives, the financial institutions find it easy to extend credit to productive sectors of the economy, while the firms find it easy to undertake risky albeit profitable projects. This chapter provides the methodology through which the study objectives were addressed. The chapter is divided into three sections; each section provides the empirical strategy of addressing respective objectives.

Firstly, the chapter presents the research design that was adopted in the study. The second section explained objective one methodology, data issues and variables used to answer the research questions, the theoretical framework of generalised methods of moments (GMM), and empirical model estimation. The third section details the second objective methodology, data, sources, and issues of bank lending variables. The dynamic panel model setting was used to examine bank lending, and derivatives use. The final section explained the methodology used to assess the impact of derivatives on economic growth. The section explained data sources and issues of economic growth and explanatory variables. The theoretical framework of the vector autoregressive model (VAR), stationarity tests procedures, economic growth, empirical model estimation, and the post estimation diagnostic tests was explained in the last section.

4.2 RESEARCH DESIGN

Research design is the roadmap that links the research objectives, research questions, and the study's empirical results (Punch 1998). In other words, it spells out what data to be collected for the study, what testing techniques are to be used, how the analysis of the data is to be performed, and how all of these are going to answer the research questions(Kumar 2011). The research design must be built emulating the purpose of inquiry which can be rooted in one of the following,

(i) Exploration

(ii) Description

(iii)Explanation

(iv)Prediction

(v) Evaluation

(vi)history

The research design is classified into two main groups, that is qualitative and quantitative research approaches. The quantitative design methods are specific, glowing structured, and have been scientifically examined for reliability and validity (Kumar 2011), while designs in qualitative approach do not have these attributes. They are less specific, precise, and do not have the same structural depth(Richard et al., 2017). This study follows a pure quantitative design. The quantitative methodology had three perspectives in which it is categorised and determined: the number of contacts in the study, the reference period of the study, and the nature of the investigation(Babu 2008). In quantitative approaches, every study can emulate either one of them said perspectives. Many of the quantitative approaches' characteristics are inhabited in this study: using numbers that span over a period and a reference period. The quantitative approach permits measuring the phenomenon in multiple grades, and it is scientifically examined for reliability and validity. Therefore, these are the main reasons the research design is quantitative. The study used secondary data sources estimated with dynamic panel and time series models with STATA 15.

Furthermore, with the nature of this study, which seeks to establish the relationships between derivatives usage, bank lending, firm value, and economic growth with other control variables, the explanatory research design was the most appropriate research design to provide the answers to the research questions reliably. It is also referred to as analytical research in the literature(Kumar 2011). The research questions of the impact of derivatives on economic growth and the impact of derivatives on bank lending and firm value are mostly applicable under explanatory research design. The explanatory research is designed to find answers on causal links between variables, for example, derivatives and economic growth, derivatives and control variables (leverage, firm size, profitability, cash flow, and liquidity). Prabha, Savard and Wickramarachi (2014b) iterated that explanatory research design is a well-structured research design in nature, therefore suitable for the current study with the time series and panel dataset and nature of the study.

The study analysed existing numeric data with statistical modeling techniques. The min data sources were the Reserve bank of South Africa and the Bloomberg financial database. Dynamic panel data models were used in objectives one and two estimated with the generalised method of moments (GMM) estimation techniques. The third objective, the

impact of derivatives on economic growth, was estimated with a vector autoregressive (VAR) model to determine the causal relationships among the variables with time series analysis.

4.3 THE IMPACT OF DERIVATIVES ON FIRM VALUE

According to Bachiller, Boubaker and Mefteh-Wali (2021), derivatives are very important tools in helping firms secure their businesses against various risks in the market. Therefore, objective one requests to establish if derivatives usage has an impact on firm value. This objective was addressed by employing a dynamic panel data model estimated with the system generalised method of moment (GMM) estimation techniques. The estimation technique is robust in controlling for endogeneity, unobserved heterogeneity, autocorrelation, and dynamic panel bias (Blundell and Bond 1998). Furthermore, the system GMM was deemed appropriate due to its well acknowledged ability to account for endogeneity prone with panel data set and growth-related models (Arellano and Bond 1991).

The subsequent sections explain the theoretical framework of GMM, data sources, and issues required to answer the research questions in objective one. The final part of the section explained the model estimation on the impact of derivatives usage and firm value.

4.3.1 Generalised Method of Moment (GMM)

The generalised method of moments (GMM) is a statistical method that combines observed economic data with the information in population conditions to produce estimates of the unknown parameters of the economic model (Zsohar). The GMM uses the moment conditions that are functions of the model parameters and the data such that their expectations are zero at the parameters' true values. In econometrics, GMM is a dynamic panel data estimator whereby data is referred to as longitudinal data(Roodman 2009). Panel data refers to multi-dimensional data involving measurements over time. It contains observations of multiple phenomena obtained over multiple periods for firms, individuals, and countries(Baum 2013).

The difference GMM and the System GMM estimators were developed by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). They postulated that GMM had the following specifications in its estimation, the number of cross sections or groups (N) must be greater than the time (T), it uses the instrumental variables (IV), the instruments must be exogenous (Z). Therefore, $E(Z'\mu) = 0$, and the number of instruments must be lower or equal to the number of the groups in the panel, that is ($Z \leq N$).

The GMM methodology was generally designed for estimators to proxy the following scenarios with:

a) Linear functional relationship.
b) Small 'T' and large 'N' panels, small time periods, and many individuals
c) Dependent variable that is dynamic, depending on its past realisations.
d) Explanatory regressors that are not strictly exogenous, with the possibility of correlation with past and current realisations of the error term.
e) Fixed individual effects.
f) Heteroskedasticity and autocorrelation

4.3.1.1. Mechanics of GMM

Considering a first-order autoregressive panel data model given by:

$$y_{it} = \alpha y_{i,t-1} + u_{i,t,} \qquad i = 1, \dots N; t = 2, \dots, T, \tag{4.1}$$

Where y is the dependent variable, i is the cross sectional identifier, N is the number of cross sections, t is time, T is the terminal time, $y_{i,t-1}$ is the first lag of the dependent variable.

And,

$$u_{i,t,} = \eta_i + \nu_{i,t,} \tag{4.2}$$

Where $\eta_i and \nu_{i,t,}$ are assumed to have an error components structure with**:**

$$E(\eta_i) = 0, \ E(\nu_{i,t,}) = 0, \ E(\eta_i \nu_{i,t}) = 0, \ \text{for} \ \ i = 1 \dots, N \ \text{and} \ t = 2, \dots, T \tag{4.3}$$

$$\boldsymbol{E}(\nu_{i,t,}\nu_{i,s}) = 0, \ \text{for} \ \ i = 1 \dots, N \ \text{and} \ t \neq s, \tag{4.4}$$

The initial conditions satisfying that the standard assumption $y_{i,1}$

$$E(y_{i,1}\nu_{i,t}) = 0, \ \text{for} \ \ i = 1 \dots, N \ and \ t = 2, \dots, T \tag{4.5}$$

The conditions (4.3), (4.4), and (4.5) imply moment restrictions that are enough to identify and estimate α for $T \geq 3$(Blundell and Bond 1998).

Estimation in first differences

Blundell and Bond (1998) emphasise that in the absence of further restrictions on the process of creating the initial conditions, the autoregressive error components model (4.1)- (4.5)

implies the following, $m = 0.5\,(T-1)(T-2)$ orthogonality conditions which are linear in the α parameter.

With these assumptions, the following (T-1) (T-2)/2 linear moment conditions are valid

$$E\left(y_{i,t-s}\Delta\upsilon_{i,t}\right) = 0 \quad \text{for} \quad t = 3, \dots, T \text{and} \quad s \geq 2 \qquad (4.6)$$

Where $\Delta v_{it} = v_{it} - v_{it-1}$ this condition only holds in the absence of serial correlation in the time varying disturbance v_{it} They were combined with the restriction in equation 4.5.

the moment conditions in equation 4.6 can be more compactly expressed as;

$$E(Z_i' u_i) = 0$$

Where Z_i is the (T $-$ 2) x m matrix given by omitting the $i$subscripts

Defining

$$Z_{di} = \begin{bmatrix} y_{i1} & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 0 & y_{i1} & y_{i2} & \cdots & 0 & \cdots & 0 \\ . & . & . & \cdots & . & \cdots & . \\ 0 & 0 & 0 & \cdots & y_{i1} & \cdots & y_{iT-2} \end{bmatrix}; \; \Delta u_i = \begin{bmatrix} \Delta u_{i3} \\ \Delta u_{i4} \\ \vdots \\ \Delta u_{iT} \end{bmatrix},$$

As given by Arellano and Bond (1991), the GMM estimation for α will be given by:

$$\widehat{\alpha_d} = \frac{\Delta y_{-1}' Z_d W_N^{-1} Z_d' \Delta y}{\Delta y_{-1}' Z_d W_N^{-1} Z_d' \Delta y_{-1}} \qquad (4.8)$$

Where $\Delta y = (\Delta y_1', \Delta y_2' \dots \Delta y_N'), \Delta y_i = \left(\Delta y_{i3,} \Delta y_{i4}, \dots \Delta y_{iT}\right), \Delta y_{-1}$ the lagged version of Δy, $Z_d = (Z_{d1}', Z_{d2}', \dots, Z_{dN}')$ and W_N , weight matrix which determining the efficiency properties of the GMM estimator.

$\widehat{\alpha_d}$ is the differenced model of the GMM estimator reference to as the Difference GMM and moment conditions $E\left(y_i^{t-2}\Delta u_{i,t}\right) = 0 \quad t = 3, \dots, T$ and $E\left(Z_{d,i}'\Delta u_i\right) = 0$ are the difference moment conditions.

4.3.1.2 Difference GMM

The difference GMM was proposed by Arellano and Bond (1991), and it is the original estimator. The difference GMM corrects the endogeneity by transforming all regressors through differencing and removes fixed effects in that process(Arellano and Bond 1991). However, this first difference transformation has a weakness in its estimation. It is because to subtracts the previous observation from the contemporaneous one, thereby magnifying the gaps in an unbalanced panel data, so if there are unbalanced panel data applying difference GMM may weaken the results to an extent(Bujari, Martínez and Lechuga 2016a). Therefore, the difference GMM model is illustrated in the following equations,

Initial model

$$lnY_{it} = \emptyset lnY_{it-1} + \beta X'_{it} + (\eta_{it} + \varepsilon_{it}) \quad (4.9)$$

Transformed model

$$\Delta lnY_{it} = \Delta\emptyset lnY_{it-1} + \Delta\beta X'_{it} + \Delta\varepsilon_{it} \quad (4.10)$$

By transforming the regressors through first differencing, the fixed effects are removed, as it does not vary with time, but the problem of endogeneity remains. From (4.10), the model becomes

$$\Delta\mu_{it} = \Delta\eta_{it} + \Delta\varepsilon_{it} \quad (4.11)$$

Or

$$\mu_{it} - \mu_{it-1} = (\boldsymbol{\eta_i} - \boldsymbol{\eta_i}) + (\varepsilon_{it} - \varepsilon_{it-1}) = (\varepsilon_{it} - \varepsilon_{it-1}) \quad (4.12)$$

Unobserved, fixed effects no longer enter the equation as they are by assumption constant between periods. Also, the first differenced lagged dependent variable is instrumented with its past levels, and now changes in the dependent variable are assumed to be represented by equation 4.10. Therefore, Arellano-Bond's estimation transforms all the regressors through differencing and uses the generalised method of moments(GMM), thus the name difference GMM (Roodman 2009). The Arellano–Bover/Blundell–Bond estimator augments Arellano–Bond by assuming that the first differences of instrument variables are uncorrelated with the fixed effects. It allows the introduction of more instruments and can dramatically improve efficiency. It builds a system of two equations: the original equation and the transformed one,

and the estimator is called the system GMM. The system GMM is modeled in the following section to show how the difference GMM was overcome by introducing more equations.

4.3.1.3 System GMM

The second GMM estimator system was proposed by (Blundell and Bond 1998a), who suggested using lagged differences as instruments for estimating equations in levels. The system GMM is handy in controlling endogeneity because it introduced more instruments to the model, dramatically improving the estimator's efficiency and transforming the instruments to make them uncorrelated (exogenous) with the fixed effects(Blundell and Bond 1998a). The system GMMbuilt a system of two equations: the original equation and the transformed equation. Furthermore, the system GMMuses orthogonal deviations; instead of subtracting the previous observation from the contemporaneous one, it subtracts the averages of all future available observations of a variable. Hence, no matter how many gaps, it is computable for all the observations except the last for each individual, so it now minimises data loss as compared to what was obtained under the difference GMM.

Therefore, the System GMM estimation equations are as follows

The simplest model without strictly exogenous variables is an autoregressive specification of the form

$$y_{it} = \alpha y_{i(t-1)} + \eta_i + \nu_{it} \quad |\alpha| < 1 \qquad (4.13)$$

The assumption being if it is a random sample of N individual time series $(y_{i1}, \ldots\ldots y_T)$ is available. T is small, and N is large. The $\nu_{it}$is assumed to be finite moments and in particular $E(\nu_{it}) = E(\nu_t \nu_s) = 0$ for $t \neq s$, that is, if there is a lack of serial correlation but not necessarily independence over time. With these assumptions, the values of γ lagged two periods or more are valid instruments in the equations in first differences. That is $T \geq 3$ the model implies the following $m = (T-2)(T-1)/2$ linear moment restrictions

$$E\left[(\bar{y}_{it} - \alpha \bar{y}_{i(t-1)}) y_{i(t-j)}\right] = 0 j = 2, \ldots\ldots, (t = 3, \ldots\ldots, T) \quad (4.14)$$

Where for simplicity,$\left(\bar{y}_{it} = y_{it(t-1)}\right)$. To obtain the optimal estimator α as $N \to \infty$ for fixed T based on these moment restrictions alone. If there is an absence of any other knowledge concerning initial conditions or distributions of the ν_{it} and the η_i. Arellano and Bond (1991) emphasised that for the model, they assume that it implies a quadratic moment restriction

$$E\ (\bar{v}_{it}\bar{v}_{i(t-2)}) = 0 \qquad (4.15)$$

The moment equations in (4.15) above can be conveniently written in vector form as

$$E\ (Z_i^t\ \bar{v}_{it}) = 0 \qquad (4.16)$$

where $\bar{v}_{it} = (\bar{v}_{i3} \ldots . \bar{v}_{iT})$ and Z_i is a $(T-2)\ X\ m$ block diagonal matrix whose the block is given by $(y_{i1} \ldots \ldots . y_{is})$

If it was the case, the application of the difference GMM estimator yields both a biased and inefficient estimate of α in finite samples, and this is particularly acute when time (T) is short. Poor performance of the difference GMM estimator in such circumstances is attributed to poor instruments (Blundell and Bond 1998). Therefore, in this case, the system GMM is applicable because of its strong fundamentals as follows:

a) One equation is expressed in level form, with the first difference as instruments.
b) The second is expressed in the first differenced form with levels as instruments.
c) The approach involves using a greater number of moment conditions. Still, Monte Carlo evidence suggests that when T is short and the dependent variable persistent, there are gains in precision, and the small sample bias is reduced when the system GMM is applied.
d) In the presence of heteroscedasticity and serial correlation, a two-system GMM estimator should be used exploiting a weighting matrix using residuals from the first step
e) However, unlimited samples such standard errors tend to be downward biased, and the conventional approach by practitioners in such circumstances is to use what is known as Windmeijer adjustment to correct for such small sample bias.

Blundell and Bond (1998), from the initial condition, exploits additional moment conditions that:

$$E(\varepsilon_i \Delta y_{i2}) = 0 \qquad (4.17)$$

This hold, given that the process is mean stationary:

$$y_{i1} = \frac{\eta_i}{1-\alpha} + \varepsilon_i \qquad (4.18)$$

With $E(\varepsilon_i) = E(\varepsilon_i\,\eta_i) = 0$ if $\mathbf{E}(\varepsilon_i) = \mathbf{0}$, $\boldsymbol{E}(\nu_{i,t,}) = \mathbf{0}$, $\boldsymbol{E}(\eta_i\nu_{i,t}\,) = \mathbf{0}$, $\boldsymbol{E}(\eta_i\nu_{i,t}\,) = 0$ and hold then the following (T-1) (T-2)/2 moment conditions are valid:

$$E(u_{it}\Delta y_i^{t-1}) = 0 \qquad t = 3, \dots, T \tag{4.19}$$

Where $\Delta y_i^{t-1} = (\Delta y_{i2,}\Delta y_{i3,}, \dots, \Delta y_{it-1,})$ defining

$$Z_{li} = \begin{bmatrix} \Delta y_{i2} & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 0 & \Delta y_{i2} & \Delta y_{i3} & \cdots & 0 & \cdots & 0 \\ . & . & . & \cdots & . & \cdots & . \\ 0 & 0 & 0 & \cdots & \Delta y_{i2} & \cdots & \Delta y_{iT-1} \end{bmatrix}; \; u_i = \begin{bmatrix} u_{i3} \\ u_{i4} \\ \vdots \\ u_{iT} \end{bmatrix}$$

Moments conditions $E(u_{it}\Delta y_i^{t-1}) = 0 \qquad t = 3, \dots, T$ can be expressed as:

$$E(Z_{li}'u_i) = 0 \tag{4.20}$$

The GMM estimator based on these conditions is given by:

$$\widehat{\alpha_l} = \frac{\Delta y_{-1}' Z_l W_N^{-1} Z_l' \Delta y}{\Delta y_{-1}' Z_l W_N^{-1} Z_l' \Delta y_{-1}}$$

Where $\widehat{\alpha_l}$ is referred to as the Level GMM estimator, and $E(u_{it}\Delta y_i^{t-1}) = 0 \quad and\; E(Z_{li}'u_i) = 0$ are the lev moments conditions.

The linear moment conditions full set under assumptions $\mathbf{E}(\varepsilon_i) = \mathbf{0}$, $\boldsymbol{E}(\nu_{i,t,}) = \mathbf{0}$, $\boldsymbol{E}(\eta_i\nu_{i,t}\,), \boldsymbol{E}(\eta_i\nu_{i,t}\,) = 0, E(\eta_i\nu_{i,t}\,) and\; E(\varepsilon_i\Delta y_{i2}) = 0$ is expressed as:

$$E(y_i^{t-2}\Delta u_i) = 0 \quad t = 3, \dots, T \tag{4.21}$$

$$E(Z_{si}'p_i) = 0 \tag{4.22}$$

Where

$$Z_{si} = \begin{bmatrix} Z_{di} & 0 & \cdots & 0 \\ 0 & \Delta y_{i2} & & 0 \\ . & . & \ddots & . \\ 0 & 0 & \cdots & \Delta y_{iT} \end{bmatrix}; \; p_i = \begin{bmatrix} \Delta u_i \\ u_i \end{bmatrix}$$

The GMM estimator based on these conditions is given by:

$$\widehat{\alpha_d} = \frac{q'_{-1} Z_s W_N^{-1} Z'_s q}{q'_{-1} Z_s W_N^{-1} Z'_s q_{-1}}$$

$with\ q_i = (\Delta y'_i, y'_i)'$ This gives the system GMM estimator as given by Blundell and Bond (1988). The moment conditions $E(y_i^{t-2} \Delta u_i) = 0 \quad t = 3, \dots, T \;\; and\; E(Z'_{si} p_i) = 0$ are the system moment conditions.

The difference GMM corrects the problem of endogeneity through data transformation by differencing the regressors and, at the same time, removing the fixed effects. The Arellano-Bond estimation transforms all regressors by differencing and uses the GMM. It is called the difference GMM. On the other hand, it is this instrument the dependent variable $(Y_{i,t})$And the other endogenous variables with uncorrelated variables with the fixed effects. The Blundell and Bond estimator augments the difference GMM with an additional assumption of no correlation on the first differences of instrumental variables and the fixed effects, allowing for the introduction of more instruments and improving efficiency in system GMM.

System GMM enhances efficiency by employing additional instruments of the lagged first difference variable $(Tobin's\ Q_{t-1})$. It solves the problem of weak instruments with difference GMM. The technique instruments levels equations with first differenced instruments and instruments differenced equations with levels instruments generating a system of equations. Firm-specific effects are eliminated by taking first differences.

More specifically for this estimation from equation 4.13, consider a model of the form:

$$Y_{it} = \beta_0 Y_{i,t-1} + \beta_1 DER_{it} + \beta_2 X_{i,t} + u_{i,t} \qquad (4.23)$$

Derivatives use(DER_{it})is assumed to be endogenous because of the possible bi-directional relationship between derivatives use and firm value, and causality may run in both directions. The system GMM technique, in addition to exogenous instruments, uses the level and lagged endogenous variables and makes endogenous variables predetermined and not correlated with the error term. Estimated the model in first differences and levels using differenced lagged regressors to instrument levels equation controls for individual heterogeneity. Variations among firms are also partially retained (Antoniou, Guney, and Paudyal 2008).

$u_{i,t}$ in equation 4.23 consists of firms' unobservable effects v_i and specific errors $e_{i,t}$

$$u_{i,t} = v_i + e_{i,t} \tag{4.24}$$

GMM uses the first difference to transform equation 4.23 to

$$\Delta Y_{it} = \beta_0 \Delta Y_{i,t-1} + \beta_1 \Delta DER_{it} + \beta_2 \Delta X_{i,t} + \Delta u_{i,t} \tag{4.25}$$

The firm fixed effect does not vary over time, and by differencing the regressors, it is removed; thus, equation 4.24 becomes:

$$\Delta u_{i,t} = \Delta v_i + \Delta e_{i,t} \tag{4.26}$$

Which follows:

$$u_{i,t} - u_{i,t-1} = (v_i - v_i) + \left(e_{i,t} - e_{i,t-1}\right) = e_{i,t} - e_{i,t-1} \tag{4.27}$$

assuming independent and serially uncorrelated error terms across firms.

$$\left[E\left(\mu_{i,t}\mu_{i,\tau}\right) = 0 \; for \; \tau \neq t\right]$$

Initial conditions satisfy:

$$E\left[\left(I/K_i\right)\mu_{i,t}\right] = 0 \; for \; t > 2$$

The presence of $y_{i,t-1}$ (lagged firm value) it is a source of autocorrelation controlled by instrumentation with past levels and differenced instruments in system GMM. T should be > 2 for differencing to be applicable, the number of available instruments increases with T, in this case where T=22 a valid instrument for $y_{i\,22} - y_{i,21} = y_{i,21}$. System GMM uses the levels equation and the AB type orthogonality conditions to obtain a system of equations in

levels and the other differenced. The second equation provides additional instruments and increases efficiency (Blundell and Bond 1998b). The two-step system GMM estimator uses one-step residuals to construct asymptotically optimal weighting matrices, yielding efficiency rather than one-step estimators.

The two-step system GMM technique developed by Blundell and Bond (1998) was employed to estimate the model. The utilisation of the orthogonal conditions on the variance-covariance capacitates control for the correlation of errors over time, heteroscedasticity in firms, simultaneity, and measurement errors (Antoniou, Guney, and Paudyal 2008). The ability to address endogeneity problems from the relation between leverage and growth opportunities through instrumentation of the system of equations at levels and at first differences. Under these considerations, Blundell and Bond establish that the system-GMM estimator becomes a handy tool.

Given the nature of the study, which investigated the variety of firms, banks motivated the use of system GMM methodology over a period. First, the GMM was used because it is a dynamic data estimator. Furthermore, the estimators were used because it controls for the endogeneity of the lagged dependent variables in a dynamic panel model (Blundell and Bond 1998a). Endogeneity means there is a correlation between the explanatory variable and the error term in a model. Thus, the model is robust in controlling omitted variables bias, unobserved panel heterogeneity, and measurement errors in the data (Arellano and Bond 1991).

4.3.2 Data sources and issues

To achieve the objective of the study, JSE listed non-financial firms in South Africa were utilised.

The study considered 199 non-financial firms out of a population of 399 listed firms on the JSE. Listed firms were selected intuitively due to the availability of derivatives data. Financial firms were excluded in constructing the final sample because of their capital structure complexities, different regulations, and mixed motives in derivatives usage (Akhtar and Oliver 2009). In addition, firms with less than three years of financial reported data were excluded from the sample to allow for instrumentation and lag construction within this study's estimation technique. The final sample for estimation constituted 150 firms for a period of 22 years from 1996 to 2017. The study employed unbalanced panel data. Panel data was explicitly selected because it enables the observation of multiple phenomena over many periods, combining cross-sectional and time series analyses (Judson and Owen 1999). Hence,

the ability to reduce co-linearity in explanatory variables and improve the efficiency of the econometric estimates (Akhtar and Oliver 2009). Data were extracted from firms' financial statements through Bloomberg's online financial database.

The dependent variable is the firm value (Tobins'Q), and the primary independent variables are derivatives use (Deri use), the extent of hedging (H extent). The control variables are leverage (LEV), firm size (size), cash flow (C.F), liquidity (LIQ), and profitability (PROF).

4.3.3 The dependent variable

This objective seeks to examine the impact of derivatives on firm value; hence, the dependent variable in the empirical model is firm value, following previous studies by Vengesai and Kwenda (2018), Wernerfelt and Montgomery (1988), Aivazian, Ge and Qiu (2005), the firm value as measured by Tobin's Q ratio. Therefore, the study used Tobin's Q as a proxy for the firm value, and it is a good proxy for firm value because of its computations. It is a good indicator of value given its inference to the ratio expressed as the market value of the firm's assets to the replacement value of those assets(Altuntas et al., 2017). All market value of outstanding stock plus the market value of debt is divided by all production capacity replacement value (Lin et al., 2017). Wernerfelt and Montgomery (1988) emphasised that Tobins' Q is a good proxy for firm value because its calculation takes the market value of the firm's assets and the replacement value of those assets. Tobins' Q ratio in this study was measured as the market value of equity divided by total assets (Jin and Jorion 2006; Panaretou 2014; Vengesai and Kwenda 2018).

Numerous studies use Tobins' Q raw ratio; however, Hirsch and Seaks (1993) suggested that log transformed Tobin's Q produces better statistical distributional properties than raw ratios. Therefore, this study used the natural logarithm transformation of Tobins' Q ratio to improve the data distribution and empirical estimates.

$$\text{Tobins}'\ \text{Q}_{it} = \frac{Market\ value\ of\ equity}{total\ assets}$$

For robustness checks and to investigate sensitivity analysis of the results, two alternative measures of firm value were constructed. Firstly, the firm value was proxied by cash flow. It is theoretically emphasised that investment opportunities and growth are constrained if cash flows are reduced(Prabha, Savard, and Wickramarachi 2014b). Thus, the study adopted cash flow as an alternative measure of firm value to analyse the impact of derivatives on firm

value through its investment prospects and growth opportunities. Another important aspect of firm value measurement considered the total sales of a firm. According to Allayannis and Weston (2001), the size and growth of a firm can be seen in its sales. As an alternative measure of firm value, the study used total sales as a dependent variable in the third model for robustness checks. It is measured as the firm's market value to the book value of the total sales proxied by Sales Q. We find out that the results are independent of how we measure firm value.

4.3.4 Independent variables

The main independent variable is derivative use. The study used two different measures of financial derivative use: (i) derivatives use as a dummy variable equal to one if a firm uses or reports any form of derivatives in a given period, and zero for firms that do not use derivatives. It was estimated in model 1 following the model by Ayturk, Gurbuz and Yanik (2016a). However, since the dummy variable does not measure the exact level of hedging in a firm, the extent of hedging was proposed in the next model proxied by the notional value of derivatives. To capture the effect of hedging or partially hedging, a continuous variable of derivative use was estimated in model 2; thus, it is the extent of hedging. (ii) Extent of hedging is measured as a ratio of the total notional value of derivative instruments to book value(Kim, Papanastassiou, and Nguyen 2017a). The study specifically accepted exchange rate forwards, currency options, swaps as currency derivatives, interest rate swaps, options, collars, and caps as interest rate derivatives (Ayturk, Gurbuz, and Yanik 2016a). It is argued that firms that carry out their business with the use of derivatives as a hedging strategy increase in their value because they can mitigate the risks associated with adverse growth opportunities (Giraldo-Prietoa et al., 2017).

$$extent\ of\ hedging\ = \frac{notinal\ value\ of\ derivatives}{book\ value\ of\ derivatives}$$

In addition to the derivatives, other control variables which influence firm value in literature were used as explanatory variables. These control variables are explained in the following subsections:

a) **Size:** The size of firms is related to the economics of scale; also, the financial distress costs are not similar across the firms (Gerald and Jouahn 1998). Literature shows that smaller firms are likely to have higher defaulting rates; therefore, small firms had higher incentives for hedging Ayturk, Gurbuz and Yanik (2016a). Empirically, more studies reviewed a positive relationship between firm size and Tobin's Q. To affect

the size of firms, this study used firm size measured as the natural logarithm of total assets. A positive sign is expected because its size influences the growth of a firm, therefore, a positive impact is expected in the coefficient between firm size and firm value.

$$\log(Total\ assets)$$

b) **Profitability**: A profitable firm is more likely to be involved in international business than the lesser one; therefore, the chances of trading derivatives and using them as hedging instruments are slightly higher. A profitable firm is expected to fetch higher values more than an unprofitable one (Kim, Papanastassiou, and Nguyen 2017a). Therefore, a higher profitable firm is more likely to be trading more in derivatives and be a high value firm (Allayannis and Weston 2001). Profitability variables were incorporated to control the profitability economics of scale, and it is measured as a ratio of net income to total assets. A positive sign is expected in this study because of the links inherently incorporated within the two variables.

$$profitability\ = \frac{net\ income}{total\ assets}$$

c) **Leverage**: Firm value can be related to the financing structure of the organisation. The reviewed literature indicated that the firm's financing structure could affect the firm's value if there are market imperfections (Vengesai and Kwenda 2018). In addition, some studies reviewed that leverage had a reducing effect on the investment opportunities due to its commitments on the debt, agency problems which can exhibit a negative relationship between firm value and leverage (Fauver and Naranjo 2010; Allayannis, Lel and Miller 2012; Deng, Elyasiani and Mao 2017a). Therefore, to control the effect of differences in firms' capital structure, leverage was used as a variable proxy measured as a ratio of long-term debt to total assets (Allayannis and Weston 2001; Aivazian, Ge and Qiu 2005; Allayannis and Simko 2009). As a result, the expected relationship in the regression results is a negative between Tobin's Q and leverage.

$$leverage\ = \frac{long\ term\ debt}{total\ assets}$$

d) **Liquidity**: firm's investments in higher returning projects are influenced by its ability to service its short-term obligations. If a company has enough liquidity to meet its basic daily needs, it could fund its capital projects with internally generated funds, protecting itself from financial risks. It was proxied as cash and cash equivalents to current liabilities to control liquidity in the empirical estimation model. A negative relationship is expected between liquidity and firm value. If the firm is illiquid, its value is reduced on the market because investors value healthy firms can meet their dues when they fall due.

$$liquidity \ = \frac{cash \ and \ cash \ equivalents}{current \ liabilities}$$

e) **Cash flow**: The ability of the firm to finance investment opportunities with its internally generated funds is in its ability to generate more revenue. It is a risk for firms to hold cash idle, and it is advisable to invest the funds and earn interest. Holding cash will reduce the value of firms, mainly because investors require firms that generate more value for their investments; therefore, to control internal funds, availability is measured as a ratio of operating cash flows to total assets. The coefficient is expected to reveal a positive impact of cash flow on the firm value.

$$cash \ flow \ = \frac{operating \ cash \ flow}{total \ assets}$$

4.3.5 Model specifications

The study used a dynamic panel model to examine the effects of derivatives usage on firm value. Literature appraisal indicates that economic relationships are dynamic, so it is the strength of panel data to help researchers understand the dynamics of their adjustments (Baltagi 2005). Firm value is dynamic because current investment levels are driven by past values (Vengesai and Kwenda 2018). A dynamic panel model includes a lagged dependent variable as one of the explanatory variables. Lagging the dependent variable reduces autocorrelation arising from any misspecification (Arellano and Bond 1991). A dynamic model captures firm dynamic over time and deals with the endogeneity problem (Arellano and Bond 1991; Blundell and Bond 1998a).

Therefore, these dynamics are characterised by the presence of the lagged dependent variable among the regressors, that is, the initial equation of a dynamic panel model given below,

$$Y_{it} = \delta Y_{i,t-1} + \beta X_{it} + \varepsilon_{it} \quad (4.28)$$

Where i = 1, ...N; t=1, …….. T and δ is a scalar X_{it} are a vector of regressors

From the given model, the analysis adopted the model from the studies of (Allayannis and Weston 2003; Allayannis and Simko 2009; Allayannis, Lel, and Miller 2012; Panaretou 2014; Ayturk, Gurbuz, and Yanik 2016a). Therefore, the general linear panel model is given by:

$$Y_{it} = \alpha + \beta * D_{i,t} + \sum \delta * X_{i,t} + \varepsilon_{i,t} \quad (4.29)$$

Where Y_{it} is the dependent variable that is firm value, D denotes the primary variables - derivatives usage, α is the intercept, β,δ are the regression coefficients to be estimated, $\boldsymbol{i}$ specific firm while $\boldsymbol{t}$ is the time, $\boldsymbol{X_{it}}$ a vector of explanatory variables with k factors (k=1. 2…N), $\boldsymbol{\varepsilon_{i,t}}$ It is the error term.

The specification above was extended to a GMM dynamic panel setting to control for unobservable, time-invariant features of the firms. Equation (4.29) was extended to a dynamic panel fixed model, which includes a fixed effects parameter to cater to individual firm's specific effects, as shown by (Blundell and Bond 1998a; Judson and Owen 1999). Equation (4.30) below gives the general form of a dynamic panel model

$$Y_{it} = Y_{i,t-1} + x_{i,t}\beta + \eta_i + \varepsilon_{i,t}; |\gamma| < 1 \quad (4.30)$$

Where η_i is a fixed effect, $x_{i,t}$is a vector of control variables, $\varepsilon_{i,t} \sim N\ (0, \sigma_\varepsilon^2)$ is a random disturbance assuming $\sigma_\varepsilon^2 > 0, \in (\varepsilon_{i,t}, \varepsilon_{j,s}) = 0$

The system GMM was deemed appropriate due to its well acknowledged ability to account for endogeneity prone with panel data set and growth-related models (Arellano and Bond 1991; Blundell and Bond 1998a). Furthermore, the estimation technique is resilient in the panel data sets where the time dimension (*T)* is small relative to the number of cross-sections *(N)* like in this study (*T*=22 and *N* =150). Blundell and Bond (1998a) argue that the system GMM is handy in controlling endogeneity by introducing more instruments to dramatically improve the efficiency of the estimator's heteroscedasticity and transform the instruments to make them uncorrelated with the error term. Roodman (2009)emphasised that system GMM builds on a system of two equations: the original equation and the transformed one.

The measuring instruments are the building blocks of the dynamic panel data model used to assess the impact of derivatives on the firm value in South Africa. The model contains observations of Tobin's Q ratio as a measure of the firm value measured as the market value

of equity divided by total assets (Jin and Jorion 2006; Panaretou 2014; Vengesai and Kwenda 2018). leverage measured as a long-term debt ratio to total assets, profitability measured a net profit ratio to total assets. In addition, firm size is measured as the natural logarithm of total assets, liquidity as a ratio of cash and cash equivalents to current liabilities, cash flow as a ratio of operating cash flows to total assets, and derivatives as notional amounts in South Africa.

The specific model estimated extends from equation (4.30)takes the following form with specific variables to analyse the firm value:

$$Q_{it} = Q_{it-1} + \beta * Der\ use_{i,t} + \delta Size_{i,t} + \vartheta Prof_{i,t} + \gamma Lev_{i,t} + \omega Liq_{i,t} + \varphi CF_{i,t} + \eta_i + \mu_{i,t} \quad (4.31)$$

Where Q_{it-1}, is the lagged Tobin's Q variable$Der\ use_{i,t}$is a dummy variable equal to 1 for firms that use derivatives and 0 for firms that do not use derivatives. Size is firm size, and Prof represents firm profitability, Lev is firm leverage, Liq is liquidity, CF for cash flows, η is time invariant unobservable firm-specific effect is time invariant.

To examine the impact of hedging on firm value, the model in equation (4.31) with derivative usage variable was extended to equation (4.32), where derivatives hedging variable was incorporated to replace the dummy derivative use. The assumption being the derivative use dummy variable in model 4.31 does not exactly measure the level of firm hedging; therefore, the extent of hedging was estimated with model 4.32. In the model, the extent of hedging is a continuous variable that proxies the notional value of derivatives.

Therefore, model 4.32 was used to measure the impact of derivatives hedging,

$$Q_{it} = Q_{it-1} + \beta * H\ extent_{\ i,t} + \delta Size_{i,t} + \vartheta Prof_{i,t} + \gamma Lev_{i,t} + \omega Liq_{i,t} + \varphi CF_{i,t} + \eta_i + \mu_{i,t} \quad (4.32)$$

$H\ extent_{\ i,t}$does the notional amount of derivatives measure firm hedging extent to book value,

Table 4. 1: Summary of firm Value and derivative variables

Dependent Variable	**Measurement**	**Symbols**	**Expected sign**	References
Firm Value	Market Value of Equity Divided by Total Assets	**Tobins' Q**	**Positive**	(Allayannis and Weston 2001) (Vengesai and Kwenda 2018)
Derivative Usage	Dummy1 Or 0 Otherwise	**Dev** (Der Use)	**Positive**	(Kim, Papanastassiou and Nguyen 2017b) (Prabha, Savard and Wickramarachi 2014b)
Extend of Derivatives Use	Notional Value of Derivatives to Book Value	**He (**Derivative **Fail Value**)	**Positive**	(Alam and Afza 2017b)
Leverage	Long Term Debt Over Total Assets	**Lev** (Ltd/Ta)	**Negative**	(Allayannis, Lel and Miller 2012) (Vengesai and Kwenda 2018)
Liquidity	Cash and Cash Equivalent to Current Liabilities	**Liq** (Quick Ratio)	**Positive**	(Allayannis and Weston 2001)
Cash flows	Operating Cash flows To Total Assets	**C.F** (Cash Ratio)	**Positive**	(Allayannis and Weston 2001)
Firm Size	Total Assets	**Size** (Ta)	**Positive**	(Ayturk, Gurbuz and Yanik 2016a)
Profitability	Net income to total assets	**Prof (net profit)**	**Negative**	(Kim, Papanastassiou and Nguyen 2017a)

4.4THE IMPACT OF DERIVATIVES USAGE ON THE BANK LENDING

The study's second objective was to establish the impact of derivatives on bank lending in South Africa. The empirical methodology to examine the impact of derivatives was explained in subsequent sections. The aim was to establish if derivatives influence banks' lending activities in South Africa. The objective was assessed through; system GMM estimator with the dynamic panel data model. Blundell and Bond (1998a) argue that the system GMM is handy in controlling endogeneity by introducing instruments to dramatically improve the estimator's heteroscedasticity and transform the instruments to make them uncorrelated with the error term. Blundell and Bond (1998a)emphasised that system GMM builds a system of

two equations: the original equation and the transformed one. The data used to test the impact of derivatives on bank lending was extracted from the statistical datasets of the Reserve Bank of South Africa from 1996 to 2017.

The subsequent sections will explain the data sources and variable issues, model estimation as they were used to assess the impact of derivatives on the lending activities in the banking industry in South Africa.

4.4.1. Generalised Method of Moments

The objective under this section also used the GMM estimation technique in analysing the impact of derivatives on the lending activities in South Africa. The theoretical framework is the same as explained in section 4.3.1; therefore, this section will reference 4.3.1 for the background of GMM and mechanical transformations.

4.4.2 Data, sources, and issues

The banking institutions' sample selection included all publicly and non-publicly traded banks from South Africa's financial system to broaden the analysis for the 22 years. The idea to use both traded and non-traded banks were to maximise the number of observations in the sample (Brewer III, Deshmukh and Opiela 2014). Banks with at least three years of repeated financial data were considered. Those with two years and below data were automatically excluded from the analysis to allow for instrumentation and lag construction with the estimation technique. Also, banks that were not reporting their returns in the BA 900 form with the statistics of the Reserve Bank of South Africa were automatically excluded. The sample included all registered banks in South Africa. Bank Supervision Department (2018) documented that there were 71 banks at the end of the final quarter of 2017, that is, 19 registered banks, three mutual banks, three corporative banks, 15 local branches of foreign banks, and 31 foreign banks with representative approval offices. The final sample for the estimation constituted 39 banks that had filled the BA900 form with the Reserve Bank of South Africa and available data from Bloomberg's financial database.

This study used aggregate loans from public sector lending, private lending, and mortgage lending in South Africa to measure lending activity in the banking sector. Bloomberg's financial database and the statistics database of the Reserve Bank of South Africa are the main sources of data used in analysing the impact of derivatives on the loan portfolio growth in South Africa. In statistics and econometrics, panel data refer to the multi-dimensional data frequently involving measurements over time and contain observations of multiple

phenomena obtained over multiple periods for the same banks (Baum 2013). Panel data involve two dimensions, a cross sectional dimension, N (39 banks in South Africa), and a time series dimension, T (22 years 1996-2017). The study employed the System Generalised Method of Moments estimation techniques developed by Arellano and Bover (1995), Blundell and Bond (1998). The method has the power to overcome heteroscedastic and endogeneity problems in estimation (see Mohanty, Das & Kumar, 2018; Vengesai & Kwenda, 2020; Hayes, 2015). Therefore, this objective used panel data set.

The objective's dependent variable is bank lending (LOANS), with the explanatory variables, derivatives use, bank size (TA), bank capitalisation (EQRA), and liquidity (LIRA).

4.4.3 Dependent variable

The study seeks to examine the impact of derivatives on the lending activities in the banking sector of South Africa; hence, the dependent variable is the total loans $(\boldsymbol{TLCOPVT_{i,t}})$**T**hat is total loans growth to the domestic, government, and corporate sectors for bank $\boldsymbol{i}$ at a period, $\boldsymbol{t}$. In examining the relationship between the growth in bank credit extension and bank participation in derivatives markets, the various exploratory variables that influence bank lending and derivatives participation are included in the model, as represented by the following equation $(\boldsymbol{DERIV_{i,t}})$**.**

$$\boldsymbol{TLCOPVT_{i,t} = f\ (X_{i,t-1}\,; DERIV_{i,t})} \qquad (4.33)$$

*($X_{i,t-1}$*are control variables (bank size, liquidity, capitalisation*); ($DERIV_{i,t}$*main explanatory variable*)*

In literature, commercial and industrial (C & I) loans were used to measure lending activities. It was referred to as the most loan type, which was exposed to credit and interest rate risk than all other types(Brewer III, Minton and Moser 2000; Purnanandam 2007; Brewer III, Deshmukh and Opiela 2014; Zhao and Moser 2017). Prabha, Savard and Wickramarachi (2014b) follow C &I loan as the proper representative channel that links productive sectors of the economy and financial system. However, fundamentally, some loans fall under domestic loans, which are used productively by small and medium enterprises, households, and farmers who might borrow to finance production and fund investment opportunities that contribute to the national grid (GDP), which is captured in the model of this study. Various loan types were used, including overdrafts and advances to the public sector, private sector, and mortgage advances to various economy segments. Therefore, the study tests the impact of derivatives on the growth of total loans measured and an aggregate loan to the domestic,

government sector, and mortgage lending. Several additional robustness tests were performed by analysing the impact of derivatives on other loan categories as dependent variables. For robustness tests, three estimations were carried, with dependent variables being private sector loans, private sector loans, and mortgage loans.

$$\text{total loans}_{it} = domestic\ sector\ loans + goverment\ sector\ loans + mortgage\ loans$$

4.4.4 Independent variables

The main independent variable is derivative use. The associated objective is to analyse the effect of derivative use on the bank credit extension to private, government, and corporate borrowers (total loans). This study's specification includes ***DERIV*** as variable measuring bank participation in derivatives. Brewer III, Deshmukh and Opiela (2014) suggest that the coefficient of ***DERIV*** summarises the impact of derivatives activity conditional on adequately incorporating the intermediating process in the remaining terms of the specification. The inclusion of this variable allows the investigation to determine whether derivatives' activity is complementing or substituting for lending activities. Loan contracts had systematic risks which reveal the importance of derivative use as a third form of contracting. Diamond (1984) emphasises that derivatives' contracts permit banks to lessen the systematic risk in their loan portfolio. This use of derivatives contracts to hedge systematic risks enables banks to obtain further reductions in delegation costs and, in turn, allows banks to intermediate more effectively. Diamond's model predicts that derivatives' activity will complement hedging activity. If banks participate in derivatives' trading and hedging complements the credit extension, as predicted by (Diamond 1984), one would expect a positive coefficient estimate of the **DERIV** variable to bank lending. To capture the effects of derivative usage on bank loan portfolio growth, Zhao and Moser (2017) included various bank variables to measure participation in derivatives contracts in the domestic and corporate borrowers. The derivative is a binary variable which equals one if the banks engage in any form of derivative activity, or zero otherwise.

Bank lending is determined by many possible supply and demand factors (Brewer III, Minton and Moser 2000; Zhao and Moser 2017). To control the effect of these factors, they employed capital to asset ratios, loan quality by C &I loan charge-offs as a proxy, and state employment rate in their model to cater for supply and demand factors. Prabha, Savard and Wickramarachi (2014a) tested the impact of the extent of bank derivatives' usage measured by the ratio of a bank's notional amounts to its total assets. Likewise, the model of this study

will incorporate bank-specific factors ($\boldsymbol{X_{i,t}}$) as control variables which influence bank lending.

a) **Size:** The total assets variable was used to control bank size (TA) effects because larger banks are expected to participate more in derivatives' activities (Purnanandam 2007). Bank size impacted the use of derivatives as either end-user or market makers due to their economics of scale; therefore, the size of a bank affects loans and external financing (Brewer III, Deshmukh and Opiela 2014; Zhao and Moser 2017). To ensure that the size of the banks and derivatives usage is controlled, the variable was proxied as a natural logarithm of total assets in the model. As a result, the coefficient is expected to be positively correlated between bank size and loan growth.

$$\log(total\ assets\ )$$

b) **Capital adequacy**: literature suggests that banks lend more if they have adequate capital; Sharpe (1995) reported a positive relationship between loan growth and bank capital. Beatty and Gron (2001) strengthened the argument with their evidence that banks with higher capital have their loan portfolio increasing, and banks with constrained capital are lending less. Therefore, banks that are capital constrained will adjust their capital to asset ratio by cutting down the loan portfolio to meet their capital requirements; thus, a positive relationship is expected between loan growth and capital to asset ratio. To control the financial distress effect, which is reflected in banks' capital adequacy and profitability, as predicted by hedging theorists, Diamond (1984) and Smith and Stulz (1985)highlighted that banks with high chances of financial distress participate more in derivatives' hedging activities. The equity-to-total assets ratio (***EQRA***) measured at time t-1 was used to control capital adequacy in the empirical model.

$$capital\ adequacy_t = \frac{total\ equity}{total\ assets}$$

c) **Liquidity**: Loan portfolio growth can be affected by banks' liquidity; they can lend more if they are liquid. Banks with less liquidity will scale down their loan books to fund their commitments by reducing their loan portfolio. To control for liquidity, the variable was measured as liquid assets-to-total assets ratio in period t-1 proxied as ***(LIRA)*** in the empirical models. The liquidity is expected to have a positive coefficient on loan portfolio growth.

$$liquidity_t = \frac{liquid\ assets}{total\ assets}$$

4.4.5Model specifications

The basis for this empirical analysis was built on the specifications of the study on banking sector lending by Prabha, Savard and Wickramarachi (2014b). C & I lending growth was the main dependent variable in the literature. It was used to proxy bank lending because it measured the critical function in channeling funds between the financial and productive sectors of the economy (Sharpe and Acharya 1992; Brewer III, Minton and Moser 2000; Prabha, Savard, and Wickramarachi 2014b; Zhao and Moser 2017).

The model developed by Prabha, Savard and Wickramarachi (2014b)pinned its roots to the model developed by Brewer III, Minton and Moser (2000) with their foundation laid by Sharpe and Acharya (1992) model. These models were interested in one set of derivatives, interest rate derivatives, except Prabha, Savard and Wickramarachi (2014b), who incorporated all derivative instruments. The improved model by Prabha, Savard and Wickramarachi (2014b) captures the effect of bank size to control the economics of scale effect in the model; therefore, it was adopted as the best model to follow.

In practice, it is difficult to categorise lending into commercial and industrial loans as the main sources of finance funding only the productive sectors of an economy. For instance, there are household borrowers who can borrow to finance productive sectors of the economy. For example, small businesses are the main pillars of the economy and can account for 80% of industries. Small enterprises can borrow to fund growth and investment opportunities that have a great bearing on the GDP. Their borrowings are categorised under private sector lending in the banking industry. In the South African banking sector, such borrowings are referred to as loans to the unincorporated business enterprise of households (item 184 of BD900). In every economy, the highest number of jobs is created by small and medium enterprises. They are small in size but large in numbers. Their borrowings from financial institutions are categorised as private-sector loans. Therefore, this study captured all lending (borrowings) in the banking sector in the model. That is, the researcher incorporated all overdrafts and loan advances given by the total yearly growth rate of corporate, government, and household lending proxied as,$\boldsymbol{TLCOPVT_{i,t}}$ with a set of explanatory variables $\boldsymbol{X_{it-1}}$ That is the bank $\boldsymbol{I}$ during period $\boldsymbol{t}$ through $\boldsymbol{t\text{-}1}$for the period 1996 to 2017.

To cater for the dynamic nature of lending activities, the analysis used a dynamic panel data model to analyse the impact of derivatives on lending estimated with system GMM.

The initial model which captures the dynamics of the lending activities is as follows

$$\boldsymbol{lending_{i,t} = \beta_0 lending_{i,t-1} + \alpha_i + \beta \chi_{it} + \lambda_t + \varepsilon_{i,t}} \quad (4.34)$$

Where the (panel dimension) $i = 1, \ldots, N$ and (time dimension) t = 1,…,T.α_i and λ_t are the (unobserved) individual and time-specific effects, $\boldsymbol{)lending_{it}the}$ dependent variable which is the total lending in the banking ($\boldsymbol{TLCOPVT_{i,t}}$) for bank i for the time t period.$\boldsymbol{lending_{it-1}}$ lagged dependent variable that is the total bank lending **(**,$\boldsymbol{TLCOPVT_{i,t}}$**),** $\boldsymbol{X_{it}^1}$vector of independent variables that are **(DERIV),** bank size **(TA)**, liquidity **(LIRA)**, capital adequacy **(EQRA)** and $\boldsymbol{\varepsilon_{it}}$the error term, the error (idiosyncratic) term with ($\varepsilon_{i,t}$)= 0, and E($\varepsilon_{i,t}\varepsilon_{j,s}$)= $\delta^2{}_{\varepsilon}$ if j= i and t= s, and E($\varepsilon_{i,t}\varepsilon_{j,s}$)= 0 otherwise.

The initial model was transformed into equation (4.35) to incorporate specific variables in the model and take the following form:

$$\boldsymbol{TLCOPVT_{i,t} = TLCOPVT_{it-1} + \beta 1\, DERIV_{i,t} + \sum_{j=1}^{3} \beta_i X_{i,t} + \lambda_t + \varepsilon_{i,t}} \quad (4.35)$$

Where**,** $\mathbf{TLCOPVT_{i,t}}$ is the yearly growth rate of corporate, and government, and household lending portfolio for banks **i** at period **t**, $\mathbf{DERIV_{i,t}}$represents derivative usage, which is a dummy variable equal to 1 for banks that use any type of derivatives and 0 for banks that do not use, unobservable bank fixed effects λ_i, $\mathbf{X_{i,t}}$ represents bank specific variables that are EQRA, LIRA, TA respectively, and$\boldsymbol{\varepsilon_{i,t-1}}$ is the error term.

The equation extends from equation (4.35) to capture bank-specific variables in equation (4.36).

$$\boldsymbol{TLCOPVT_{it} = TLCOPVT_{it-1} + \beta 1 DERIV_{it} + \gamma TA_{it} + \partial EQRA_{it} + \vartheta LIRA_{it}} + \lambda_i + \boldsymbol{\varepsilon_{i,t}} \quad (4.36)$$

Where TA is total assets, EQRA, is equity to total assets ratio, LIRA is liquid assets to total assets ratio,

4.4.6.Sensitivity analysis and Robustness checks

To further analyse the effects of derivatives usage on bank lending, model 4.36 was extended to investigate the impact of derivatives on different loan categories. The impact of derivatives use on the growth of different loan categories was tested with three alternatives, dependent

variables. Total loans were replaced with sector lending with private, public, and mortgages as dependent variables. That is, the dependent variable in equation 4.36 was substituted with private sector lending. The following model examines the extent of derivatives use on private lending,

$$\boldsymbol{PVTLENDING_{it} = InPVTLENDING_{it-1} + \beta i * DERIVUSE_{it} + \gamma TA_{it} + \partial EQRA_{it} + \vartheta LIRA_{it} + V_i} + \varepsilon_{i,t-1} \quad (4.37)$$

PVTLENDING is the measure of total loans to the private sector,$PVTLENDING_{it-1}$is the lagged dependent variable.

The effects of derivatives on lending to the public sector were estimated using model 4.38. were used to test the impact of derivatives usage on the growth of public sector loan growth.

$$\boldsymbol{PUBLENDING_{it} = PUBLENDING_{it-1} + \beta i * DERIVUSE_{it} + \gamma TA_{it} + \partial EQRA_{it} + \vartheta LIRA_{it} + V_i} + \varepsilon_{i,t-1} \quad (4.38)$$

PUBLENDING is the measure of total lending to the public sector lending and,$PUBLENDING_{it-1}$is the lagged dependent variable

Lending growth of mortgage was assessed with the model 4.39 below, and the main aim was to find out the extent to which the derivatives influence banks to increase their lending to the mortgage sector. Model 3.36 dropped the total loans and replaced by the loan growth of mortgages as captured below in model 4.39

$$\boldsymbol{MORTGAGE_{it} = MORTGAGE_{it-1} + \beta i * DERIVUSE_{it} + \gamma TA_{it} + \partial EQRA_{it} + \vartheta LIRA_{it} + V_i} + \varepsilon_{i,t-1} \quad (4.39)$$

where MORTGAGE is the measure of lending to finance properties of government, households, and corporate sectors and$MORTGAGE_{it-1}$.

Table 4. 2: *Summary of derivatives and bank lending variables*

Dependent Variable	Measurement	Symbols	Expected sign	References
Total Loans	Domestic, Gvt and Corporates Sector Lending	TLCOPVT	Positive	(Prabha, Savard and Wickramarachi 2014b) (Brewer III, Minton and Moser 2000)
Explanatory Variables	*Measurement*	*Symbols as in Excel Data Sets*		
Derivatives Usage	Derivatives reported (dummy)	DERIV	Positive	(Zhao and Moser 2017)
Bank Size	Total Assets	TA	Positive	(Zhao and Moser 2017) (Brewer III, Deshmukh and Opiela 2014)
Capital Adequacy	Equity to Total Assets	EQRA	Positive	(Prabha, Savard and Wickramarachi 2014b)
Liquidity	Liquid Assets to Total Assets	LIRA	Positive	(Brewer III, Minton and Moser 2000)
Sectorial Lending	Mortgage Lending	MORTGAGE LENDING	Positive	(Minton, Stulz and Williamson 2009)
	Public Sector Lending	PUBLENDING	Positive	(Prabha, Savard and Wickramarachi 2014b)
	Pvt Sector Lending	PVTLENDING	Positive	(DeYoung and Yom 2008)

4.5 IMPACT OF DERIVATIVES ON THE ECONOMIC GROWTH

This section covers the third objective, which addresses the economic role of derivatives to economic growth. The main aim was to establish a causal relationship between derivatives usage and economic growth in South Africa. The first hypothesis tested was on the derivatives' impact on economic growth. The second hypothesis tested the extent of derivatives and economic growth through the liquidity channel measured by bank lending. In the financial system, bank lending is the source of liquidity in any economy; therefore, it provides funding for economic growth (Beck and Levine 2004). Hence, bank lending was proxy liquidity in this study. The third hypothesis was to test the firm value and economic growth using derivatives. The vector autoregressive (VAR) model was used to test the causality pattern between economic growth and bank lending and firm value in the South African economy to analyze the impact of derivatives on economic growth. Quarterly time series data for the period 1996 q1 to 2017 q4 was used in the study. To assess the economic growth nexus, the study considers four variables: economic growth, derivatives usage, bank lending, and firm value.

The subsequent sections explain the theoretical background of VAR, stationarity perusal, cointegration analysis, post-diagnostic analysis, and model estimation.

4.5.1 Theoretical framework of Vector autoregressive (VAR) model

Gujarati (2009) indicated that autoregressive is a model with a lagged dependent variable on the right-hand side of the equation with a vector of two or more variables in the system. Therefore, the case of a vector means that the system contains a vector of two or more variables. The VAR model is restricted to integrating variables. It is only constructed if variables are integrated of order one, that is, if the series is stationary after the first difference (Prabha et al., 2014). Therefore, whether the study estimated VAR or VECM depends on the results of the Johansen cointegration test in section 4.5.3. If the variables are cointegrated, then the study constructed the long run (VECM) model. If there is no cointegration, the short-run model, that is, the VAR model is constructed. The VAR model estimation methodology variables are endogenous; there are no exogenous variables in the system (Roodman 2009).

Pramesti (2017) explained that the dependent variable is a function of its lagged values and the lagged values of other variables in the model. Therefore, although all variables have equal lags and k lags across all the variables, the same number of lags k is used to estimate the model, not individual lag for each variable. Also, the VAR model is specified in levels; thus,

the VAR in differences is misspecification. Finally, the VAR model is estimated by ordinary least squares (OLS) (Gujrati 2004).

Wooldridge (2009) explained that the VAR model is mostly used for estimates if there is no cointegration among the variables in the system and if the study needs to establish the causal relationship among the variables. The VAR model is a quantitative forecasting approach usually applied in multivariate time series data. This model describes the relationship between observations on a variable at a time with own observation on the variables at earlier times.

In practice, VAR models can be used in drawing structural inferences and policy analysis. In structural analysis, certain assumptions about the causal structure of the data under investigation are imposed. Then, the resulting causal impacts of unexpected shocks or innovations to be specified on the variables in the model are summarised. Finally, these causal impacts are usually summarised with impulse response functions and forecast error variance decompositions.

4.5.2 Stationarity test

Gujarati (2009) explained that the stochastic process is stationarity if its mean and variance are constant over time. Thus, the covariance value between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. The study used time series data, so the first step before running the VAR model is to test the stationarity of the series. If the data are not stationary, the regression results cannot be used for inference because they are spurious and not exhibiting mean reversions (Heino 2005). Therefore, it means that the data generating process of the series does not involve around zero. Therefore, by utilising the VAR model, the variables are required to be stationary.

In econometrics, stationarity is performed because the regression results are unreliable if the series are nonstationary. Hence, the data can only be studied its behaviour for the period under consideration; therefore. It will be difficult to generalise the series to other periods. Therefore, the data cannot be inferred for forecasting purposes if it is nonstationary, and there will be little practical use. In addition, if the dataset had two or more nonstationary time series, the regression analysis results generated will be spurious or nonsense regression (Gujarati and Porter 1999). Thus, the results will be unreliable and cannot be used in policy analysis and structural inference. For the reasons stated, it is important to test for the stationarity in the time series.

In the empirical literature, the Dickey-Fuller test (DF), augmented Dickey-Fuller (ADF) test, and Phillip Perron (PP) test are used to detect unit roots in the dataset.

The augmented Dickey-Fuller test was advocated by (Elliott, Thomas, and James 1996). In ADF unit root tests, the hypothesis is stated as:

H0: the variables are not stationary or got a unit root

H1: the variables are stationary

With ADF, to make the stationary of variables normally, there is a need for first differencing the variables. The decision criterion of the ADF is to reject the null hypothesis if the test statistic is greater than the 5% critical value and accept the alternative hypothesis, that is, the variables are stationary. The ADF test uses the absolute value. However, if the ADF test statistics are lower than the critical value, the variables are non-stationary and cannot test the causality among the instruments. Therefore, the study used ADF to test the stationarity of the dataset.

4.5.3 Cointegration test

In econometrics, cointegration is used to test and estimate stationarity linear relationships or cointegration relations between non-stationarity time series variables. Cointegration exists between two or more non-stationarity series if they possess the same order of integration, and a linear combination of these series is stationary. Cointegration of two or more variables means that there is a long-run equilibrium relationship between them. Eagle Granger, Augmented Eagle Granger, and Johansen cointegration tests determine if two or more time series are integrated (Gujarati 2009). The Johansen and Eagle Granger cointegration tests are primarily used in the empirical literature.

Suppose variables are stationary in the first difference (integrated of order one). In that case, it is necessary to carry out a cointegration test among the variables, that is, to establish if they have a long-run relationship. Johansen tests for the cointegration approach were adopted in this study using STATA 15. This approach was proposed by Johansen (1991). Although, the cointegration test in STATA implies that the variables should be in level form and not in their first difference or if in log transformation of their raw form, Johansen proposes that it is still better than the first difference form.

The hypothesis is stated as:

H0; no cointegration equation

H1; there is a cointegration equation

The decision criterion of the Johansen cointegration test is rejected at a 5% value. The null hypothesis is rejected if the Max and Tracy statistics are greater than the 5% critical value (Max and Tracy > 5% critical value); otherwise fails to reject the null hypothesis.

Cointegration implies that the variables exhibit a long-run relationship; the series are related and combined linearly. It also implies that if there are shocks in the short run, which may affect the movement in the individual variables, they will converge with time in the long run. Therefore, in econometrics, we estimate a short-run vector autoregressive (VAR) model if there is no cointegration and a long-run model vector error correction model (VECM) If there is cointegration is estimated (Gujarati 2009).

4.5.3 VECM estimation

Depending on the nature of the cointegration among the variables, the relationship can be analysed using VECM estimation. VECM is a restricted VAR model, with cointegrating restrictions built into the specification. It is constructed to examine both the long-run and short-run dynamics of the cointegration series. Moreover, VECM restricts the long-run behaviour of endogenous variables to converge on their cointegrating relationships. The cointegrating term in the VECM is known as the error correction term (ECT). The resulting VAR from VECM representation has more efficient coefficient estimates (Gujarati and Porter 1999). The VECM is constructed because the variables proved to be cointegrating in levels, as exhibited in the second stage of VAR estimation.

To specify the VECM model, the VAR model was differenced, and by doing so, a lag is lost; thus, the model introduced K-1 lag length across the entire system. Furthermore, the model captures the error correction term (ECT) as a very important feature of the VECM, which is the adjustment coefficient (Eduard and Stefan 2009b).

Therefore, the VECM model is as follows

$$\Delta Y_t = \delta + \sum_{i=1}^{k-1} \gamma_i \Delta Y_{t-i} + \sum_{j=1}^{k-1} \eta_j \Delta X_{t-j} + \sum_{m=1}^{k-1} \xi_m \Delta R_{t-m} + \sum_{r=1}^{k-1} \lambda_r \Delta W_{t-r} + \delta_i ECT_{t-1} + \mu_t \quad (4.45)$$

Where,

$\mathbf{Y_t}$is the dependent variable,$\mathbf{Y_{t-1}}$ =lagged dependent variable,$\mathbf{X_{t-j}}$,$\Delta\mathbf{R_{t-m}}$,$\Delta\mathbf{W_{t-r}}$lagged independent variablesΔ are the difference operators, **k-1** is the lag length, which is reduced by 1

$\boldsymbol{\gamma_i}, \boldsymbol{\varphi_j}, \boldsymbol{\vartheta_m}, \boldsymbol{\lambda_r}$ are short-run dynamics coefficients of the model's adjustment long-run equilibrium, $\boldsymbol{\delta_i}$ Speed adjustment parameter with a negative sign. $\mathbf{ECT_{t-1}}$ is the error correction term, the lagged value of the residuals obtained from the cointegrating regression of the dependent variable on the regressors, contains the long-run information derived from the long-run cointegrating relationship,

$\boldsymbol{\mu_t}$, these are residuals, stochastics error terms.

Having the $\boldsymbol{ECT_{t-1}}$, it is the lagged OLS residual obtained from the mathematical computation of the long-run equation below:

$$Y_t = \sigma + \eta_j X_t + \xi_m R_t + \mu_t \quad (4.46)$$

After estimating the long-run model, the residuals are extracted, and they are lagged, and the equation becomes cointegrated as shown below:

$$ECT_{t-1} = [Y_{t-1} - \eta_i X_{t-1} - \xi_i R_{t-1}] \quad (4.47)$$

The above equation explains the mathematical form of computing $\boldsymbol{ECT_{t-1}}$.

Therefore, the above discussion leads to the estimation of the VECM model illustrated as follows,

$$\Delta InGDP_t = \delta + \sum_{i=1}^{k-1} \beta_i \Delta InGDP_{t-i} + \sum_{j=1}^{k} \lambda_r \Delta InDER_{t-j} + \sum_{j=1}^{k-1} \phi_j \Delta InTLCOPVT_{t-m} + \sum_{m=1}^{k-1} \varphi_m \Delta InTobins'\ Q'_{\ t-r} + \partial_1 ECT_{t-1} + \mu_{1t} \quad (4.48)$$

$$\Delta InDER_t = \alpha + \sum_{i=1}^{k-1} \beta_i \Delta InGDP_{t-i} + \sum_{j=1}^{k} \lambda_r \Delta InDER_{t-j} + \sum_{j=1}^{k-1} \phi_j \Delta InTLCOPVT_{t-m} + \sum_{m=1}^{k-1} \varphi_m \Delta InTobins'\ Q'_{\ t-r} + \partial_2 ECT_{t-1} + \mu_{2t} \quad (4.49)$$

$$\Delta InTLCOPVT_t = \alpha + \sum_{i=1}^{k-1} \beta_i \Delta InGDP_{t-i} + \sum_{j=1}^{k} \lambda_r \Delta InDER_{t-j} + \sum_{j=1}^{k-1} \phi_j \Delta InTLCOPVT_{t-m} + \sum_{m=1}^{k-1} \varphi_m \Delta InTobins'\ Q'_{\ t-r} + \partial_3 ECT_{t-1} + \mu_{3t} \quad (4.50)$$

$$\Delta InTobins'\ Q_t = \gamma + \sum_{i=1}^{k-1} \beta_i \Delta InGDP_{t-i} + \sum_{j=1}^{k} \lambda_r \Delta InDER_{t-j} + \sum_{j=1}^{k-1} \phi_j \Delta InTLCOPVT_{t-m} + \sum_{m=1}^{k-1} \varphi_m \Delta InTobins'\ Q'_{\ t-r} + \partial_4 ECT_{t-1} + \mu_{4t} \quad (4.51)$$

Where,

Δ difference operators, *InGDP, InDER, InTLCOPVT, InTobin's Q* are the four variables used in the model as in the VAR estimation above. $\boldsymbol{\phi_j, \varphi_m, \beta_i, \lambda_r}$ are the short-run dynamic coefficient of the

model, $\boldsymbol{\partial_{1,2,3,4}}$ speed of adjustment parameter with a negative sign, $\boldsymbol{ECT_{t-1}}$ is the error correction term, $\boldsymbol{\mu_{4t}}$ The stochastic error terms.

4.5.4 Empirical model specification

The empirical model tests the relationship between economic growth, derivatives, firm value, and bank lending based on the finance growth nexus. Analysis in sections 4.3 and 4.4 employed South African data; this objective used time series econometrics (the vector autoregressive (VAR) model) which tests the causality relationships of economic growth with other variables over a single country.

There are four dependent variables used in the VAR model, that is real gross domestic product (GDP), derivatives usage (DER), firm value (TOBIN'S Q), and bank lending (TLOCPVT). In the VAR system, the dependent variable is a function of its lagged values and lagged values of other variables in the model (Gujarati 2009). Also, the model is specified in levels because, if specified in differences, it leads to misspecification of the model (Anderson and Hsiao 1982). The VAR system consists of a set of linear dynamic equations whereby each variable is specified as a function of an equal number of lags ***(k)*** and all other variables in the system (Gujarati and Porter 1999). Having four variables means there must be an estimate of four VAR models and all the variables are endogenous; that is, they are determined inside the system. Therefore, in econometrics, to test the statistical relationships among the variables involves four main steps: the first is to specify the model, followed by testing stationarity among the variables and testing cointegration or determine the long-run relationship and final performing the VAR model (or VECM if the variables are cointegrated). To test the impact of derivatives on economic growth, the study inferred from and followed the neoclassical growth model theories, utilising changes in the GDP as the main dependent variable. The basic model specification is represented as follows,

$$\boldsymbol{Y_t = \delta + \sum_{i=1}^{k} \beta_i Y_{t-i} + \sum_{j=1}^{k} \emptyset_j X_{t-j} + \sum_{m=1}^{k} \vartheta_m R_{t-m} + \sum_{r=1}^{k} \lambda_r W_{t-r} + \mu_t} \quad (4.40)$$

Were,

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

Following VAR specified in 4.40, the initial vector implication is captured in the following system of the model with specific variables to be tested; since there are four variables, it also means the are four equations, each being a dependent variable of the other as given below,

$$InGDP_t = \varphi + \sum_{i=1}^{k} \beta_i \ InGDP_{t-1} + \sum_{j=1}^{k} \lambda_r InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InTLCOPVT_{t-m} + \sum_{r=1}^{k} \emptyset_j InTOBINS'S\ Q_{t-r} + \mu_{1t} \quad (4.41)$$

$$InDER_t = \alpha + \sum_{i=1}^{k} \beta_i \ InGDP_{t-1} + \sum_{j=1}^{k} \lambda_r InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InTLCOPVT_{t-m} + \sum_{r=1}^{k} \emptyset_j InTOBINS'S\ Q_{t-r} + \mu_{2t} \quad (4.42)$$

$$InLPVTB_t = b + \sum_{i=1}^{k} \beta_i \ InGDP_{t-1} + \sum_{j=1}^{k} \emptyset_j InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InTLCOPVT_{t-m} + \sum_{r=1}^{k} \emptyset_j InTOBINS'S\ Q_{t-r} + \mu_{3t} \quad (4.43)$$

$$InLNONNFIN_t = \lambda + \sum_{i=1}^{k} \beta_i \ InGDP_{t-1} + \sum_{j=1}^{k} \lambda_r InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InTLCOPVT_{t-m} + \sum_{m=1}^{k} \emptyset_j InTOBINS'S\ Q_{t-r} + \mu_{4t} \quad (4.44)$$

Where ***InGDP*** is the economic activity of a country measured by ***GDP***, ***lnDER*** is the measure of the notional volume of derivative markets, ***InTLCOPVT*** is the measure of bank lending, ***InTOBIN'S Q*** is the measure of the firm value, k is lag length, andβ_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).

4.5.5 Data sources and issues

The time series analysis estimator (VECM) model was used to test the causality pattern between economic growth and bank lending and firm value in the South African economy to analyze the impact of derivatives on economic growth. Quarterly time series data for the period 1996 to 2017 was used in the study, and total observations are 88. The model consists

of four variables, namely the economic growth rate (GDPG), derivatives usage (DERIV), bank lending (TLCOPVT), and firm value (TOBIN'S Q).

a) **Economic growth:** South Africa's real GDP growth rate was obtained from the South African statistics department database, reported quarterly. It is the quarterly growth rate of GDP at market prices based on a constant local currency, which measures the overall economic growth for a given period. In literature, economic growth was analysed using cross country and time series approaches linked to financial development, banking sector, and stock development by Levine and Zervos (1998b), Beck and Levine (2004), Bujari, Martínez and Lechuga (2016), and Vo, Huynh and Ha (2019) assessed the impact of derivatives on economic growth. Therefore, this study used time series analysis with quarterly data to test the impact of derivatives on the economic development of South Africa.

b) **Derivative usage:** The second variable is derivatives usage. Derivatives market data proxy as the outstanding amount of derivatives obtained from the Reserve bank of South Africa database. The data was found in monthly series, and it was converted using the STATA to make its quarterly data. Derivative usage incorporated all the instruments, namely the notional amount outstanding of interest rate (total futures and options) and foreign exchange (total futures and options).

c) **Bank lending:** The third variable is bank lending, the mean gross loans of sample banks lending to the households, government, and corporate sectors. As earlier observed in this study, many empirical studies have supported a positive relationship between economic development and bank development commonly presented by the extent to which financial institutions extend lending to the private sector (corporate lending) (Levine and Zervos 1998). To differ from all other arguments, this study placed more attention on bank lending to households, government, and corporate sectors in South Africa ($\boldsymbol{TLCOPVT_{i,t}}$**).** The variable was proxy liquidity in an economy**.** The assumption is that households in an economy can borrow to finance unincorporated businesses' growth and investment opportunities, increasing their productivity and increasing the country's economic activities. Therefore, this measure of lending activities proxies all credit extensions to all sectors of the economy, which add value to the GDP of a nation. Since it had been observed that derivatives use facilitates greater lending activities in the banking sector, there is an increasing demand for advances from various sectors to fund investment opportunities and

capital projects, which leads to a nation's economic growth. The source of data was the Reserve bank of South Africa statistics section BD900 (objective two). The data was obtained in monthly series and converted using the STATA to make its quarterly data.

d) **Firm value:** The fourth variable tested is the firm value which is measured as the market value of equity divided by total assets (Tobin's Q) of non–financial firms listed on the JSE, a proxy for firm value. Although it does not directly measure the investment and production, Tobin's Q value measures a firm's growth projections. Again, the source of data was Bloomberg's online financial database. The data was obtained in quarterly series.

Table 4. 3: Summary of economic growth variables

Variable	Description	Sources	Expected signs	Reference
Real GDP growth rate ❖ GDP growth (quarterly %)	Quarterly percentage growth rate of GDP at market prices based on constant local currency.	Department of South Africastatistics database Period 1996-2017 quarterly data	Positive	(Oliinyk *et al.* 2019; Vo *et al.* 2019b)
Derivatives ❖ DER	All instruments - notional amount outstanding • interest rate-total futures and options • foreign exchange-total futures and options	Reserve bank of South Africa	Positive	(Hong *et al.* 2019; Lema and Grandes 2020)
BANK LENDING ❖ the quarterly growth rate of total loans ❖ TLCOPVT	The weighted average of sample banks (private, public, and mortgage lending)	Reserve bank of South Africa statistics section BD900 (objective two), Bloomberg online database,	Positive	(Prabha, Savard and Wickramarachi 2014b)
FIRM VALUE ❖ TOBIN'S Q RATIO	the market value of equity divided by total assets	Bloomberg online financial database,	Positive	(Lang, Ofek and Stulz 1996)

4.5.6. Post estimation diagnostics tests

For the model liability and stability, the diagnostic tests are particularly important instruments in the VAR system. They trace the model's reliability, ensure that the model is stable, determine that the errors are not serial correlated, and review that residuals are normally distributed. The diagnostic tests are carried out by performing the following tests:

normality tests, autocorrelation tests, stability tests, impulse response function tests, and heteroscedasticity tests, as detailed below.

4.5.6.1.Heteroscedasticity test

Heteroscedasticity is the unequal spread of variances, and its disturbances (errors) are not constant in a given model. It is prevalent in all model data sets, although mostly in cross-sectional data models. Heteroscedasticity is mostly caused by poor data sampling methods, particularly when collecting primary data. It can also be a result of wrong data transformation. For example, over differencing a variable may lead to heteroscedastic, wrong model specifications related to the functional form, and the presence of outliers can lead your model to be heteroscedastic (Gujarati and Porter 2009). John (1997) shows that if the heteroscedasticity is not addressed, it can affect the variances and standard errors of the estimators. The OLS underestimates the variances and standard errors, yields low standard errors, and leads to higher expected t-tests and f tests statistics; these will lead to unreliable hypothesis testing and cannot be used to construct confidence intervals and inferences (Wooldridge 2009).

4.5.6.2 Residual normality test

Since the regressions are based on the assumptions that the error term is normally distributed, $\mu i$to find out if this were the case in this model since there were no true error terms μi observed directly, there was ei as the residuals, therefore,ei as the residuals were used to test for normality since they were used as a proxy for error termsμi in the model. There are several normality tests in empirics. Therefore this study refers primarily to the Jarque Bera test. In statistical packages, it is based on OLS residuals on a large sample. Suppose the computed chi-squared value exceeds the critical value chi-squared for 2. d.f at the chosen value of the significance. In that case, the null hypothesis of the normal distribution will be rejected. But if it does not exceed the critical chi-squared value, we do not reject the null hypothesis and conclude that the model is normally distributed.

4.5.6.3 Autocorrelation tests

Autocorrelation is defined as a correlation between members of observation ordered in time as in time-series data or cross-sectional data space. The presence of autocorrelation can lead to biased results, the least-squares are linear and unbiased, but they are not efficient. That is, they do not have minimum variance compared to the procedures that consider

autocorrelation. The estimated variance of OLS is biased. Sometimes, the usual formulas to compute OLS estimators' variance and standard errors seriously underestimate true variances and standard errors, inflating t values. It appears that a particular coefficient is statistically significantly different from zero, whereas that might not be the case. Therefore, the general t and f values are not reliable.

Autocorrelation can be detected through three methods, namely graphical, Durbin-Watson d statistics, and the run test. Durbin-Watson d was developed in 1951, and its simplicity made it the best autocorrelation testing model to detect the presence of autocorrelation. It is based on the OLS residuals, routinely computed by most regression packages such as STATA. The test computed that the d value should lie between 0 and 4, whereby if the results are close to zero it means, there is evidence of positive autocorrelation. On the other hand, if it is close to 4, it means a negative, and if d is close to 2, there is autocorrelation (Gujarati 2004).

Since the effects of autocorrelation are quite serious in regression analysis, if the Durbin-Watson d falls within the indecisive region, it might be prudent to assume that autocorrelation is present and proceed to correct the condition.

4.5.6.4 Impulse response test

The impulse response function explains the reaction of an endogenous variable to one of its innovations. It also describes the evolution of the variable of interest along a specified time horizon after a shock in a given moment (Vo, Huynh and Ha (2019). An impulse response is an essential tool in empirical causality analysis and policy effectiveness analysis. Wooldridge (2009) explains that the impulse response traces the impact of a variable on other variables in the system. It also traces the effects on present and future values of the endogenous variable of one standard deviation shock to one of the innovations (Gujarati and Porter 2009). It is used to assess further significant Granger causality or Granger relationship results in the VAR system.

Given the VAR model estimated in section 4.4.5, the equations are used to explain the dynamics of the impulse response function, given by the $\mu_{1,2,3,4}$, which are the stochastic error terms often called impulses or innovations or shocks in VAR language.

As an example of the GDP regression equation taken from section 4.4.5, a model estimation is given below,

$$\mathrm{InGDP_t} = \varphi + \sum_{i=1}^{k} \beta_i \ \mathrm{InGDP_{t-1}} + \sum_{j=1}^{k} \lambda_r \mathrm{InDER_{t-j}} + \sum_{m=1}^{k} \vartheta_m \mathrm{InTLCOPVT_{t-m}} + \sum_{r=1}^{k} \emptyset_j \mathrm{InTOBIN'S\ Q_{t-r}} + \mu_{1t} \quad (4.41)$$

The impulse response function traces the response of the dependent variable in the VAR system to shocks in the error terms, such as $\mu_{1,2,3,4}$ from the VAR model in equation 4.41, above. Therefore, the error term μ_1 in the InGDP equation above, if it increases by a value of one standard deviation, such a shock or a change will first cause a change in InGDP in the current period and future periods. But since InGDP appears in the InDER, InTLCOPVT, InTOBIN'S Q regressions, any change in μ_1 will also have an impact on InDER, InTLCOPVT, InTOBIN'S Q. It also applies to a change in one standard deviation in μ_2 of the InDER equation below will also have an impact on InGDP, InTLCOPVT, InTOBIN'S Q

$$\mathrm{InDER_t} = \alpha + \sum_{i=1}^{k} \beta_i\ \mathrm{InGDP_{t-1}} + \sum_{j=1}^{k} \lambda_r \mathrm{InDER_{t-j}} + \sum_{m=1}^{k} \vartheta_m \mathrm{InTLCOPVT_{t-m}} + \sum_{r=1}^{k} \emptyset_j \mathrm{InTOBINS'S\ Q_{t-r}} + \mu_{2t} \quad (4.42)$$

and the same time, for a change of one standard deviation in μ_3, of InTLCOPVT and

$$\mathrm{InTLCOPVT_t} = b + \sum_{i=1}^{k} \beta_i\ \mathrm{InGDP_{t-1}} + \sum_{j=1}^{k} \emptyset_j \mathrm{InDER_{t-j}} + \sum_{m=1}^{k} \vartheta_m \mathrm{InTLCOPVT_{t-m}} + \sum_{r=1}^{k} \emptyset_j \mathrm{InTOBINS'S\ Q_{t-r}} + \mu_{3t} \quad (4.43)$$

And μ_4 of InTOBINS Q equation.

$$\mathrm{InTOBINS\ Q_t} = \lambda + \sum_{i=1}^{k} \beta_i\ \mathrm{InGDP_{t-1}} + \sum_{j=1}^{k} \lambda_r \mathrm{InDER_{t-j}} + \sum_{m=1}^{k} \vartheta_m \mathrm{InTLCOPVT_{t-m}} + \sum_{m=1}^{k} \emptyset_j \mathrm{InTOBINS'S\ Q_{t-r}} + \mu_{4t} \quad (4.44)$$

The impulse response function traces out the impact of such shocks for several periods in the future (Gujarati 2009). Hence, the analysis of impulse response is the centre piece of VAR analysis.

4.6 SUMMARY

The study used dynamic panel data models estimated with system GMM estimation techniques to empirically analyse objectives one and two, which examine the impact of derivatives on the value of non-financial firms and bank lending activities in South Africa. The system GMM was used to estimate the models because of the following advantages: it corrects endogeneity by introducing many instruments to improve the efficiency dramatically; it transforms the instruments to make them uncorrelated (exogenous) with fixed effects; and it builds a system of two (2) equations, that is, the original and transformed equations which use orthogonal deviations to minimise data loss. The third and final

objective assesses the economic benefits of derivatives to the overall South African economic activities, which were estimated using the VECM model. The VECM model was estimated after the series depicted that the variables had a long-run association. The next chapter focuses on the research findings and analysis.

CHAPTER FIVE

RESEARCH FINDINGS AND ANALYSIS

5.1 INTRODUCTION

The previous chapter laid out the methodology which the study followed to achieve the objectives of the study. The system GMM estimator was the primary methodology used to estimate objective one and two models, respectively. That is, to establish the impact of derivatives on firm value and bank lending in South Africa. To come up with results STATA 15 computer software package was used with dynamic panel data models. Finally, the third objective, which links objectives one and two to assess the impact of derivatives on the overall performance of the South African economy, was achieved with the use of the time series econometrics models vector autoregressive (VAR).

This chapter was divided into three sections which focus on the research findings and analysis of the research objectives. The first section of the chapter answers the research questions of objective one: what are the effects of derivatives usage on firm value utilising South African listed non-financial firms? Is there a relationship between firm value (Tobin's Q) and profitability (PROF), liquidity (LIRA), leverage (LEV), and firm size? The second section of the chapter answers the research questions of objective two: what are the effects of derivatives usage on bank lending in South Africa? Finally, the last section of the chapter peruses research questions of objective three, which inquire about the impact of derivatives on the economic growth in South Africa.

5.2IMPACT OF DERIVATIVES ON THE FIRM VALUE

5.2.1 RESEARCH FINDINGS AND ANALYSIS

This section covers the research findings and discussions of the first objective: the impact of derivatives usage on JSE listed non-financial firms. The impact of derivatives usage on the firm value was ascertained through the following research questions. First, what are the effects of derivatives usage on firm value in South Africa, evidence of listed non-financial firms? Second, what is the relationship between firm value (Tobin's Q) and liquidity (LIRA), leverage (LEV), profitability (PROF), and firm size (SIZE)? These question's findings are addressed in this section.

The methodology used to achieve the research objective utilised the dynamic panel data model estimated with the system generalised method of moment (GMM) on a panel of 150 listed non-financial firms in South Africa. The estimation technique is robust in controlling for endogeneity, unobserved heterogeneity, autocorrelation, and dynamic panel bias with panel data was used(Arellano and Bond 1991).

5.2.1.1 Descriptive statistics

Table 5.1 below reports the descriptive statistics for the dependent, independent, and control variables for the sample of non-financial firms investigated. The objective is to assess the impact of derivatives on the firm value utilising non-financial firms listed on the JSE from 1996-2017.

Table 5. 1:Descriptive statistics

Variable	Description	Mean	SD	Min	Median	Max
Q	Tobin's Q ratio	0.2985	0.4654	0.267	0.2363	138.601
Dev	Derivatives use	0.2791	0.4486	0	0	1
HE	Notional value	20.607	56.242	0	0	7424
Lev	Leverage	0.0901	0.1088	0	0.0539	421.085
Liq	Liquidity	1.0699	0.9227	0	0.8298	77137.98
Prof	Profitability	0.0671	0.0887	-17.939	0.0684	17.063
Size	Firm Size	7.4332	1.9204	-2.042	7.5577	12.897
C.F.	Cash flow	0.0978	0.0876	-5.821	0.0934	2.151

The descriptive statistics table 5.1 above shows the value of firms measured as the market value of equity divided by total assets (Tobin's Q) as the dependent variable. The derivative use (dummy variable equals one if a firm reports derivative and 0 otherwise) and extent of hedging (HE) is measured as the notional value of derivative to book value as main independent variables. Also, other control variables (leverage as long term debt to total assets, firm size as the logarithm of total assets, cash flow as operating cash over assets, liquidity as quick ratio, and profitability as net cash over total assets). The inference from the descriptive statistics above shows that more than 50 percent of firms in South Africa do not hedge their exposures using derivatives, as revealed by a zero-median value. It implies that, from this study's sample, most firms are not holding, trading, or issuing derivatives for hedging. The above statistics are supported by the results of Correia, Holman and Jahreskog (2012), which reveal that firms are only hedging risks they are facing during the period of trade, such as foreign exchange risk using foreign exchange derivatives. Although there was a difference between the studies, the current study does not select which type of derivatives to analyse and which not. The value of firms can be derived if the sources of risks which lead to underinvestment and financial distress are alleviated.

The firm value measured by Tobin's Q indicated a mean of 0.2985, median of 0.2363, and standard deviation of 0.4654. However, the median Q is less than the mean Q, which indicates that the distribution of Tobin's Q is skewed (Ayturk, Gurbuz, and Yanik 2016a). Therefore, to control for the skewness in the sample, Tobin's Q used in estimators was transformed to the natural log of Tobin's Q so that the distribution will be asymmetric.

The mean value of derivatives usage (dummy variable) is 0.2791, which translates to 27.91%. It implies that, on average, 27.91 % of non-financial firms use derivatives in South Africa. The percentage of firms that are using derivatives is lower than firms in developed economies. These findings are consistent with Fauver and Naranjo (2010), who stated that fewer firms use the derivatives market for risk management in emerging markets due to illiquid derivative markets. In Turkey, Ayturk, Gurbuz and Yanik (2016a)conclude that 36.41% of non-financial firms are using derivatives, specifically for hedging market variables: interest rates, foreign exchange rates, and commodities prices. Statistics show that derivatives use by non-financial firms had a declining mean of 27.91%, which reflected that derivatives' use is decreasing among non-financial firms.

In comparison, in similar surveys conducted, Callahan and Hairston (2020)reported a mean of12 %, and Correia, Holman and Jahreskog (2012)reported a higher mean value of 90 %, reflecting that non-financial firms are using derivatives. From the descriptive inference, non-

financial firms reported a lower value of firms using derivatives mainly because they do not speculate using derivatives, which transfigure that firms resorted to only trading and buying derivatives for hedging purposes (Clicks Group 2017). This suggests that larger and mature firms are more likely to take part in derivatives usage than small and medium firms.

On average, South African firms have less leverage, a mean value of 0.0901, which is 9%. The leverage means the value is lower than developed economies with an excess of 50%. For example, Pakistanifirms' mean leverage value was 58% (Afza and Alam 2013; Vengesai and Kwenda 2018). The literature on financial leverage suggests that leverage constraints investment(Kim, Papanastassiou, and Nguyen 2017a; Savas and Kapusuzoglu 2020). Hence, lower leverage may allow South African firms to create value for their shareholders without debt constraints.

On average, the cash and cash equivalent ratio divided by total assets are more than 1, indicating that South African firms hold more cash and are highly liquid. It indicates that South Africa has a good standing on the ability to service maturing debt obligations. However, on the other hand, there are higher opportunity costs on holding too much idle cash, which reduces profitability. The exceptionally low profitability ratio averages 6% on total assets. It suggests that firms in South Africa are not using external finances to finance their investments.

Moreover, previous research (Prabha, Savard, and Wickramarachi 2014b) shows that more internal finance mitigates the need for hedging. From this perspective, derivatives are not utilised adequately to take advantage of locking in fluctuations in the variations in the cost of funds. Literature shows that firms that use derivatives to hedge benefit from external finances; they use bonds and bank loans to finance their growth opportunities and lock in variations in their interest rates.

Firms can create value using derivatives to mitigate the causes of risks, financial distress, and market variabilities and open the gates of financial growth opportunities with certainty. Inclusion of firm-specific variables that can resemble the model's financial distress and those that can influence the firms to hedge in the derivative markets were considered. Firms' size was measured by the natural logarithm of total assets to control the effect of size, as depicted in the theory that large firms use derivatives because of economies of scale. Descriptive statistics show that firm size had a high value of the mean, namely, 7.43, which suggests that mature and large firms are likely to be the dominant users of derivatives due to their appetite for securing their income inflows from abroad and even locally. Also, another implication is that firms hedge depending on the nature of the products they offer and the hedging strategies

of their rivals. The sample of firms investigated shows that firm size is a major determinant that can cause a firm to trade or hold derivatives. The higher value of medium (75%) has been reflected, which suggests that the firm's size might be a key driver for a firm to take part in the derivatives markets. Firm size, measured in terms of assets, shows that firms use assets to secure their financial needs.

Cash flow was incorporated to cater to the variations of cashflows. On average, South African non-financial firms had a low variation in cash flows of 10%. This finding suggests that they are less dependent on external finances in their operations. It is in line with the liquidity variable, which shows that, among the sample firms, they are holding more idle cash, reflected by 1% mean of liquidity. The medium of 9% also reflects that very few of the firms depend on external finances. Ivilina and Betty (2014) explained that they must hedge with derivatives for firms to manage their cashflows better. They also highlighted that firms with low capital investments had reduced cashflows. For firms to reduce the variability in their cashflows, derivatives hedging is the best strategy to lower the expected financial distress and cost of bankruptcy. From this view, it seems that cashflows do not determine the firms' use of derivatives, among other firm-specific variables.

Statistics show exceptionally low profitability; on average, it is 6% for the non-financial firms in South Africa. Among the sampled firms, an exceptionally low number of firms with high profits that hold derivatives depicted 7% in the reported medium value. Profitability was measured using a ratio of total profits to total assets.

There is more variation on the use of derivatives, as shown by a high standard deviation (44.86%) relative to the mean, which is 27%. The derivatives' use variation shows that South African firms are not consistent in their risk management strategies using derivatives. The descriptive statistics also show a high variation of profitability and firm value compared to the mean values. This variation can be explained by the increasing risk, uncertainties in the business cycle operating environment, economic instability, technological hindrances, political unrest, and volatility in the South African economic environment.

5.2.1.2 Correlation analysis

Table5.2 reports the correlation matrix of the explanatory variables and firm value. The correlation matrix is included to check for multicollinearity in the explanatory variables. Multicollinearity creates skewing the results in a regression model and thus leading to the reduction in power of the regression model (Gujarati 2003). Explanatory variables are highly correlated when one variable can be used to determine the movement of the other explanatory

variable. Therefore, the presence of multicollinearity among the variables can lead to unreliable regression estimates. Therefore, it is important to examine its level. In this study, the correlation coefficient was used to detect multicollinearity for all the explanatory variables.

The correlation in statistics shows how strongly variables are related either inversely or directly, as depicted by negative or positive signs, and shows the direction of influence between variables, as explained below.

Table 5. 2: Correlation matrix -Pearson correlation coefficient

	Q	Lev	Liq	Prof	Size	CF	DEV	HE
Q	1							
Lev	-0.016	1						
Liq	0.033*	-0.127*	1					
Prof	0.488*	-0.153*	0.223*	1				
Size	0.174*	0.228*	-0.198*	0.024	1			
CF	0.385*	-0.077*	0.112*	0.543*	0.078*	1		
DEV	0.046*	0.094*	-0.001	-0.104*	0.311*	-0.092*	1	
HE	0.123*	0.148*	0.040	0.044	0.355*	0.052	0.029	1

* p<0.1-** p<0.05; *** p<0.01*indicates statistically Significant levels at the 10%,5% and 1%*

A correlation above 0.8 between independent variables indicates multicollinearity, and all the reported in table 5.2 are low(Akoglu 2018). From table5.2 above, the correlations between the explanatory variables are at most 0.55, proving that multicollinearity is not a problem among the independent variables in this analysis. The correlation analysis shows a positive and statistically significant association between firm value (Tobin's Q) and derivative use (dummy variable) and hedging extent at 10% level. Also, Tobin's Q is positive and statistically significant at a 10% level association with control variables: profitability, size, cash flow, and liquidity. Only leverage had a negative correlation that is insignificant with firm value, indicating that firms with high debt levels destroy shareholder value.

The correlation between firm value (Tobin's Q) and leverage is negative (-0.016), indicating that, when firms are holding more debt, their value is reduced; this was consistent with the findings reported by (Vengesai and Kwenda 2018). Firm value is reduced as leverage increases, implying that their value is also reduced if firms increase their debt. The matrix also shows that leverage and liquidity have an inverse relationship. If firms increase their leverage, the firm's liquidity is reduced because more money will be used to settle the debt

and its interest. It is depicted by a negative 0.126, which reflects a weak relationship between the two variables.

Firm value, measured by Tobin's Q, reflects a weak positive association with the liquidity variable, which suggests that firms that increase liquidity also increase the firm value, but, for this analysis, there is a weak association. Among the variables in the correlation matrix, profitability reflects a moderate positive association with firm value, suggesting that firm value increases if the firms increase their profitability. Cash flow and firm size had weak positive associations with firm value in the short run. If the firms increase their cash flow and size, it implies that their value will also increase.

In addition, profitability also had a weak relationship with leverage. Firms that are profiting are not holding more debt because debt reduces profits. The relationship shows a negative relationship of 0.1539. This finding suggests that firms with high leverage will have reduced profits due to settlement mature debts and interests. More debts reduce profits. Leverage and cash flow reflect a negative relationship of 0.0767, which suggests that if the debt is increasing, firms' cashflows are depleted. Companies with more debt have reduced cashflows; more cash generated in the business is used to pay debts.

Leverage and firm size had a weak positive relationship of 0.2278, implying that firms increase their leverage if they are big. The positive correlation between leverage and firm size reveals that firms increase their debt appetite if they grow. Another important relationship between leverage and derivatives use was observed. It is a positive 0.0935, implying a weak relationship, suggesting that corporates hold and buy derivatives if they are levered because they need to hedge the debt risks. If the firms are highly levered, they hold more derivatives for hedging purposes.

The relationship between derivatives' use and firm liquidity reflects a weak negative association of -0.0098, meaning that there is no evidence that firms' greater use of derivatives will impact their liquidity. This relationship suggests that firms' liquidity and derivatives are close to zero, meaning no relationship between them. If firms increase their liquidity position, firms might not need to trade derivatives, as depicted by the variables. The same analysis applies to the relationship between derivatives and profitability. It reflects a weak negative relationship of -0.1040, suggesting that profitability is inversely related to the derivative use variable. Derivatives and firm value (Tobin's Q) reflect a positive association of 0.0462, meaning that holding a larger number of derivatives also increases the firm value. Firms can hedge risks that affect the firms to carry out projects that generate more revenue and add

value to the firms. If the firms could hedge the sources of risks, they can lessen the under-investment risks and invest in capital.

The above discussion proves that multicollinearity is not detected among the variables, meaning that the regression model results could be reliable in its statistical inference.

5.3 EMPIRICAL RESULTS

5.3.1 DERIVATIVES USAGE AND FIRM VALUE

Tobin's Q was used to measure firm value. (Dai *et al.* 2020)indicated the possibility of the endogeneity problem between hedging and firm value. Possible sources of endogeneity are reverse causality and unobserved heterogeneity. Studies on value relevance recognised derivatives as an explanatory variable, while studies on the determinants of hedging revealed that higher value is a significant factor determining the propensity to hedge(Choi, Salam, and Kim 2020); hence, a possible bi-directional relationship exists. Alam and Afza (2017a) documented that observed and unobserved firm characteristics can affect both the use of derivatives and firm value. In such situations, error terms and explanatory variables can be correlated. Other authors(Altuntas et al., 2017; Choi, Salam, and Kim, 2020) suggested that a dynamic model and the GMM estimator developed by Arellano and Bond (1991) can be used in the presence of correlation between firm value and its lagged values.

The lagged dependent variable in the dynamic model considers the autoregressive feature of the data(Alam and Afza 2017a). The system GMM developed by Blundell and Bond (1998a) improves the efficiency by using lagged values on endogenous variables in the first differences equation and uses the levels equation together with the AB type orthogonality conditions to obtain a system of equations in levels and the other differenced. The second equation provides additional instruments and increases efficiency (Blundell and Bond 1998a). Given the nature of the data, this study used a dynamic panel model. Following previous studies, the first lag of the dependent variable (Tobin's Q), derivatives use (dummy variable), financial leverage ratio, firm size measured by the natural logarithm of total assets, and profitability ratio were accepted as endogenous variables in the estimated dynamic model.

Table 5.3 reports the regression output of the dynamic panel model, which examined derivatives' use and firm value utilising the system GMM estimator. The first model used Tobin Q (market value of equity as the dependent variable). For robustness checks, two other alternative dependent variables were tested with the impact of derivatives on the firm value. Additionally, models were analysed; that is, first, we test whether derivatives have an impact

on firm value through other growth opportunities proxies. Therefore in model 2, the cash flow was used as a dependent variable because the literature shows that if the cash flows are reduced, they constrain investment opportunities and growth of firms. In model 3, we used total sales as the dependent variable, which implies that the size and growth of firms can be determined through their sales.

Table 5. 3: Dynamic panel-data estimation, derivatives use and firm value

Dependent variable	Tobin Q	Cashflow	Sales
	Model 1	Model 2	Model 3
L.Tobin Q	0.609***		
	(0.001)		
L.Cashflow		0.150*	
		(0.0907)	
L.Sales			0.903***
			(0.024)
DER	0.052***	0.0341	0.116***
	(0.001)	(0.0482)	(0.031)
Leverage	-0.003***	-0.0548**	-0.00798
	(0.000)	(0.0263)	(0.0167)
Profitability	1.110***	3.740***	0.137***
	(0.006)	(0.898)	(0.049)
Size	0.051***	0.548***	0.525***
	(0.000)	(0.11)	(0.106)
Cash flow	1.180***	0.342	0.114
	(0.008)	(0.345)	(0.137)
Liquidity	-0.009***	-0.0236	-0.0256
	(0.001)	(0.0255)	(0.0317)
Observations	2,284	2,050	2,572
Number of id	176	186	186
AR (2)	0.592	0.287	0.391
Hansen/Sargan	0.295	0.184	0.283
Number of groups/instruments	176/46	180/46	186/46
Wald	18047.81***	8212.22***	30809.27***

* p<0.1;** p<0.05;*** p<0.01 *Significant at the 10%,5% and 1% level, respectively; standard errors are provided in parenthesis*

Table 5.3 provides dynamic panel data regression results of derivative use on firm value which addressed the concerns of objective one. The regression results with fisrt model had a dependent variable which is proxied by the Tobins Q. It is measured as the natural logarithm of the market value of equity over the total assets. The second mode with a dependent variable cashflow measured as the natural logarithm of operational cashflow. The last was sales measured as the natural logarithm of total sales to total assets in model 3. The system GMM estimator was used. The table reports the coefficients of estimates, AR (2) tests for serial autocorrelation, and the Hansen test is used to test for over-identification of instruments.

The coefficient of derivatives use positive and statistically impact firm value for non-financial firms listed on JSE at the 1% significant level. It is based on model 1, where firm value was proxied by the natural logarithm of the market value of equity to total assets. Also the coefficient of 0.052 indicates that firms that used derivatives for hedging are valued at 5.2% higher given all other things equal this was in line with the claims of(Choi, Salam, and Kim 2020). Also, the derivative use is positive and statistically significant when the natural logarithm of sale was used as the dependent variable in model 3 at the 1% level.

The results provided evidence exhibited in model 1 and model 3 that there is a statistically significant positive relationship between derivatives usage and firm value at the ninety-nine percent confidence level. Thus, the use of derivatives has a significant positive impact on value generation in South African non-financial firms. The findings imply that non-financial firms that use derivatives to hedge their exposures generate more value. The results are consistent with (Bachiller, Boubaker, and Mefteh-Wali 2021)for USA firms using a pooled OLS and fixed effects panel models, Panaretou (2014) for UK firms, and Alam and Afza (2017a) for Turkish firms.

The findings are following risk management theories that suggest that efficient and active risk management practices create value for firms (Froot, Scharfstein, and Stein 1993). MacKay and Moeller (2007) document that risk management with derivatives increases firm value. From the risk management perspective, firms can hedge their risks, reduce costs and add value to the firm. Dai *et al.* (2020), in the context of risk management, found that firms that are active in risk management derive more benefits from reducing cash flow sensitivity. Firms experiencing high volatility in cash flows will experience higher financing costs, thereby lowering their investments' net present value (NPV).

In South Africa, on average of 28% of non-financial firms show that they are using derivatives from the descriptive statistics given before. In addition, empirical evidence shows that firms are using derivatives to hedge exposures in their market variables as depicted by the regression results of model 1 and model 3 positive statistically significant coefficients.

Fluctuations in market variable movements cause market risks. For example, changes in the following variables cause market risks: variation in interest rate causes interest rate risk; exchange rate causes exchange rate risk; and commodity price leads to price risk, which reduces the income levels of corporates and reduces earnings. If firms fail to have insurance against these risks, their business will suffer the risk of survival.

Firms that participate in derivatives markets have their value enhanced. This is evidenced by high earnings, growth in terms of operating at a wide scale, more branches are heavily

invested in capital projects compared to the firms that are not taking part in derivatives. Firms using derivatives to hedge can actively manage their balance sheet by holding less cash and can access external financing in capital markets.

This finding concurred with the findings of Canadian firms (Paligorova and Staskow 2014)in which corporate hedging enhanced the value of firms that hedge as compared to non-hedging firms. These findings also confirmed that firms that are involved in international business are participating more actively in derivative markets to protect their cashflows through hedging foreign exchange rate movements with the forward rate agreements. The results of this study added that derivative instruments are widely used by non-financial firms in the economy of South Africa.

For the control variables, this study found out that highly-levered firms measured by a long-term debt ratio to total assets are more active participants in derivatives. The estimated results show that leverage is statistically significant with firm value; both models reflect a negative relationship between the variables and are significant at a 1% level. It is suggested that high levered firms are a result of derivatives usage because derivatives increase leverage in firms due to hedging facilities. In this study, the methodology (GMM) used caters to the bi-directional effect among variables; thus, the results depict a negative statistical relationship between derivative use and leverage among firms. Consistent with previous studies, Vengesai and Kwenda (2018);(Alam and Afza 2017b); Yuan and Motohashi (2014); (Altuntas *et al.* 2017)found that firm value was a decreasing function of financial leverage.

Investors place less value on highly levered firms due to agency costs created by debt, as suggested by (Hassan and Afza 2016), who found that leverage constrains firm investment and destroys value. The results of this study confirm evidence that levered firms hedge more than the evidence in developed nations, which do not allow hedge because of fewer unencumbered assets, which constrain them from raising large amounts of external finances. This findings concur with the model of (Froot, Scharfstein, and Stein 1993), which stressed that if firms can hedge with use of derivatives they can fund their operations with debt.

Firms' size had an impact on firms' decisions to participate in derivatives trading. Larger corporates use derivatives more in their trading operations because they need to protect their costs of production and insure themselves against changes in prices of raw materials. In South Africa, empirical evidence shows a statistically positive impact of firm size to the firm value at a 1% level on all the models. it implies that bigger firms use derivatives to venture into new and large investment opportunities than smaller firms. Derivatives enhance firms' value by utilising the instruments to hedge foreign currency, interest rate risk, and

commodities' risks. From the models in table 5.3, the coefficient of the firm size measured by the natural logarithm of total assets had a positive and statistically significant coefficient at a 1% level on all the estimated models. It depicts that there is a relationship between firm value and the size of the firm. These results are consistent with the theory propounded by Han (2020), which stressed that large and mature corporates hedge more than small firms. Also, big firms enjoy economies of scale through the use of derivatives.

The cash flow variable had a positive relationship with firm value, with a statistically significant coefficient. The variable that measures the effect of the availability of internal funds depicts an association between operating cash flow and firm value in model 1 and is not significant on other estimated models. Investors place greater value confirms that generate high cash flows, which are more profitable and able to service their obligations. Lau (2016)found out that lower operating income margin firms participate more in derivatives to protect the small amounts of cash flows they generate.

The results show that the cash flow variable has a higher value among all the variables in the model. The result can imply that cash flow is perfectly correlated across firms, and its coefficient is 1.18, which is a satisfactory investment level. Hence, firms, to secure their proceeds, need to hedge their cashflows through the use of derivatives. These findings confirm with the theory, that hedging is a better method of managing cashflows (Ivilina and Betty 2014). Companies reduce their capital investments if their cashflows are low, meaning their value will also reduce. In addition, it implies that to achieve value generation, and firms must hedge cashflows and undertake capital investments for value generation to firms. Hedging reduces cash flow changeability and allows firms to be financially strong, and lessen costs of bankruptcy. Derivative instruments allow firms to use bank loans and finance from external sources to fund their investments by locking finances' costs. The cash flow variable had a significant impact on the firm's decision to use derivatives because firms need to protect their wealth from market variables that may affect their value in the present and the future.

If firms have no access to external finance, their investment will not exceed their cashflows. Hedging strategies depend on how the competitor hedges and on the nature of the products offered by the firms. From these analyses, based on a theory by Kim, Papanastassiou and Nguyen (2017b)argue that most firms are willing to hedge more if their rivals hedge less, which implies that the hedging policy inherits the strategic substitutability feature of the product market game.

Profitability, measured as net profit to total assets, reflects a positive statistically significant relationship to firm value on the estimated models at a 1% level. Thus, profiting firms are using derivatives. The results in table 5.3 show the variable profitability with a positive sign which is strongly significant at a 1 % level among the estimated models. The economic implication might suggest that firms that are making profits make decisions of hedging using derivatives to protect their profits, streams of cash flow from operations, and are value-enhancing.

If firms are growing their profits, it means their value is enhanced. High profit-making firms use more derivatives to hedge the sources of risks that might affect underinvestment. This finding suggests that profit-making firms are likely to fund their capital investments with returned profits generated internally and not include debt in their capital structure.

The discussion above shows that firms gain in value through employing derivative instruments in their risk management strategies. Expected firm's inflows from international transactions, expected cash flows can be secured through the use of derivative instruments; therefore, firm value increases in the market.

To check for robustness with another proxy that measure growth opportunities, the impact of derivatives on the firm value in South Africa, cashflow was used as an alternative in model 2. The results reflect that its coefficient is positive but not statistically significant in Table 5.3. Also, the natural logarithm of sales was used in the analysis, and its coefficient is positive and statistically positive in model 3.

5.3.2 DERIVATIVES HEDGING AND FIRM VALUE.

According to Ayturk, Gurbuz and Yanik (2016b), derivatives' use of a dummy variable does not measure the exact derivatives hedging. In conformance with the study ofAyturk, Gurbuz and Yanik (2016b), hedging was used as a continuous variable to distinguish the value effect of hedging. In this study, hedging means the use of derivatives. Table 5.4 depicts the regression results to show the relationship between the derivatives hedging and firm value. Hedging is insurance in investments, whereby an investor attempts to offset potential losses, and derivatives are used as hedging tools because of their ability to short-sell derivatives.

The results in table 5.4 show that the coefficient of derivatives hedging is positive and statistically significant at the 1% level for the two models, estimated using the system GMM. The statistically positive coefficient implies that there is a positive relationship between hedging and firm value.

Firms that invest more in hedging have higher values than non-hedgers. Contrary to Ayturk (2016), who found weak evidence on value relevance of derivatives' use in Turkish firms, this study found strong evidence on value relevance for South African non-financial firms. This study's results imply that non-financial firms can create value through hedging with derivatives. This finding fulfills the theories which modeled that, for a firm to hedge against uncertainty, it needs insurance for price risks. There is a a need to guard for inventory price rises through entering into futures contacts with suppliers.

Table 5. 4:Dynamic panel-data estimation, hedging with derivatives and firm value

	Tobin's Q	Cashflow	Sales
	Model 1	Model 2	Model 3
L.TobinQ	0.737***		
	(0.003)		
L.Cashflow			0.85***
			(0.0588)
L.Sales		0.121	
		(.0163)	
HE	0.001***	0.000128***	0.000
	(5.310)	(0.000)	(0.000)
Leverage	-0.005***	-0.128***	0.0107
	(0.001)	(0.0341)	(0.0193)
Profitability	0.620***	2.788***	0.151
	(0.042)	(0.861)	(0.109)
Size	0.033***	0.608***	0.200***
	(0.001)	(0.121)	(0.0597)
Cash flow	0.771***	1.094***	0.323**
	(0.057)	(0.397)	(0.127)
Liquidity	0.084***	0.0429	0.00257
	(0.005)	(0.0344)	(0.0357)
Observations	924	1025	801
Number of ids	166	171	161
AR (2)	0.376	0.254	0.385
Hansen/Sargan	0.192	0.354	0.215
Number of groups/instruments	166/46	171/46	161/46
Wald	268.96***	64867.96***	3721.71***

* p<0.1;*Significant at 10% level;*** p<0.05; *Significant at 5% level;**** p<0.01 *Significant at 1% level.*

Table 5.4 results show that non-financial firms in South Africa are hedging using derivatives, locking in prices of their commodities, raw materials, and cashflows against price changes. The theory of Smith and Stulz (1985) shows that hedging decreases a firm's cash flow volatility, and consequently, lowers the expected financial distress and bankruptcy costs. This, in turn, results in a lower cost of debt. These findings imply that firms can finance their growth and investment opportunities by using debt.

The study's results confirm that all the firms are using derivatives for hedging the sources of risks encountered in their daily operations. These findings concur with Froot, Scharfstein and Stein (1993), who note that hedging can limit the under-investment problem when a firm faces growth opportunities and can reduce the cost of external financing. Therefore, it frees

the hands of managers to pursue optimal investment strategies and higher growth objectives by generating enough internal funds. Credit extension is likely to benefit both banks' shareholders and bondholders by lowering risk-based capital requirements and deposit insurance premiums in the banking industry.

Consistent with models 1 and 2, leverage is negatively statistically significant at a 1% level, impacting firms' value. A statistically positive relationship is noted between firm value and profitability at a 1% level in models 1 and 2. The relationship between liquidity and size is still the same as the models in table5.3 which is positive statistically significant at a 1% level.

In both the estimation models, the lag dependent variable, Tobin's Q coefficients, are statistically significant, implying that if the firm value is dynamic, its previous value influences futures value in the same direction. The dynamic coefficients imply that more valuable firms are expected to generate higher values in the future.

5.3.3Model specification tests

In a dynamic panel analysis, it is crucial to test the legitimacy of instruments and model specifications. The GMM technique is consistent in the absence of second-order serial correlation. The study used the serial correlation AR (2) test proposed by Arellano and Bond (1991). The models of this study passed the AR (2) test, thereby indicating the absence of autocorrelation. The Hansen tests are shown in table 5.4 also prove that the instruments are not over-identified. Consistent with dynamic stability, the coefficient of the lagged dependent variables in all models is less than one. These findings prove that all the models of this study are correctly specified.

5.4THE IMPACT OF DERIVATIVES USAGE ON THE BANK LENDING

5.4.1 RESEARCH FINDING AND ANALYSIS

This section covers the second objective, which established the impact of derivatives usage on bank lending activities in South Africa. The focus was centered on how derivatives influence lending activities in the South African economy. This section addresses the findings of the research question, what are the effect of derivatives on bank lending in South Africa?
The system GMM with a dynamic panel data model was used to estimate the impact of derivatives on lending. However, the panel data were unbalanced. Therefore, the system GMM was considered to be the best methodology. Arellano and Bover (1995) and Blundell and Bond (1998a) propounded that system GMM overcomes the problem of widening the gaps between unbalanced panel data by subtracting previous observations from contemporaneous ones. In addition, system GMM was chosen because it controls and corrects endogeneity (if there is a correlation between the explanatory variables and error terms in the model). It also by introducing many instruments, through lagged dependent variables in the dynamic panel model and transforms the instruments to make them uncorrelated (exogenous) with fixed effects(Roodman 2009). System GMM also uses a system of two equations: the original and transformed one and orthogonal deviations that minimise data loss. It also controls for omitted variables' bias in the model, unobserved panel heterogeneity variables in the model, and measurement errors involved in the data.

5.4.1.1 Descriptive statistics

Table 5.5summarises descriptive statistics for the dependent and independent variables. The mean of total loans (TLCOPVT) year-on-year change is 1.77. The dependent variable reflects a standard deviation of 5.29. Also, the DERIV variable, the measure of derivative use in the banking sector, on average, shows a mean of 4.10, which suggests that very few banks in the sample used derivatives. Consequently, very few banks are utilising the benefits of derivatives to hedge the risks of lending, and the 1.05 standard deviation reflects a slight deviation of the hypothesis that banks use derivatives to lend.

Table 5. 5: Descriptive statistics

Variable	*Description*	*Mean*	*Std. Dev.*	*25%*	*Min*	*75%*	*Max*
TLCOPVT	*Pvt +pub + mortgage lending*	*1.770*	*5.290*	*2803*	*2132*	*4644772*	*4.150*
DERIV	*Derivatives nominal value*	*4.103*	*1.051*	*1107*	*174*	*2892607*	*7.710*
TA	*Total assets*	*3.550*	*9.751*	*8944*	*8082*	*1.61E+07*	*7.260*
MORTGAGE	*Mortgage lending*	*1.681*	*4.481*	*8247*	*227*	*2455790*	*2.981*
PUBLENDING	*Public lending*	*13184*	*19200*	*1244*	*1*	*1778766*	*1.100*
PVTLENDING	*Private lending*	*79465*	*1.891*	*1877*	*2132*	*3757594*	*1.141*
QRA	*Total equity/total assets*	*0.155*	*0.136*	*0.711*	*0.02*	*0.18991*	*0.784*
LIRA	*Liquid assets/total assets*	*0.205*	*0.183*	*0.679*	*0.008*	*0.286534*	*0.858*
ROA	*Return on assets*	*2.146*	*2.446*	*0.839*	*0.007*	*1.7174*	*11.212*
EMPG	*Employment growth rate*	*1895.201*	*8435.605*	*39.017*	*37.179*	*40.188*	*4018*

Descriptive statistics show a high variation in the size of banks measured by the natural logarithm of total assets, which reflects a mean of 3.56 and a standard deviation of 9.76, relative to bank lending. Literature shows that the size of the financial institution had a bearing on lending activities. Shen and Hartarska (2018) confirm that large mature banks use derivatives because of the economies of scale effect. Banks with the highest total assets can lend more and generate more assets.

Economic conditions of South Africa measured with the growth rate of employment recorded a mean of 1895.20 and standard deviation of 8435.61, respectively. Liquidity, measured as a ratio of liquid assets to total assets (LIRA) with an average of 0.20 and a standard deviation from the mean of 0.183. The profitability of banks reflected an average of 2.15with a standard deviation of 2.45. Capital adequacy measured as a ratio of total equity to total assets had an exceptionally low standard deviation of 0.134 from the mean, with a mean of 0.155.

5.4.1.2 Correlation matrix

Table5.6 reports the correlation matrix of the explanatory variables and bank lending. The correlation matrix is included to check for multicollinearity in the explanatory variables. A correlation above 0.8 between independent variables is an indication of the presence of multicollinearity.

Table 5. 6: Correlation Matrix -Pearson correlation coefficient

variables	Loans	Publending	Pvtlending	deriv	Ta	mortgage	qra	Lira	Roa	Empg
Loans	1									
Publending	0.663	1								
Pvtlending	0.642	0.709	1							
Deriv	0.371	0.445	0.466	1						
Ta	0.37	0.676	0.556	0.750	1					
Mortgage	0.499	0.608	0.189	0.704	0.444	1				
Qra	0.325	0.177	0.409	0.016	0.292	0.286	1			
Lira	0.146	0.156	0.318	-0.111	0.153	0.077	0.241	1		
Roa	0.005	-0.081	-0.073	-0.088	-0.05	0.022	-0.1	0.26	1	
Empg	0.535	0.473	0.508	0.370	0.492	0.525	0.111	0.08	0.2	1

Intable5.6, the correlations between the explanatory variables are all below 0.75, proving that multicollinearity is not a problem among the independent variables in this analysis. The correlation analysis shows a positive and significant association between credit extension and derivatives' use of 0.371. Public sector lending and derivative use have a positive association of 0.4446, which implies that if banks use derivatives, there is an increase in lending to the public sector. In private-sector lending, the variable has a positive association of 0.4662, which suggests that banks consider private sector loans a risk. A high-value correlation indicates that if there is an increase in the corporates, banks have to hedge more of the risk overall. From this analysis, derivative use suggests that lending activities are increasing in the banking sector because of the association of variables depicted in the correlation matrix. Therefore it implies that banks that use derivatives to hedge their exposures and, for speculative purposes, create revenue that they can provide for lending(Zhao and Moser 2017).

Banks' size was measured by the natural logarithm of assets and showed a positive association between bank size and derivative use. This correlation is a sign which suggests that more banks with huge assets trade in derivatives markets. The implications in line with theory, which states that big banks tend to trade and hold derivatives because of the economies of scale effect(Kim, Papanastassiou and Nguyen 2017a). Correlation between bank size and loan growth shows a low positive association of 0.3679 which supports the notion that banks' size influences their the ability to extend credits. As a result, big banks lend more to increase their assets and can venture into other investments for diversification.

Capital adequacy is measured by the total equity to total assets ratio with the ratio of 0.0158 indicates a positive association with derivative use, which suggests that capital requirements

do not confirm an influence on the bank's need to participate in derivatives markets. The capital base of a bank influences credit extension. Therefore, banks that are better capitalised increase their lending.

Profitability had a -0.0878 weak negative correlation with derivatives' use. This value shows that profitability does not have a significant effect on banks to use of derivatives. Also, profitability did not reveal any correlation with lending indicated by a -0.0053 weak negative correlation, suggesting that banks participate in lending, regardless of its profitability. Banks with high profits levels venture into capital projects with internally generated finances rather than providing those funds for lending, which require to be insured with derivatives.

Economic conditions of a nation are reflected in the growth rate of employment variable, whose value is 0.3697, which means that there is a moderate positive correlation between employment growth rate and derivative use. This correlation suggests that, if the economy is doing well, banks are faced with high demands of loan applications. The size of the workforce indicates the level of investment in an economy; namely, a larger workforce means that the economy is performing well, which leads to economic growth. The employment growth rate and loan growth have a 0.5352 moderate positive correlation, which shows that the greater performance of the economy will result in a larger number of loan applications.

From the above discussion, multicollinearity is not a problem among the variables, and it implies that the explanatory variables are not correlated to each other; therefore, the regression results can be used to infer economic implications.

5.4.2 EMPIRICAL RESULTS

5.4.2.1THE IMPACT OF DERIVATIVE USAGEON BANK LENDING

As stipulated above, this section focused on answering the research question, what are the effects of derivatives on bank lending in South Africa? The dependent variable assumes the banks' lending growth using total loans, which are made up of private sector loans, public sector loans, and mortgage loans. Prior studies were concerned with commercial and industrial lending, exposed to credit and interest rate risks other than loan types. However, this study tests the impact of derivatives on the growth of total loans and other loan types. To further test the impact of derivatives, total loans were breached into sectorial lending, which encompasses private lending, public lending, and mortgage lending growth, respectively. The dynamic panel data model estimated with system GMM was employed.

Table 5. 7: Dynamic panel data estimation results [System GMM] -total loans to derivatives

VARIABLES	LOANS
L.LOANS	1.361***
	(0.0494)
L2. LOANS	0.377***
	(0.0495)
DERIVATIVES	0.112***
	(0.0399)
LIRA	4.4106*
	(0.08906)
EQRA	3.9847**
	(0.5957)
SIZE	6,323***
	(0.1891)
EMP	50.92
	(0.1423)
AR(2)	0.184
Hansen test	0.267
Observations	367
Number of Groups	45
Number of instruments	30
Wald chi2(7)	63944.42***
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 5.7 provides dynamic panel data regression results of bank lending, and derivatives use for South African banks. Again, AR (2) is used to test for serial autocorrelation. The Hansen test is used to test for over-identification of instrument. All the tests are insignificant that is greater than 5%.

The results presented in table 5.7 show that, for control variables, banks with greater liquidity measured by liquid assets to total assets (LIRA), large banks measured by the log of total assets (SIZE), capital adequacy measured by equity to total assets (QRA), and profitability measured by return on assets, are more likely to increase their lending. These were supported by the positive statistically significant coefficients from the regression results above at the 1% level.

These findings contradict the results from US banks (Prabha, Savard and Wickramarachi (2014b), which showed that only profits and banks with unused loan commitments cause banks to increase their C& L loans. They showed that bank size, capital, and liquidity ratios are insignificant, and net interest margins negatively affected lending.

These control variables might have a different impact on the growth of other loan types. Several other tests and robustness checks were performed. Primarily, the objective was to

analyse the extent of the use of derivatives on the growth of total loans, measured by the national values of derivatives contracts held by sampled banks. The dependent variable, namely, total loans, was legged. The results documented in table 5.7 show that banks' derivatives holdings are positive to the growth of total loans.

From the additional tests carried out, all the four regressions and the derivatives' use variable coefficient are positive and statistically significant at 1% levels. Model 1 had total loans as the dependant variable, and in model 2 (Table 5.8), total loans were replaced by private lending as the dependant variable. In model 3 (Table 5.9), public lending becomes the dependent variable to test the effects of derivatives on public lending, and lastly, in model 4 (Table 5.10), the dependant variable is mortgage lending. From these models, it was revealed that lending to all sectors had positive coefficients, which suggest that derivatives influenced lending to the private and public sectors compared to mortgage lending, as illustrated in table 5.10. Literature supported the notion that derivatives' use affects banks' lending activities, thus more advances(Zhao and Moser 2017). Their study reported that banks hedge more with credit derivatives because firms that take part in credit default swap markets are either large, foreign multinationals companies or investment-grade US firms.

Table 5.7 shows the regression results of the model with total loans as a dependent variable. The dependent variable was total loans, and derivatives was the main independent variable. For control variables there is liquid to total assets ratio which is a measure of the liquidity effect. Also, return on assets reflected the profitability, natural logarithm of total assets was the measure of bank size, and total equity to total assets ratio represented capital adequacy, and economic conditions of states represented the employment growth rate.

The studies of Diamond (1984) and Stulz (1985)were based on the benefits of hedging for financial institutions to alleviate the chances of suffering costs of financial distress. Literature shows that banks can use derivative instruments to hedge and manage risk and cost of financial distress while making more money that will be made available for credit to borrowers in an economy. Deng, Elyasiani and Mao (2017a) highlighted that to gain huge economic rents, and banks must hedge using derivatives, grant more loans, and lessen greater credit risk in lending.

The results reflected in the regression model 1 Table 5.7 it shows total loan growth in South Africa on derivatives' use,. It indicated that derivatives have a significant effect on bank lending as shown by the positive correlation coefficient . Which implies that 1 unit increase in derivative use causes there is a 3.7% increase in lending in the banking sector in South

Africa on lag 2. Derivatives have a considerable influence in banks' hedges to extend advances at the 99% confidence level. A positive coefficient shows an association between derivatives trading and loan growth in bank assets. This findings concur with the findings of Brewer III, Minton and Moser (2000), which show a positive impact of derivatives on bank credit advances. These findings infer that when banks are hedge using derivatives, they receive vast benefits. In accordance with that, if banks were using derivatives to generate revenue from holding derivatives for speculation and trading them, not to assist the arm of lending, the sign for the derivative variable was supposed to be negative. The results support the notion that lending is increased by trading and holding derivatives as hedging instruments which allow banks to protect themselves from fluctuations in interest rates(Sinha and Sharma 2016).

Banks protect themselves from credit risk and interest rate risk using derivatives and can lend more the certainty of the outcomes. The results suggest that if banks can hedge the sources of risks associated with lending, it becomes easy for banks to grant more loans to all sectors. Corporates borrow and buy insurance on their income variations and finance their growth opportunities and capital projects. Banks in an economy will be performing major role in channelling funds to productive sectors if they use derivatives to increase their capacity to lend more. Economic activities are promoted by using derivative instruments through availing opportunities for banks to have an efficient way of providing loans. The results of this study are consistent with theories of hedging. (Purnanandam 2007)emphasises that if banks face financial distress, they employ aggressive methods to manage interest rate fluctuations through on-statement of financial position or off-statement of financial position instruments.

The results presented in table 5.7. show that given all other things are equal, the relationship between bank loan growth and bank capital requirements is positively significant at all levels. Banks will venture into lending at a large scale if they are well capitalised, and meet their capital requirements.From the regression in equation 1, the growth of total loans is positively and significantly correlated to the QRA, which is the measure of capital adequacy. This finding implies that banks increase their loan portfolios if they have good capital requirements. This result supports the argument that banks, which are facing capital inadequacy, reduce their loan assets to fund their capital requirements. The environment in the South African banking industry is heavily regulated. Therefore, the capital requirement is a priority. Brewer, Zhao and Moser (2017)echo similar sentiments on capital adequacy in their studies in America. Therefore, banks must meet the minimum capital requirements with

their regulators for them to adequately and fully participate in lending activities. Sharpe and Acharya (1992) and Bernanke, Lown and Friedman (1991)also, through their postulated theory, rooted that if banks have met their capital requirements, they are more likely to increase their bank loan portfolios. A financial institution with low capital could increase its minimum capital position by reducing its assets. Most banks feel that the best way to increase their capital requirements is through reducing their loan assets. Banking managers view this strategy as a better one than issuing equity because of costs. Therefore, banks with low capital positions are more likely to reduce their loan growth while meeting the regulatory capital requirements. At the same time, banks which have strong capital bases have the appetite and capacity to increase their lending.

The natural logarithm of total assets, which captures the effect of bank size and bank derivatives' use, reflects a positive significant coefficient at a 1% level. This finding suggests that banks with high assets have the advantage of economies of scale to participate in derivatives and are able to increase their wealth through lending. Moreover, the coefficient reveals that if bank's assets increase, loan portfolios also increase. This finding suggests that banks increase their lending if they are holding more assets, and bank size has a positive influence on the banks' use of derivatives. It is consistent with the work of (Purnanandam 2007), who concluded that banks that are growing and banks which hold few liquid assets participate more in hedging strategies. Also, his hypothesis of size was supported with these results, which confirm that the economies of scale effect influence larger banks to be predominant derivative users.

The ability of banks to service their short-term obligations by measuring liquid assets as a ratio of total assets reflects a significant coefficient which suggests that banks' lending is associated with available liquidity. Banks lend if their liquidity improves. A positive association among variables with their coefficients which show stability,is consistent with preceding studies of (Brewer III, Deshmukh, and Opiela 2014). For banks to obtain intermediation efficiency and absorb much credit risk, they have to hedge all sources of risks, as emphasised by the (Diamond 1984) model. (Hirtle 2009)also confirmed that banks increase their credit supply if they obtain credit protection access through hedging with credit derivatives or interest rate derivatives. The evidence was limited to certain types of borrowers and loans. This evidence was more significant for long-term loans, and new loan flows as protection for increases in credit derivatives.

Economic conditions of a national show that the growth in banks loan is influenced by the state of the economy. The impact of the employment rate on the growth of loans was

considered. The positive coefficient, which is statistically significant at the 1% level, reflects that banks lend more if the economy was is stable and is performing well. The employment growth rate captures the performance of a country; that is, if there is high employment, it means that more people are working, which reflects high investments and economic growth. More investments require finances, and banks are the main sources of finance through loans. Banks' lending activities increase when an economy is performing well. The positive relationship between loan growth and employment shows that the South African economy demands more finances through bank loans.

Results on regression from the model equation in table5.7 indicate that, on average, when banks participate in any form of derivatives,their loan portfolios increase. Diamond's (1984) model infers that interest rate derivatives can assist banks in reducing systematic risks. Fluctuations of interest rate, defaults of credits, cashflow variations, price movements, and foreign currency volatility are the major risks banks suffer in growing their loan assets. If banks manage to use derivative instruments to mitigate the sources of all the risks, they are likely to have a high volume of loans in their balance sheets because they can provide more lending without facing more risks.

5.4.3 DERIVATIVE USE AND LENDING TO PRIVATE SECTOR

Table 5.8 reports the regression model results with the the private sector as a dependent variable, which examines the effects of derivative use and bank lending to the private sector of South Africa. This study investigated private sector lending in which banks extended overdrafts, loans and advances which were extracted from the corporate financial sector, non-financial corporate sector, unincorporated business enterprises of households, households, and non-profit organisations serving households.

Diamond's (1984) model proposed that hedging be practiced in the banking sector, and banks should maximise their knowledge of banking. This study points out that lending to the private sector is riskier; so, banks should draw benefits from hedging for this types of loan. Private sector borrowers need finance to fund their operations since it is the core pillar that drives the economy. The private sector incorporates 90% of the industry, which falls under the category banks classify them as private sector lending.

Table 5. 8:Dynamic panel data estimation results [System GMM]- private sector loans to derivatives

VARIABLES	PvtSector
L.PvtSector	0.872***
	(0.0508)
L2. PvtSector	0.208***
	(0.0553)
DERIVATIVES	0.0239**
	(0.0192)
LIRA	1.9906***
	(0.163)
EQRA	1.7450***
	(0.0604)
SIZE	2.8701***
	(0,627)
EMP	0.2783
	(0.0247)
AR(2)	0.210
Hansen Test	0.248
Observations	375
Number of Groups	45
Number of instruments	30
Wald chi2(7)	63944.42***
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

This table provides dynamic panel data regression results of bank lending (private sector loans), and derivatives use for South African banks. AR (2) is used to test for serial autocorrelation, and the Hansen test is used to test for over-identification of the instrument; their statistics reveal that the model is stable because the instruments are justifiable.

In South Africa, banks hold more private loans as the major assets, and there are majority of risky borrowers because the chances of defaults are high. It is because individuals borrow to finance personal expenses, for example, to fund funerals, or buy cars in installments which will be difficult to repay since there is no generation of revenues from the borrowed money. However, banks can lend more to the private sector by using derivatives to manage risks and protect their assets. Derivative instruments, if effectively employed, are the tools used to manage risk, which enable banks to reduce credit risk and expand lending. This control variable of assets was included to control the size of banks since size affects the use of derivatives by enabling banks to benefit from economies of scale (Purnanandam (2007).

Regression results of the model in table 5.8 are consistent with Cebenoyan and Strahan (2004). They revealed that lending to corporate business is riskier than advances to residential

real estate, citing the latter category, as well as lending to consumers, as a safe sector to advance money. Banks, when managing credit risks using derivatives, will benefit more when lending to commercial businesses. Prabha (2014) commentated that if there is a financial crisis, lending to real estate is riskier, and banks benefit if they hedge using derivatives. Lending to the private sector's regression, the major determinant of lending significant are the capital adequacy and liquidity ratios, which suggest that banks that are better capitalised have more liquid assets to lend extensively to the sector.

5.4.4 DERIVATIVE USE AND BANK LENDING TO THE PUBLIC SECTOR

Table 5.9 below summarises the results of the regression model with public sector lending as a dependent variable. The objective was to investigate the impact of derivatives on bank credit extension to the public sector. Extracts of overdrafts, loans, and advances to the public sector were extended to the central government, social security fund, provincial governments, local governments, and public non-financial corporates sectors, such as Eskom and Transnet, and foreign public sectors.

Table 5. 9: Dynamic panel-data estimation [System GMM]- Public sector loans to derivatives

VARIABLES	Publicsectorlending
L.Publicsectorlending	0.583***
	(0.042)
L2. Publicsectorlending	0.254***
	(0.0424)
DERIVATIVES	0.0293***
	(0.00484)
LIRA	0.3099
	(0.392)
EQRA	0.68500
	(0.8031)
SIZE	1.774***
	(0.181)
EMP	9.763
	(0.16393)
AR (2) Tests	0.822
Hansen test	0.197
Observations	375
Number of Groups	45
Number of instruments	30
Wald chi2(7)	2590.77***
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 5.9 above provides dynamic panel data regression results of bank lending proxied by public sector loans as dependent variable and derivatives used as the main independent variable for South African banks. AR (2) is used to test for serial autocorrelation, and the Hansen test is used to test for over-identification of instruments; their test statistics are insignificant.

Table 5.9's results assess the impact of derivatives for banks to lend to the public sector. Statistically, the lending coefficients are depicted in the advances to government as positive with derivative use. Government institutions are regarded as a safe sector because the government does not default. It may be useful for banks to hedge these loans against market risks. Market variables in interest rates do not cater to clients' default rate but affect the cashflows to be received in the future. Therefore, banks need to protect their incomes against the erosion of value. Derivative use shows that banks lend more if they use derivatives in their trading as tools for risk management. Public sector loans are not affected by the size of

banks. Small or large banks find this sector safe to lend more money to than all other sectors. This is in line with what theory of(Froot, Scharfstein, and Stein 1993), which states that if low cashflows are generated within the business, firms should hedge so that they can reduce costs of debt.

5.4.5 DERIVATIVE USE AND BANK LENDING TO THE MORTGAGE SECTOR

The results of the extent of derivative use and bank lending to the mortgage loans are reported in table 5.10 below. Mortgage advances are extracted from the following categories: farm mortgages, residential mortgages, and commercial and other mortgages drawn from the public financial sector, private financial corporate sector, and household sector.

Table 5. 10: Dynamic panel data estimation [System GMM]- Mortgage loans to derivatives

VARIABLES	Mortgage
L.mortgage	1.631***
	(0.041)
L2. Mortgage	-0.663***
	(0.039)
DERIVATIVES	-0.022***
	(0.027)
LIRA	-1.3806
	(0.177)
EQRA	3.651
	(0.370)
SIZE	1.489***
	(0.059)
EMP	17.28
	(0.128)
AR (2) test	0.416
Hansen tests	0.286
Observations	375
Number of Groups	45
Number of instruments	30
Wald chi2(7)	109598.18***
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

This table provides dynamic panel data regression results of bank lending (mortgage loans) and derivatives use for South African banks. AR (2) is used to test for serial autocorrelation, and the Hansen test is used to test for over-identification of the instrument, and their test statistics are insignificant.

Table 5.10 reports the dynamic panel data estimations using yearly data of lending to the mortgage sector. Regression results of the modeling table 5.10 examine the impact of banks' derivatives to advance loans to mortgage borrowers. This regression serves a crucial role in testing the relationship between banks' advances to the mortgage sector and their participation in derivatives contracts. This presentation is not consistent with prior research because derivatives use negatively impacting mortgage lending. Derivative use variable is negative and statistically significant at 1% level, which implies that the growth of derivative use in banking reduces lending to mortgage seekers.

It implies that there is no association between lending to this sector and banks' participation in derivatives. Zhao and Moser (2017) suggest that a negative association between derivative usage and lending activity implies that banks use derivatives for speculating purposes. They argue that revenues gained from speculation would substitute the need for lending. Secondly, banks could charge a fee to over-the-counter dealers for placing derivatives' positions. Either of these activities generates revenues for banks. Hence, derivative activities can be substitutes for lending activities. Therefore, if there are substitutes, their model will give a negative coefficient on the DERI variable. The study revealed the negative association between derivative usage and mortgage lending. Banks are not hedging this type of lending. The reason for the decrease in lending to a mortgage could be the history of poor performance of the loan type and the blame put on the mortgage lending to the 2008/9 financial crisis. Thus, could be the inference from a negative impact of derivatives on South Africa's mortgage lending.

The above study confirmed that the results of this study are consistent with hedging theories which state that financial distress can cause hedging to increase among banks, firms, and institutions. This can confirm this study's findings that banks with lower capital adequacy are prone to face financial distress and are more likely to participate in the derivatives market. Additionally, the findings of this study show that bank size had a greater significant impact on the use of derivatives, and larger banks enjoy economies of scale in risk management compared to smaller financial institutions.

Furthermore, this study's findings confirm that banks increase lending by protecting their credit risk through interest rate derivatives and credit derivatives, but this was limited to

certain types of borrowers and loan types. The evidence is depicted in the private sector lending and public sector lending, which had long-term loans. This study's results differ slightly from the study of Wen (2014), which stated that, when Chinese banks manage loan portfolios, they have to make decisions about terms on which loans will be made, how much should be lent, and strategies on how risks of such loans will be managed. In South Africa, lending was based on the capital adequacy, liquidity, and profitability of an institution through derivatives.

5.5IMPACT OF DERIVATIVES ON THE ECONOMIC GROWTH

5.5.1RESEARCH FINDINGS AND ANALYSIS

This section presents the results of objective three, which investigated the impact of derivatives through bank lending and firm value on economic growth. A time series econometrics model (VAR model) with quarterly data for 1996 q1-2017q4 was used. King and Levine (1993) found out that financial development facilitates economic growth. Levine and Zervos (1998b) advocated that stock markets and banks' well-functioning promote economic growth. Vo *et al.* (2019a) showed that derivatives in high-income countries are more directly influenced than less developed nations. Vo, Huynh and Ha (2019) concluded that derivatives positively contribute to the economic growth in the short-run in the US and Japan. This study investigates lending to corporates, households, and governments. Lending to the economy is a fundamental factor that is availing liquidity to the economic agents of economic growth furthermore, if the financial system could have the capacity to lubricate smooth financing productive investments, output growth, and investment opportunities as a result of derivatives usage inthe banking sector which facilitate greater lending.

This section presents the answers to the following research questions: the relationship between derivatives usage and economic growth through bank lending and firm value. The answers are presented in this section: the first part provides stationarity tests results, co-integration tests results, regression results of VECM modeland their estimates to the main results of derivatives' impact on economic growth, and the the last part of the section presents the model diagnostic tests. This study reflects the effect of derivatives usage on credit extension and economic growth and the effects of derivative usage by non-financial firms on value creation and economic growth in South Africa.

5.5.1.1 Stationarity test results

Before the scientific testing of stationarity of the variables, the data were subjected to virtualize their movement by performing spurious regression and observing the value of R-squared and Durbin-Watson d-statistics suggested by (Engle and Granger 1987).

Table 5. 11: Spurious regression test-checking stationarity

R-Squared (R^2)	Durbin-Watson d-statistics
0.8769	0.6235

The spurious regression results show that the R-squared is greater than the Durbin-Watson d-statistics, meaning that the series is not stationary. The rule of thumb is that when the R-squared is greater than the Durbin-Watson d-statistics, the series is non-stationary, and the regression is spurious. Hence, the outcome of regression cannot be used for hypothesis, forecasting, or prediction. Therefore, the stationarity of the dataset was carried out. For testing stationarity within series, this study used the augmented the Dickey-Fuller test for unit root. Eduard and Stefan (2009a)proposed that this test is a better approach than the general Dickey-Fuller test because it requires higher-order autoregression to be tested.

Table 5. 12: Augmented Dicker Fuller test results

	ADF TEST Z(t)	*1% CRITICAL VALUE*	*5% CRITICAL VALUE*	*10% CRITICAL VALUE*
H0: The level of the variable is non-stationary				
InGDPG	1.913	4.110	3.482	3.169
InDER	1.228	3.534	2.904	2.587
InTOBIN'S Q	1.626	3.534	2.904	2.587
InTLCOPVT	1.190	3.621	2.947	2.607
H0: The first difference of the variable is non-stationary				
*InGDPG****	3.188	3.535	2.904	2.587
*InDER****	7.099	3.535	2.904	2.587
*InTOBIN'S Q****	2.904	3.535	2.661	2.587
*InTLCOPVT****	4.821	3.634	2.952	2.610

*Note. **** indicates the first difference of the variables.*

The augmented Dickey-Fuller test (ADF) for unit root was used. Data were not stationary in levels I (0); the variables were converted to the first difference I (1) for it to be stationary. Table5.12shows the ADF test statistics for both levels I (0) and the first difference I (1) of the four 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, the results for testing with the first difference are indicated with ****yardsticks. The first difference results show that the log of real GDPGper quarter, the log of derivatives,the bank lending, and the log of Tobin's Q are stationary. The non-stationary null hypothesis of the first difference is rejected at the 5% significant level. Hence, the first difference results were used, and the variable was 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 the5% critical value from the results in Table 5.12, meaning that that null hypothesis is rejected, and the variables are stationary. The next step is to test the long-run relationship within the variables in the equations.

Table 5. 13. Phillips-Perron test for unit root

	PP test statistics Z(t)	*1% critical value*	*5% critical value*	*10% critical value*
H0: The level of the variable is non-stationary				
InGDPG	2.534	4.380	3.600	3.240
InDER	3.201	4.380	3.600	3.240
InTOBIN'S Q	2.133	4.380	3.600	3.240
InTLCOPVT	2.518	4.380	3.600	3.240
H0: The first difference of the variable is non-stationary				
*InGDPG*****	6.220	4.380	3.600	3.240
*InDER*****	6.466	4.380	3.600	3.240
*InTOBIN'S Q*****	5.959	4.380	3.600	3.240
*InTLCOPVT*****	5.783	4.380	3.600	3.240

5.5.1.2 Cointegration relationship testing results

The stationarity test showed that the time series data were not stationary in levels(0), and the study proceeded to carry out the stationarity test at the first difference. The outcome became stationary. Therefore, the variables become stationary at the first difference; that is, they are stationary at I (1), which means that the series are integrated of order one. From that scenario, cointegration was important to establish if a long-run relationship exists. Therefore, Johnsen's cointegration test was used, and its decision criterion implies that the null hypothesis should be rejected if trace and max statistics are greater than the 5 % critical value. Hence, the null and alternate hypotheses can be stated as follows:

Maximum rank of 0

H0:0means that there is no cointegration equation among the variables; and
H1: H0 is not true.

Maximum rank of 1

H0: There is one cointegration equation.
H1: There are no cointegration equations.

Cointegration implies evidence of a long-run relationship among variables, that is, bank lending, derivatives, firm value, and real GDP have long-run relationships. Table 5.14 below shows the results of the Johansen cointegration test, which depicts that the variables are integrated in the long run, which implies that the VECM model must be used to find whether the variables are cointegrated in the long run or not.

Table 5. 14: Johansen cointegration test results

Maximum rank	*Trace statistics*	*Max statistics*	*5% CRITICAL VALUE (trace)*	*5% CRITICAL VALUE (max)*
0	58.0917	35.4411	47.21	27.07
1	22.6506	18.7014	29.68	20.97
2	3.9491	3.8874	15.41	14.07
3	0.0642	0.0642	3.76	3.76
4	-	-	-	-

The cointegration tests in table5.14 above show that at a maximum rank of 0 trace and max statistics are greater than the 5 % critical values. Therefore the null hypothesis was rejected of no cointegration equations, and the alternative hypothesis accepted that there is cointegration among the variables. At a maximum rank of 1, the null hypothesis is there is one cointegrating equation among the variables. The results show that trace statistics is less than the critical value at 5% and therefore accept the null hypothesis that there is cointegration among the variables. The same results apply at a maximum rank of 2 and 3 that the variables are cointegrated, implying that they had a long-run relationship.

At a maximum rank of 0, the null hypothesis means no cointegration. At one maximum rank, the null hypothesis means there is one cointegration equation at two means there are two cointegration questions. Based on these results, the researcher concludes that the variables

had a long-run cointegration relationship among economic growth, derivative markets, bank lending, and firm value.

The results from the above Johansen cointegration test depicts that the variables have a long-run association which implies that the study shall use the VECM estimation to test the causality among the variables. Therefore, the following sub-section relates to the effects of the derivatives market on economic growth with the aid of the long-run model(VECM model).

5.5.2 EMPIRICAL RESULTS

To determine the relationship between derivatives usage and economic growth variable with bank lending and firm value in the short and long run, the first step was to specify the model, then test stationarity of the dataset and cointegration test to establish the long-run relationship. The series were stationary at the first difference, and the cointegration test also revealed a long-run relationship among the variables. After exhibiting a long-run relationship with the Johnsen cointegration test among the variables, the VECM model was applied to estimate the impact of derivatives on economic growth. Therefore, the results are presented in the following format. Section 5.5.2.1 presents the VECM model results, and section 5.5.3 presents the post estimation tests.

5.5.2.1. Impact of Derivatives Usage VECM Model Empirical Analysis

Table 5. 15:Vector Error Correction Model estimates

VARIABLES	D_GDP (Economic growth)	D_firm value (Tobin'Q)	D_Derivatives Derivatives	D_banklng (Bank lending)
L._ce1	-0.175***	-0.590***	-29.81	0.0537
	(0.0435)	(0.156)	(92.98)	(0.0615)
LD.GDP	0.230**	0.0858	74.03	-0.133
	(0.0989)	(0.354)	(211.3)	(0.14)
LD. Tobins Q	0.0455	-0.349***	4.936	0.0159
	(0.0299)	(0.107)	(63.89)	(0.0423)
LD. derivatives	-0.0000	0.0000	0.0231	0.0000
	(0.0000)	(0.0000)	(0.114)	0.0000)
LD. bank lending	0.0501**	0.241	-57.37	0.234**
	(0.0767)	(0.275)	(163.9)	(0.108)
Constant	-1.586***	-5.306***	0.115	0.593
	(0.393)	(1.409)	(840.2)	(0.556)
Observations	86	86	86	86

*Standard errors are in parentheses ***, **, * indicating significant at p<0.01, p<0.05, p<0.1 respectively.*

The results above show that the VECM model automatically changes the variables from their log form to the first difference: GDPG converted to D_GDP, DERIVATIVES to D_DERIVATIVES BANKLENING to D_BANKLENDING and Tobin's *Q*to D_ *TOBIN'S Q,* which are the dependent variables of the estimated model.

From the regression results above, **L_cel** is the error correction term (ECT) estimating the long-run relationship among the variables. The lagged value of the residuals obtained from the cointegrating regression of the dependent variables on the regressors. The ECT contains the long-run information derived from the long-run cointegrating relationships. For a good model, ECT should have a negative sign. The models of this study confirms that their

coefficients are all negative, meaning they are all correctly estimated, that is, -0.175 equation 1 withΔD_GDP as the dependent variable,-29.81 equation 2 with ΔD_DER as the dependent variable,-0.0537 equation 3 with ΔD_*BANKLENDING* as the dependent variable and -0.590 equation four withD_ *TOBIN'S Q.*

The model estimatingerror correction model (ECM) results are represented by (l-ce) in the system. It is the cointegration equation one which reflects that the model had one error term. The model estimated the long-run and short-run causalities of the derivatives usage, bank lending, and firm value to the economic growth measured as real GDP. Long-run causality is reflected by the coefficients of ECM, the cointegration equation one within the four estimated models, which are -0.175,-29.81,-0.0537, and -0.590, respectively.

The regression model is represented by equation 20, in which,Δ log of GDP is the dependent variable, ECT measures long-run causality in the model, and LD.GDP, LD DERIVATIVES, LD.*BANK LENDING* and LD. *TOBIN'S Q* is independent variables. The coefficient of ECT (-0.175) is statistically significant at the 1% level, which shows that real GDP, as a measure of economic activities, has a long-run relationship with derivatives, bank lending, and firm value, given all other things equal. The error correction term measures the long-run causality effect. Equation 20depicts that the overall economic activities of a nation in the long term are impacted by the development of the derivatives markets, bank lending, and firm values exhibited by a statistically negative relationship in the model.

From the main variable of interest derivatives usage, equation 21, where derivatives in the dependent variable, show that the ECT, the long-run impact of derivatives, and development of economic growth fail to exhibit the significance of derivatives in the economy. The ECT is not statistically significant, which implies that derivatives are not impacting overall economic growth.

Furthermore, bank lending activities positively impacted economic growth in the short-run, which is not statistically significant. Theoretically, it is postulated that banks provide funding for firms to carry out investment projects which boost economic growth. The firm value affected the economic activities in the long run as reflected by the negative correlation of the long-run equation, which is statistically significant at a 1 % level. The short-run is depicted by the independent variables of equation 20which shows that the log of real GDP and the log of bank lending have a unidirectional causality effect in the short-run. Hence, lending activities cause economic growth in the short run. Real GDP and firm value have an

independent causal relationship in the short run, meaning that they do not influence each other.

The results of the model regression of equation 22, in which the Δ log of bank lending was the dependent variable, depicted that in the long run, bank lending is not statistically significant, with the ECT coefficient being -0.0537. Therefore, Bank lending variable and GDP had a unidirectional causality in the short-run running from bank lending to economic growth. It implies that if the economy is growing, banks have the ability and capacity to extend more credits to the economy, which promotes the growth of productivity. In the short-term, banks are channeling more funding due to the growing demand for finance with the growing economic activities. Therefore, the unidirectional causality running from bank lending activities to economic growth in the short-run. Also, bank lending and firm value had a unidirectional short-run causality running from firm value to bank lending, which is significant at a 10% level. The economic implication is that banks are the main source of firms to grow, corporate lenders to finance investment opportunities, and growth in the short term.

For the estimated model using Stata 15 specified in the model, the results summary confirms that the long-run, the equationsof the ECT are statistically significant at 1% in the long-run.The evidence shows that a 1% unit increase in derivative usage, lending activities, and firm value growth led to a 0.175 % increase in economic growth at the 99% confidence interval. Also, a 1% unit increase in firm value growth facilitated 0.590 % growth in the economic activities at the 99% confidence interval. lastly, derivatives and bank lending as dependent variables were not statistically significant.

From the results, estimated derivatives do not impact economic growth either in the short or long run. It implies that derivatives are not causing economic growth and could suggest that derivative markets in South Africa are not developed to the extent of transmitting their residue to the development and growth of the economy in South Africa.

The following table explained how the long-run information is transmitted in the equations,

Table 5. 16: Extract of ECT from Stata (Error correction equation)

Beta	Coefficient	std. Err	Z	p>|z|	95% conf.
ECT					
GDPG	1	.	.	.	.
DERIV	0.001	0.000	1.20	0.231	-0.000
BANKLENDING	-0.063	0.032	-1.95	0.052	-0.126
TOBIN'S Q	0.313	0.108	2.90	0.004	0.101
CONSTANT	-6.030	.	.	.	.

Source: Extract from Stata estimations

The long-run equation was examined using Johansen normalisation restriction is reported in table 5.16, whereby the restriction is placed on GDP, which is the target variable in this study. The results in table 5.16 reflect the ECT cointegration equation, where the error correction term is generated. The signs of coefficients are reversed; that is, negative BANK LENDING-0.063is changed to positive 0.063. In the long run, both derivatives and firm value (TOBIN'S Q) have negative effects on GDP. On the other hand, the bank lending had a positive effect on GDPG.

Derivatives given being have a negative effect on GDP; also it is not statistically significant. Bank lending and firm value coefficients are all statistically significant at the 1% level. The extract of ECT contains the long-run information, which shows that a 1% change in the growth of derivatives will result in a 0.00 % decrease in the growth of GDPG; the rate is insignificant. Furthermore, a 1% change in bank lending also affects the GDPG growth by a 0.63% decrease. If it changes by 1%, the firm value will increase the growth of GDPG by 3.13 %.In summary, the growth in derivatives indirectly has a negative impact on the GDPG in South Africa, opposing the propositions in developing nations.

5.5.2.2VECM and Granger Wald Causality Testing

For robustness of the model, causality checks were performed to validate the results of the VECM model estimated above through granger causality checks. To further understand the causal relationship among the variables, the Granger causality test was performed to check the direction of causality between the variables. The Granger causality Wald test was estimated to observe the causal relationship between economic growth and derivatives. Firstly, we observe that derivatives, firm value, and bank lending do not cause economic growth because their chi squared are greater than 0.05, which means there is no short-run

casual effect. It explains all that there is no short-run causal effect is running among the variables. The results represented in table 5.17 the chi-squared are all above 0.05.

Table 5. 17: Granger/Wald causality test

Null Hypothesis	*chi 2*
derivatives do not granger cause GDPG	*0.3273*
bank lending does not granger cause GDPG	*0.5137*
TOBIN'S Q does not granger cause GDPG	*0.1282*
GDPG does not granger cause DERIVATIVES	*0.7261*
bank lending does not granger cause DERIVATIVES	*0.0.7264*
TOBIN'S Q does not granger cause DERIVATIVES	*0.9384*
GDPG does not granger cause bank lending	*0.3406*
derivatives do not granger cause bank lending	*0.9906*
TOBIN' S Q does not granger cause bank lending	*0.7064*
GDPG does not cause TOBIN'S Q	*0.8086*
DERIVATIVES do not granger cause TOBIN'S Q	*0.9566*
bank lending does not granger cause TOBIN'S Q	*0.3813*

*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

5.5.3 Post Estimation Diagnostic Tests

After estimating and testing the dynamic model with VECM, the results were diagnostically tested for autocorrelation, stability, and reliability of the models and are presented below.

5.5.3.1 Autocorrelation Test

Table 5. 18: Autocorrelation testing: Lagrange-multiplier test

Lag	chi^2	Df	Prob>chi^2
1	32.468	16	0.524
2	20.133	16	0.214

H0: no autocorrelation at lag order

The null hypothesis shows that there is no autocorrelation at lag order. Two lags have been used to test autocorrelation. At lag one, the p-value is 0.524. which is greater than the 5% critical value therefore, the null hypothesis(H0) is accepted and means that there is no

autocorrelation. Lag 2 has a p-value is 0.214, which is above 5%. Once again, the null hypothesis(H0) is accepted since there is no autocorrelation.

The model is desirable and is the correct one to use.

5.5.3.2Residual Normality test

The Jarque-Bera test was used to check if residuals are normally distributed (Jarque and Bera 1987). The target variable was GDPG; its p-value is 0.323, which is above the 5% critical value. Therefore, the null hypothesis (Ho) is accepted. The model is desirable because the residual is normally distributed. Furthermore, all the variables are normally distributed. Therefore, the model is accepted and used to analyze economic growth using derivatives, loans, and Tobin's Q.

Table 5. 19: Normality testing: Jarque-Bera test of normality

Equations	chi^2	Df	Prob >chi^2
D.GDPG	2.260	2	0.323
D_DERIVATVES	1.355	2	0.508
D.LTCOPVT	0.462	2	0.793
D.TOBIN'S Q	1.230	2	0.541
ALL	12.265	8	0.140

5.5.3.3.Stability tests

Table 5. 20:Eigenvalue stability condition

Eigenvalue	Modulus
1	1
1	1
1	1
0.5439	0.5439
0.4199	0.4199
0.2666	0.3268

The VECM specification imposes 3-unit moduli, and this reflects that the model is stable.

5.6 CONCLUSION

This chapter presented the study's findings and analysis in three sections. The first section covered results of derivatives' use and firm value. Secondly, derivatives' use and bank lending and, the last section covered the economic benefits of derivatives to the real economy of South Africa through bank lending and firm value.

On average,28% of the JSE listed non-financial firms use derivatives to manage risk. The results obtained suggested that the use of derivatives generates value for non-financial firms. There is a significant hedging premium for South African non-financial firms that use derivatives. The findings indicated a positive association between derivatives hedging and firm value, implying that investing more in derivatives' hedging creates more value for such firms.

This study reveals that derivatives, irrespective of type, had a positive influence on lending. There is statistical evidence showing that loan portfolios of banks that participate in derivative instruments are increasing. Further tests confirm that banks are lending more to the private sector if they are trading derivatives than the public sector. The banking sector in South Africa exhibits a negative relationship between lending to the mortgage sector, implying that they are not hedging when lending to this sector. This suggests that they regard it as a safer lending sector. This study revealed that South African banks hedge credit risk, interest rate risk, and cash flow risks to generate more revenue to lend more.

The results of economic growth and derivatives fail to establish either long or short-run association but reveal a unidirectional causality running from derivatives usage to economic growth. In the short -run, log of real GDP measure of economic activities and log of loans as a measure of bank lending has a unidirectional causality effect which means that lending activities and economic growth have causal effects running from bank lending in the short

run. The extract of ECT contains long-run information, which shows that a 1% change in bank lending will result in a 0.063 % increase in GDP per year, and a 1% change in the value of firms will cause a decrease in GDP by 3.13 % in the long run.

The final chapter presents the conclusions and recommendations of this study.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The previous chapter reported and presented the research findings of the study. Each objective finding was estimated from the Stata using dynamic models. Stata 15 software was used, and the dynamic panel model was estimated using difference and system GMM in the first objective. The system GMM was used in the second objective, and the final objective was estimated using the VECM model (after variables confirmed cointegration among them). Descriptive statistics, the correlation matrix, and model results were also reported. This final chapter of the study summarises the findings and presents conclusions drawn from the research carried out in South Africa. The following aspects are discussed in this chapter: the effects of derivatives on bank credit extension, firm value and its indirect influences on the economic growth of the South African economy. This chapter also presents the practical implications of the research findings on the economic benefits of derivative markets to the government policymakers and formulators, corporate finance strategists of corporates, private and public companies' treasurers, financial institutions, and investors. Lastly, areas of further research are suggested.

6.2 SUMMARY OF THE RESEARCH CHAPTERS

Chapter one of the study provided the footpath which the research study followed. It presented the overview of the overall study, the roadmap of the study, the aim, objectives, and research questions, and the research paradigm of the study.

Chapter two explained the historical background of derivatives in the financial landscape, theoretical aspects of derivatives markets and instruments in the financial literature, functions of derivatives instruments in commerce, and uses of derivatives in the financial world. This chapter revealed that derivatives are important in hedging variabilities in the market variables, such as interest rates, prices of commodities, and foreign exchange rates. A snapshot of the South African derivative instruments traded and held in the banking sector was also presented in this chapter. The analysis revealed that interest rate derivatives are the most traded derivative instruments in South African banks, specifically forward interest rate derivatives, swap interest rate derivatives, and foreign exchange rate derivatives (ABSA Bank 2016). Theoretically, it was confirmed that risk emanates from currency price

movement in foreign transactions, and corporates and banks hedge using derivative instruments.

Furthermore, the chapter scrutinised the practical aspect of the study. This chapter confirmed that firms in developed markets participate in the derivative markets mainly to hedge sources that emanate from foreign transaction prices of currency movements. Commodities' risks and derivatives were used more by firms that have high chances of financial distress (Froot, Scharfstein, and Stein 1993). In the banking sector, it was revealed that derivatives' instruments facilitate lending and permit banks to lend more if they are hedging sources of risks which affect lending using derivative instruments (Brewer III, Minton and Moser 2000; Zhou and Wang 2013; Wen 2014). Economic growth using derivative markets were examined in the developed markets (Haiss and Sammer 2010b; Prabha, Savard, and Wickramarachi 2014b; Vo, Huynh and Ha 2019; Vo *et al.* 2019a). Different channels in which instruments use derivatives were explained. The areas which are not examined empirically were identified in the chapter.

The third chapter highlighted the research paradigm utilised to achieve the research objectives. Stata 15 econometrics software was used to estimate the models. Objective one was estimated using the difference between GMM and system GMM. Objective two utilised only system GMM mainly because the panel data were unbalanced, as advocated by Arellano and Bover (1995). The last objective linked objective one and objective two to assess the impact of derivatives on economic growth using data of a single country over time. Time-series econometrics VECM was used for analysis because the variables confirmed that there is a long-run relationships tested with Johnsen cointegration.

Chapter five presented research findings and analysis of the results. The results were linked to the relevant theoretical literature. The analysis was based on the objectives in chapters two and three, which examined the economic benefits of derivatives in the South African economy.

Chapter six provided summary, conclusions of the findings, and recommendations. The chapter's theoretical and empirical aspects of the study were identified and presented. The chapter also highlighted the limitations and recommended future research areas.

6.3 CONCLUSIONS

The researcher was moved to develop the topic, "Economic role of derivatives to the bank lending, firm value and economic growth: Evidence of South Africa" because of the provocative question of why derivatives' markets were increasingly used in commerce? Thirsty for knowledge about who might be the beneficiary from the astonishing growth of derivatives markets in the financial system propounded the research to answer who and which areas or sectors of the economy were benefitting from these instruments.

A snapshot of the following statistics shows the increasing importance and growth of derivative markets in business:

i. Price Waterhouse Coopers (PWC) (2012) reported that as of June 2012 that OTC derivatives were valued at R27,7 trillion in South Africa.
ii. Abdel-Khalik and Chen (2015) documented that the total amount of derivatives held by 25 of the largest US banks showed great variations in their growth, that is, in 2012, derivatives were valued at$308 trillion compared to $16.6 trillion in 1995, which reflects the great importance and growing use of derivatives in commerce.
iii. The Reserve Bank of South Africa indicated that derivatives' financial instruments held by banks in South Africa grew from R261 billion to R337 billion from 2015 to 2016, respectively.

Researchers asked the following questions: what purpose do derivative markets serve in the financial markets since commodity, equities, bondss, and other essential markets perform reasonably well without derivative markets? Some studies argued that derivative markets generate valuable opportunities that do not exist in the financial system. Moreover, there is no doubt that derivatives can improve the actual performance of the markets of the underlying instruments (Cont 2006). This study sought to enlighten the policymakers and decision-makers of private and public firms and financial institutions on the economic benefits attached to the derivative markets.

6.3.1 OBJECTIVES OF THE STUDY

- **OBJECTIVE ONE:** ***To establish the impact of derivative markets on the non-financial firms listed on the JSE***

The dynamism of the markets has led to the relevance of derivative instruments in commerce. However, firms are exposed to many global risks due to globalisation. In retort, corporates

across the globe turned to hedge strategies using derivative markets. The objective explored the effects of the impact of derivatives on firm value in the South African non-financial listed firms. The aim was to assess if firms were using derivatives to derive value from hedging. The research objective employed a dynamic panel data model estimated with the generalised methods of moments (GMM) on a panel of 199 listed non-financial firms. The estimation technique was robust in controlling for endogeneity, unobserved heterogeneity, autocorrelation, and dynamic panel bias. On average,28% of the JSE listed non-financial firms confirmed the use of derivatives to manage risk. The results obtained suggested that corporates generated more wealth through the use of derivatives. That is, they can secure cash flow variations from international transactions through hedging. The results confirmed significant hedging premiums for non-financial corporates in South Africa that they are using derivatives. The findings indicated a positive association between hedging extent and firm value, implying that investing more in derivatives hedging was creating more value for such firms.

- **OBJECTIVE TWO:** ***To establish the influences of derivative instruments on the banking sector lending: Evidence from South African financial sector***

The strength of financial institutions in the technological change is in their ability to ensure themselves against market variabilities and uncertainty outcomes in lending, taking deposits and transactional banking, and foreign and rates trading. To indemnify against the brutality of market movements, banks resort to derivative markets to undertake hedging, speculation, and arbitrage market variables. This study explored the impact of derivatives' use on bank credit extension with South African banking industry data for 22 years from 1996 to2017. System GMM estimation techniques with dynamic panel data was used. The results of this study revealed that derivatives, irrespective of type, had a positive influence on lending growth in the banking sector. There was strong evidence to show that loan portfolios of banks that participate in derivative instruments are increasing. Also, the results show that, in South Africa, local banks were the predominant players in derivatives and lending activities, as compared to international banks and foreign branch representatives.

Further tests confirmed that banks were lending more to the private sector if they were trading derivatives, as compared to the public sector. The banking sector in South Africa exhibited a negative relationship when lending to the mortgage sector, which implies that banks were not hedging when lending to this sector since they regarded it as a safer lending sector. There were a statistically significant relationship between South African banks to

hedge credit risk, interest rate risk, and cash flow risks and the generation of more revenue and lending.

- **OBJECTIVE THREE**: ***To establish the economic role of derivatives to economic growth through bank lending and firm value***

This study revealed that derivatives, irrespective of type, positively influenced bank lending in South Africa. There is a statistically significant correlation between South African banks to hedge credit risk, interest rate risk, and cash flow risks, and the generation of more revenue and lending. Also, non-financial firms confirmed that they increased value by hedging risk premiums using contracts of derivatives. The use of derivatives trading revealed a positive statistical relationship in all the estimated models. It is signifying their importance to banks and non-financial companies to alleviate sources of risks and permit banks to give out more credits, and allow firms to invest much of their capital. Empirical results showed that in the short-run, log of real GDP and log of loans had a bidirectional causality effect which means that lending activities caused economic growth in all directions in the short-run. Real GDP and Tobin's Q also had a bidirectional causal relationship in the short run. In the long run, both logs of Inloans and log of InTobin's Q had negative effects on GDP. The Inloans coefficient was statistically significant at 1% level, and InTobin's Q was not statistically significant. The extract of ECT, which contained the long-run information, showed that a 1% change in derivatives would result in a 0.0002 decrease of the GDP per year, which implies that derivatives eventually had a negative impact on the development of the economy. Also, a 1% increase in loans will result in a 1.52 % decrease in GDP per year. The results of long-run information, it shows that a 1% increase in the firm value results in improving yearly real GDP by 1.15% each year from 1996 to 2017. Furthermore, a 1% change in the value of the firm increased GDP by 1.15 % in the long run. These findings imply that non-financial firms' use of derivatives amplified yearly real GDP by 1.15% and increased their capacity to carry out investments in capital expenditure.

6.4THE MAIN CONTRIBUTION OF THE STUDY

These research findings added new knowledge to the existing body of knowledge through the following dimensions.

From the methodological point of view,the study extended the prior studies by addressing the problem of endogeneity in the relationship between derivative use and firm value. And extending bank lending to economic growth with a dynamic panel model and novel

estimation technique (GMM) and time series econometric estimation model (VECM). Previous studies used the OLS estimator and pooled regression methods on cross-sectional and time series data, which disadvantaged the models with serious endogeneity and heterogeneity issues. This study's model and estimation technique did not use studies that combined the results of firm value and lending activities to inquire their impact on the growth of an economy, especially in Africa. Numerous methodological tests were used to overcome challenges in discerning the effects of derivatives' use on South African economic development.

Regarding the theory of developing economies, few studies have been conducted on the effects of derivatives and firms'value and derivatives and bank lending. Such studies are predominantly concentrated in developed economies, such as the USA. However, developing economies have different institutions, financial situations, economic conditions, market perfections, and imperfections. Therefore, evidence from the developing economies must be explored separately. This study provided empirical evidence from a developing nation. Hence strategic investment decisions were based on the analysis of the developing economy'speculiar characteristics.

Furthermore, this study differed from other studies since it assessed lending in the banking sector, private sector, and corporate sector. The study does not identify which derivative instrument had a greater effect on bank lending activities because of the economies of scale effect.

Corporate risk management is a vital aspect of the company's operating strategy in global markets. Firms can, for instance, borrow cheaply from capital markets, either in the international or local markets, without the fear of the currency denominating the debt or in which form the interest is repaid through utilising derivative instruments—hedging the fluctuations of market variables are used, for example, to protect the increase in borrowing rates and interest rate swaps. For foreign trade transactions, currency swaps are used as tools for insurance against sources of risks that emanate from uncertainty in the markets. Corporates can eliminate the risk of foreign currency by hedging the foreign currency inflows from their entrepreneurial activities abroad or even locally, which might be eroded by inflation. Derivatives' instruments facilitate firms to insure their risks by hedging and manage prices and interest variabilities in the markets. Derivatives traded on the exchange markets had two constructive functions; the discovery of price and management of risk. The use of derivatives is important to financial institutions, corporates, and other economic agents,

which are consumers, producers, importers, and exporters, because their prices can be anticipated in the future, and firms can lock in the prices.

6.5RECOMMENDATIONS

Capital markets facilitate firms to raise finance for long-term projects. These markets are populated with many financial instruments, such as commodities, equities, bonds, and derivatives. Derivatives' markets trade financial instruments on the capital markets. They are made up of four main types of contracts performed on the capital market;they are options, swaps, futures, and forwards. The value of derivative instruments is derived from the price of underlying instruments, like commodities, interest rates, foreign currency, and equities. In size, the swaps in notional amounts are the largest derivatives markets followed by forwards' markets. The precariousness in foreign currency, interest rates, stocks, and commodities prices spurred demand to unbundle risks using financial instruments. Among global OTC derivatives' instruments, interest rate derivatives accounted for about 77% t traded in 2017 (Bank of International Settlement 2019). The second-largest item traded was foreign exchange derivatives.

The research findings documented in this study powerfully supported policies to inspire financial development of in the financial sector in South Africa, which will help in stimulating economic growth. Therefore, policymakers should adopt strategies that reinforce financial development in a country through fiscal or monetary interventions. In the monetary intervention context, measures to erase credit constraints should be implemented. These measures will allow for the reduction of capital costs and increase the efficient allocation of financial resources. Such policies should be supported to ensure the long-term stability of the macroeconomic environment in South Africa.

Derivatives are regarded as risk instruments. Therefore, they need proper regulation since their effect can destabilise the whole financial system. As claimed by the Dodd-Frank Act, the regulations of OTC should be put in place on derivatives, especially on the OTC derivatives, which have made inroads to be transparent so that it will not put the global economy at risk of period 8/7/2006(Department 2018).

This study provided empirical evidence and highlighted the major effects of derivatives markets on economic growth for the benefit of society. It identified the implementation of desirable economic activities to boost the development of markets for derivatives instruments. Furthermore, government policymakers and financial regulators were recommended to introduce incentives and encourage derivative instruments to boost

economic growth. The government should encourage decision-makers and policy formulators to develop derivative markets and maintain them for the overall economy and welfare. It is a prerequisite for government to implement key regulatory procedures to reduce transactions that are not transparent. If the government fails to regulate the derivatives markets, the financial system can risk a shutdown.

6.6RECOMMENDATIONS FOR FUTURE RESEARCH

Further research studies can be conducted in this subject area by considering the impact of economic influences of derivatives capital market liquidity and economic growth, the impact of derivatives on the stability of the financial system, and the impact of the derivative markets on economic growth. In addition, studies can be done through incorporating case studies in specific sectors of the economy, for example, the link between the derivatives markets in the manufacturing and mining sectors.

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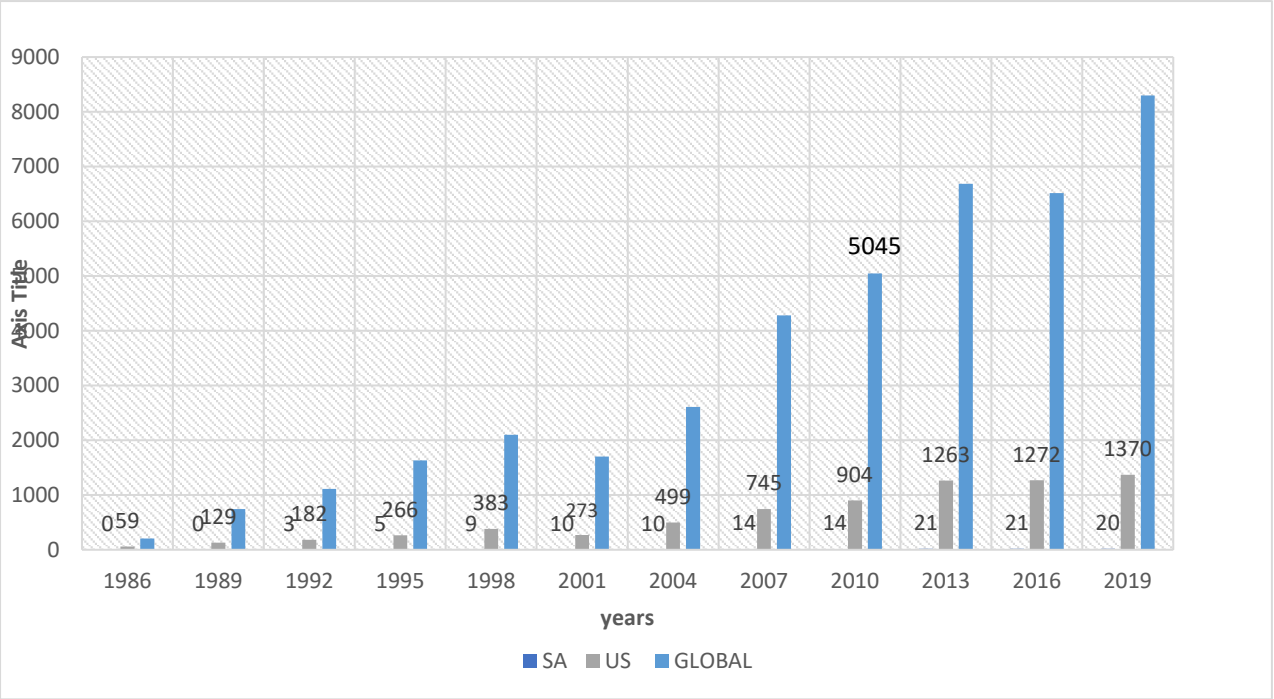
APPENDIX A

APPENDIX A1: ECONOMIC GROWTH OF SOUTH AFRICA FOR THE PERIOD 1994-2016

Source : Reserve bank of South Africa (1994-2016)

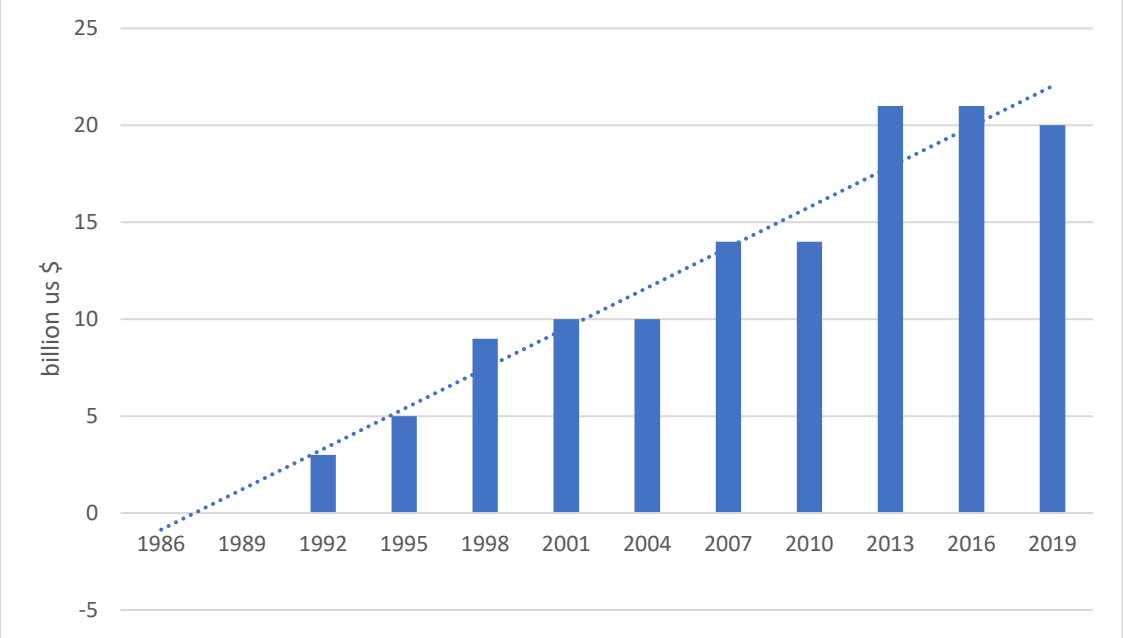
APPENDIX A2. DERIVATIVES STATISTICS

OTC turnover foreign exchange derivatives



Source: Bank of International Settlement- Triennial OTC derivatives statistics (TRIENNIAL) (1986-2019)

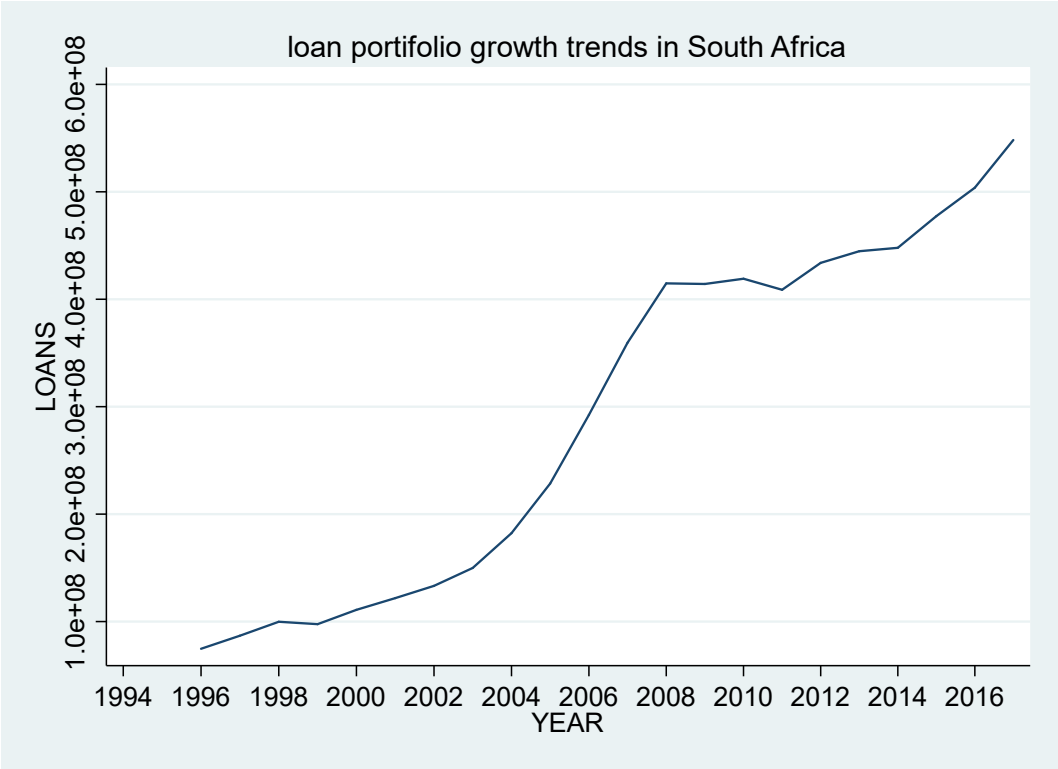
Turnover of OTC foreign exchange instruments-South Africa



Source: Triennial OTC derivatives statistics (TRIENNIAL) (1986-2019)

APPENDIX A3. LENDING STATISTICS IN SOUTH AFRICA

Loan Portfolio trends in South Africa



Source : Reserve bank of South Africa (1994-2016)