MCom

The Effect of Fintech on Banking Performance in South Africa.

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ABSTRACT

This research analysed the potential for a long-run relationship between financial technology (FinTech) firms and the banking sector performance in South Africa (SA) for a period spanning from the year 2000 to 2018. The investigation also sought to examine the effects of FinTech on the banking sector performance and how it differs with the size of the bank. The investigation also determines if there exist causal link(s) between FinTech firm presence and the banking sector performance. Where banking performance is reflected through banking related financial ratios of return on equity (ROE), return on assets (ROA), net interest margin (NIM), and yield on earning assets (YEA). Methodologically, this study used the Autoregressive Distributed Lag (ARDL) model and the Granger Causality test to inform the investigation. ARDL model helped the researcher to establish whether FinTech firm presence has a significant directional relationship with the determinants of performance in the banking sector. The Granger Causality test was used to infer if FinTech drives banking performance. The major results of the ARDL model show that FinTech firm presence was a significant factor in the long-run determinants of ROE, ROA, and YEA at 1% level of significance, whilst only at 10% level for NIM. The results of the Granger Causality test, however, showed that FinTech firm presence cannot be used to predict future RSA banking sector performance. This study concludes that is a relationship between FinTech and the determinants of banking sector performance. However, ROE being the only determinant with a negative relationship. This research also recommends that a closer eye be kept on the thinning of NIM by banks to compete with new FinTech firms as this may lead to risky lending where the cost of debt does not reflect the risk. The banking sector should welcome FinTech as it brings about more efficient banking sector performances. The financial sector benefits from incoming innovation brought about by FinTech firms.

Table of Contents

List of Figures and Tables

List of Acronyms

ATM	Automated Teller Machine
ARDL	Autoregressive-Distributed Lag
BS	Bank Size
CPI	Consumer Price Index
CTI	Cost to Income
DG	Deposit Growth
GDPG	Gross Domestic Product Growth
NIM	Net Interest Margin
ROA	Return on Assets
ROE	Return on Equity
RSA	Republic of South Africa
WB	World Bank
YEA	Yield on Earning Assets

CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Background of Study

The way banks operate has been influenced by dramatic changes in technology and shifting consumer preferences. The preferences have tended to question the traditional methods of banking through new solutions and business interactivity offered by financial technology (FinTech) firms. As such, as pointed out by Arner, Barberis, and Buckley (2015), Chiu, Bool, and Chiu (2017) a completely new era in the banking sphere has emerged post the global financial crisis (GFC) of 2008. Although, technology has been integrated into banking and financial services sector for the past three decades, it was initially limited to the automation of back-office operations (Masocha, Chiliya & Zindiye, 2011). Technology has challenged this notion in all sectors of the banking industry. It has been driven by the desire to improve clients' experiences and efficiency in banking services. This evolution is likely to continue as technology keeps revolutionising the way modern economies function. As theorised by Schwab (2015) this is set to develop at an exponential rate into the fourth industrial revolution (4IR) which calls for an increase in the use of digital means and ways in any given community in all sectors of life.

The link between technology and the banking sector is one that has existed for over a century. It dates to the 1866 transcontinental cable first laid in the Atlantic ocean to improve multi-national communication processes (Arner, Barberis, & Buckley, 2015). In no time, this development gave birth to a more efficient global banking and financial services sector as information could be passed more efficiently over telegraph. This event has been termed 'the first phase' in the evolution of financial technology. The second was marked by the introduction of the Automated Teller Machine (ATM) in 1966 which acted as a complement to the already introduced credit card system (Arner, Barberis, & Buckley, 2015). In addition, the banking and financial services industry managed to start integrating their operations with new Information Technology (IT) infrastructure which translated to better services being offered to clients then, thereby improving banks performance. The current phase gained prominence post-2008 financial crisis. It was spurred on by a multitude of factors, including financial institution's pitiable public opinion, varying regulatory scrutiny, political pressure, and economic circumstance, *inter alia* (Arner, Barberis, & Buckley, 2015).

Differences in regulation between that of banks and FinTech firms offering specialised banking services such as lending, asset management payment services and deposit taking (Cortina & Schmukler, 2018) are some of the contributing factors to the positive disruption and growth of this industry in Africa. This outgrowth in the banking and financial sector has the potential to affect the performance of traditional banks in SA, both in a positive and negative manner as argued by Beck's *et al*. (2016) in their innovation-fragility debate. This debate identified the potential for better banking efficiency as well as the additional risk associated with this innovation. This debate has also driven many scholars to investigate how the presence of FinTech in their respective economies has affected the performance of banks (Lee *et al*., 2021; Phan, *et al*., 2020). On the same platform, this study, thus, sought to add to literature that investigates the potential relationship between banking performance and FinTech firm presence with specific reference to RSA

1.2 Statement of the Problem

Different studies have looked at banking performance through different lenses within developing countries. For example, elsewhere Li *et al*. (2017) looked at performance through the lens of share price. While Lee *et al*. (2021) and Phan, *et al*. (2020) looked at performance through the lens of financial ratios of ROA, ROE, NIM, and YEA. A study by Shapshak (2019) showed that RSA has become one of the main hotbeds for FinTech start-ups. This was also complimented by Genesis Analytics (2020). The study by Genesis Analytics estimated that there where over 200 FinTech firms present within the country by 2019. It gave a directory of the firms making it possible to establish when the firms entered the market and how long they have been present. These FinTech firms seemingly can be seen to be acting as a force of disruptive innovation in the RSA banking industry. Therefore, this study will investigate the possibility of a long-term relationship between FinTech and banking performance in the country.

1.3 Aim of the study

This research aims to examine the prospects of a long-run relationship between FinTech firms and the banking sector performance in RSA

1.4 Research Questions

The research seeks to look at:

1. What are the prospects of a long-run relationship between FinTech firm presence and banking sector performance in South Africa?
2. What effects did the interaction of FinTech firm and bank size have on banking sector performance?
3. What causal link exists between FinTech and banking sector performance?

1.5 Research Objectives and Hypothesis

The objectives of the study are as follows:

1. To examine whether a long-run relationship exists between FinTech firm presence and banking sector performance.

   H_0 There is no significant long-run relationship between FinTech firm presence and banking sector performance.

   H_1 There is a significant long-run relationship between FinTech firm presence and banking sector performance.

2. To examine whether the effect of FinTech on banking sector performance vary with size of the bank.

   H_0 FinTech's effect on banking performance does not vary with bank size.

   H_1 FinTech's effect on banking performance varies with bank size

3. To determine if a causal relationship exists between FinTech firm presence and banking sector performance.

H_0 There is no causal relationship between FinTech firm presence and banking performance.

H_1 There is a causal relationship between FinTech and banking performance.

1.5 Significance of the Study

Despite the emergence of digital innovation and its perceived effects on the financial industry, the impacts of digital innovation and FinTech growth on financial institutes are less understood. Earlier studies examined the pattern of venture capital investment in FinTech (Cumming & Schwienbacher, 2016), traced the transformation of the financial sector after digitalization (Brandl & Hornuf, 2020), investigated how retail banks share prices react to FinTech start-ups (Li, Spigt, & Swinkels (2017) and tested the determinants of the global FinTech market (Haddad & Hornuf, 2019). A recent study by Phan *et al*. (2020) examined the role of FinTech on bank performance with particular attention to Indonesian banks. This study thus adds to the body of thin knowledge on the relationship between FinTech and banking sector performance through an investigation on the impact of FinTech firms' presence in the RSA banking sector. In addition, this study uses an Auto-Regressive Distributed Lag model which helped unpack the long run relationship between FinTech and banking sector performance. The research will help in the formulation of cyber space banking laws. It also will enable the banking stakeholders to understand nature of the FinTech firm operations in RSA. More so, the society would access real time banking services even in the remotest areas in South Africa. To the researcher, the study assisted in the understanding of the existence and shifting trends of the FinTech business sector in developing countries.

1.6 Scope of the study

This research was limited to the FinTech business sector in RSA. The delimitations also include data bases, at least, Bloomberg for financial data, company websites, and LinkedIn for the demographic of companies' understudy. The details enabled the researcher to understand if the FinTech companies are operational in RSA.

1.7 Organisation of the Study

This study is made up of five chapters. The initial chapter introduced the study by highlighting the background, statement of the problem, aim of the study, outlined objectives of the study, illustrated the research hypothesis, justification of the study, delimitation, and organisation of the study, respectively. The second chapter presents empirical literature behind FinTech and banking sector performance in RSA. The third chapter focused on the research methodology that is model specification, econometric estimation and diagnostic tests, data characteristics justification of variables, among other things. The fourth chapter presents and analyses the data obtained on the phenomenon being studied. The last chapter outlines the conclusions drawn from the findings of the study, recommends any future research in connection with FinTech and banking performance.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter is set to unpack the knowledge gap by reviewing existing literature thematically. However, it starts off by giving key terms and definitions used in this study of FinTech and banking and financial services. It is followed an overview of the FinTechs and the backing landscape in SA. Further attention was given to the underlying literature on the relationship between FinTech firms and banking sector performance. Lastly, the researcher discusses the study's theoretical framework.

2.2 Key Terms and Definition

Key terms in this study are banking and financial services, banking performance and financial technology (FinTech).

Banking and financial service has no set definition thus can be loosely defined as any attempt at undertaking any one of the five elements of the financial process. These elements are "mobilisation, intermediation, maturity transformation, risk transfer, and financial deepening and repression" (Ocran, 2012, p. 8).

Banking financial performance can be viewed through the lens of profitability, liquidity, and credit quality performance (Bodie, Kane, & Marcus, 2014). The definition agrees with that of banking and financial service by Ocran (2012). Ratios based on performance data from banks annual financial statements is thus used to measure performance in line with these categories.

A basic definition of **financial technology** defines the term as "the use of technology to provide new and improved banking services" (Thakor, 2020, p. 2). The Basel Committee (2018. no page) argues financial technology is "technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions, and the provision of financial services." These two definitions for financial technology embrace aspects of the banking and financial services as well as the banking financial performance hammering on profitability, financial access among other things.

Hence, all these aspects guided this research in unison of perspective concerning the prospects of the long run relationship between FinTech business and banking.

2.3 FinTech and banking in South Africa: An overview

The financial technology ecosystem in Africa is not strictly defined with multiple reports spotting different levels of depth to it (Lim, lakhoua & Mazzawi, 2016; Maino, Massara, Perez-Saiz, Sharma, 2018; Rand Merchant Bank, 2018). This discussion, however, take hid to the Basel Committee (2018. No page) which describes the phenomenon as "technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions, and the provision of financial services." Arner, Barberis, and Buckley (2015) postulate that financial and technological developments are mutually intertwined with the 2008 global financial crisis being part of the reason for the current dynamic state of FinTech. The three scholars' research further expanded upon the progressions of FinTech showing three distinct periods in which FinTech has been present.

As pointed out earlier, the initial and earliest period FinTech can be tracked to the year 1866 with the laying of the transatlantic cable. Though such technology was not meant for sole use in the financial industry, it served as a compliment to the industry as it enabled the globalisation of financial services for trading countries. This phase of development in the intertwining of technology and finance lasted from 1866 to 1967 as put forward by Arner, Barberis, and Buckley (2015). They argue that the second phase of this relationship spans from the year 1967 to 2008. It was marked by the introduction of the first ATM by Barclays Bank (Reuters, 2017). This evolution in financial services only came around in 1980 in RSA through Standard Bank's introduction of the first ATM (Standard Bank, 2011). This period saw the digitalisation of the financial industry with an abundance of information technology being merged with the financial services industry, spear headed by innovation in the United States of America (USA). The third and current phase of the FinTech evolution spanned from 2000 to the present day. This phase has been spurred on by among other things regulatory scrutiny and economic conditions.

A combination of the above factors has led to the emergence of financial technologies at retail and corporate level, globally. The Rand Merchant Bank of South Africa (RMB) (2018) report on

financial technology in RSA describes twelve sectors and the material stakeholders of change in each sector that could effect change within the industry. Although, not exhaustive, the report divided FinTech into understandable sectors whose progress can be monitored. The twelve sectors identified in the report are payment and remittances, lending, Regtech, insurance, security, blockchain, big data, saving and investment, crowdfunding, comparison solutions (RMB, 2018). All these sectors can be identified as evolution of the banking industry in Africa, particularly in SA. A government funded report coordinated by Genesis Analytics (2020) grouped these technologies into eight segments of payments, lending, savings and deposits, insurtech, investment, financial planning and advisory, capital raising and B2B tech providers. The Genesis Analytics report directory furthermore expands on the different types of FinTech firms that fall within these segments.

Genesis Analytics (2020) ascertained in the year 2019 there were 217 active FinTech providers in the country alone. It states that 30% of these active firms are in the business of providing payment infrastructure followed by 20% providing business to business (B2B) tech supports. Investment and lending are also seen to have a significant presence in the country making up 10% and 12% total FinTech firms, respectively with other segments holding below 10% of firm concentration in their segments. Most of these firms have been established within 11 years post the global financial crisis and have assisted in enabling small business to establish a presence in the market through access to different technologies such as mobile payments technologies (Mugwabana, 2020). This explains that there are FinTech firms that may be able to disrupt the activities of the conventional banking giants in the country which may hamper or improve their performances. One can argue that the increase in FinTech brings a better competitive force in the banking industry which has an effect in the long run relationship between FinTech firms and the established banking and financial services sector.

Turning onto the aspects of banking and financial services sector in SA, its role in investment is pivotal as it plays host to the financial process. In addition, the impact of the FinTech on these five financial processes highlighted earlier by Ocran (2012) namely mobilisation, intermediation, maturity transformation, risk transfer, and financial deepening can change the way and rate at which investment flows to and within Africa. Ocran (2012, p. 8) defines mobilisation of funds as “the moving of funds from those with surplus to those who are in need”. This implies that those in

need of funding through debt channels will be able to access it which oils economic growth, while giving banks a return on investment. Going further, Ocran defines intermediation as a process where "an individual, institution or market sources funds and then issues a claim against itself" (p. 8-9). In doing so, it provides a link between loanees and loaners of funds. Maturity transformation is the process of matching short-term borrowing with long-term lending (Ocran, 2012, p. 9). Risk transfer is postulated to be the deliberate act of moving risk from one entity to another (Lam, 2014). Shaw (1973) also delimits financial deepening as when the rate at which financial assets are accumulated is faster than the rate at which non-financial assets are accumulate. These processes of the financial systems are provided by banking institutions under one roof, thus exposing them to economies of scale in the long run. Vives (2017) observes that FinTech firms differs from the usual banking practices as they create services centred on the provision of one defined five processes of the financial systems discussed above. This has ramifications on the potential long run relationship between FinTech and banking performance such as Mukuru a payment provider penetrating the cross-border transaction market and taking share away from the conventional banks.

The banking sector in RSA has been relatively concentrated since the 19th century when imperial banks had an estimated 90% of the market share within the country (Verhoef, 2009). Currently, the big four banks within the country are all domestically owned and have a market share of 92.8% (MarketLine, 2021). These big four banks are Amalgamated Banks of South Africa (ABSA) Group Limited, Standard Bank Limited, Nedbank Limited, and FirstRand Limited. The big four banks have held this dominant position on the market due to statutory requirements targeted at banking operations and historical reputation within the industry (Verhoef, 2009). Banking performance in the country has been relatively positive except for the period from 2007 to 2009 where the global financial crisis affected it (Kumbirai and Webb, 2010; Bhimjee, Ramos, & Dias, 2016). FinTech firms are bringing in a new form of disruption with low barriers to entry in the banking space. This development challenges the almost naturalised oligopolistic nature of the banking sector in RSA.

The banking sector in the country is well regulated with over 10 different pieces of legislation covering its reach. These pieces of legislation though they have not informed this study they include:

- The Banking Act, 1990 (Act no.94 of 1990)
- National Payment Systems Act, 1988 (Act no.78 of 1998)
- The Financial Intelligence Centre (FICA), 2001 (Act No.38 of 2001)
- The National Credit Act of 2005 (Act No. 38 of 2008)
- The Financial Intermediatory and Advisor Act (FAIS), (2002) (Act No.37 of 2002)
- The Consumer Protection Act, 2002 (Act 68 of 2008)
- The Home Loan Mortgage Act, 2000 (Act No. 63 of 2000)
- The Prevention and Combating of Corruption Act, 2004(Act No. 12 of 2004)
- Companies Act
- King Code I-IV
- Basel III
- The Competition Act, 1998 (Act No.89 of 1998)
- The Financial Markets Act, 2012 (Act No. 19 of 2012)

However, this shows that the banking sector of RSA is highly regulated. These laws form barriers to entry and makes it difficult for new banks to survive. These pieces of regulation do not cater for new FinTech start-ups which offer concentrated banking services leaving space for disruption. SA's main banks, additionally make use of significant brick and mortar assets which they derive value through their operation. Such operations are expensive to maintain so creating a hurdle of higher operating costs. Though, new entrants still have an opportunity to enter the market through wireless banking. The move entails significantly less fixed costs which may allow them to compete on a small scale (MarketLine, 2021). This new paradigm of competition has the potential of disrupting banking performance. This indicates a knowledge gap in this area of study which this research sought to fill in.

2.4 Empirical Literature

This section outlines extant literature around the discourse of FinTech business practices through a funnel approach. The review was thematised according to the flow of the research objectives to

provide answers to the research questions. The subtopics are FinTech and banking efficiency, impacts of the bond of FinTech and bank size, and the push factors on banking performance.

2.4.1 FinTech and banking efficiency

Lee *et al.*'s (2021) study on the FinTech and banking efficiency has aligned itself with the positive side of Beck *et al.*'s (2016) innovation-fragility debate in that innovation in the financial sector has led to more efficient banking in China. The study was limited to China located in Asia a characteristic that excludes other developing countries. The study also aligns itself well with Vives' (2017) concept that states that application of new FinTech techniques in banking could result in the lowering of the cost of banking and has further impacts on products provided to consumers. The lowering of costs emanates from new FinTech start-ups not having to apply for regulatory banking licences which carry their own implied costs to acquire and renew. Fixed costs associated with physical infrastructure is also a saving point which FinTech firms offering segregated banking services can exploit to operate at lower cost points. This enables FinTech firms to be competitive in the oligopolistic banking services industry of RSA.

The offering of impact products through use of character analysis from consumer data also provides new techniques which could affect the banking industry. These elements give banks competition and potentially reduce the cost of banking to clients (Vives, 2017). Vives' analysis was however based mainly on a European environment which is vastly more developed than the African one in terms of enabling infrastructure such as the Internet and its access. It is additionally leaning heavily on itself with concept rather than quantitative analysis of relationship between FinTechs and banking sector performance. Another research by the World Bank (WB) on whether FinTech was a threat to global banking (Lorente *et al.*, 2018) agrees with Vives (2017) who argues for a more competitive banking landscape especially within the SMEs financing space. These studies are however only theoretical and not country specific which is what this research focussed on.

2.4.2 Impacts of the bond of FinTech and bank size

Concerns around the negative side to financial innovation such as FinTech debate that financial innovation increases risk within the financial system. Such risks heighten the potential of a financial crisis through increased uncontrolled credit as was observed during the bursting of the

2007-2008 housing bubble. This argument is supported by the fragility side of Beck *et al.*'s (2016, p. 35) innovation-fragility argument which acknowledges that "financial innovation is associated with more aggressive risk-taking by banks and higher bank growth, which helps provide valuable credit and risk diversification services to firms and households, which in turn enhances capital allocation efficiency". This may likely be a problem if the FinTech firms continue operating in a loosely regulated space. Research by Mild, Waitz and Wöckl (2015) on the peer-to-peer lending enable by technology shows dangers that may protrude from incorrect pricing of lending by FinTech companies charging low interest rates to high-risk clients to compete. Such methods of unsecure lending may heighten the possibility of an economic crisis and thus an unstable financial climate which has further ramifications on banking operations.

Nkosi (2018, p. 46) argues that "there is no relationship between the personal banking industry and FinTech start-ups in relation to external corporate venturing, internal corporate venturing and collaboration". This suggests that RSA Banks are most likely choosing to compete with these start-ups instead of financing or purchasing them. It also shows that banks are choosing to forgo the positive efficiency benefits from collaboration as witnessed in Kenya (Ntwiga, 2020; Kiilu, 2018). Other studies on the effects of FinTech on traditional banking in China found that overall bank efficiency has improved since Internet-only banking entered the financial market. Banks were seen to be diversifying operational income while improving performance and efficiency (Chen, You, & Chang, 2021; Wang, 2021). Furthermore, with the development of FinTech and competitive pressure has led to banks profits decreasing (Chen, 2020). This study however showed different results to Lee *et al*. (2021) study of FinTech and banking efficiency in China which found FinTech innovations not only improved the cost efficiency of banks, but also enhanced the technology used by banks". The studies however utilised different approaches to investigating FinTech effects on banking. Whilst Lee's *et al*. (2021) study based its methodological approach on indexed FinTech and banking quality data, Chen's (2020) research was based on internal banking data but did not relate it to a FinTech variable making their study more of an observation of just banking performance leaving a gap for a more robust study that utilises a variable that represents FinTech. A more robust study which included a FinTech variable was carried out by Phan *et al*. (2020) in their investigation of the relationship between FinTech firm presences and banking performance in Vietnam. Their study showed a negative relationship between banking performance and growth of the financial technology industry in Vietnam opposing the findings of Lee *et al*. (2021) in China.

These studies are however based on findings in Asian countries which are exposed to different economic factors. As such, studies from different developing economies show different results, hence this study. In Africa, a study on FinTech relation to banking performance in Kenya and the mobile payment services industry has shown a positive relationship to be present (Kiilu, 2016). This study however only looked at the relationship between mobile payment services and banking performance excluding other FinTech related services such as lending and insurance services which encapsulated within this study.

2.4.3 Push factors on banking performance.

Banking performance is affected by both external and internal factors (Fani *et al*., 2018; Bodla and Verma,2006). Dietrich and Wanzenried (2014) highlighted an array of external factors including inflation, gross domestic product, and income levels within the country of operation in developing countries. These factors did not include technology which Arner, Barberis, and Buckley (2015) question through their conceptualisation that technological progression outside the world of banking affect banking performance. This impact comes through the channels of competition and internal adoption. Phan *et al*. (2020) found FinTech firm presence have a negative contribution to banking performance. This finding thus indicates technology is a push factor on banking performance. Thus, this study thus adds onto the literature of push factors of banking performance.

2.5 Theoretical Framework

This study uses innovation-fragility theory to illustrate how FinTech linked innovation affects banking performance. Under the innovation-fragility theory financial innovation is "the act of creating and popularizing new financial instruments, financial technologies, financial institutions, and financial markets" (Tufano, 2003, p.310). The growth of FinTech firm presence thus signifies the creation and popularisation of the use of new technologies to compete with and complement the traditional banking and financial services institutions. Such innovations have led to a more efficient and profitable banking sector (Arner, Barberis, and Buckley, 2015). Such continued innovation may however lead to increased financial sector fragility (Beck *et al*., 2016; Tufano, 2003; Gennaioli, Shleifer, & Vishny, 2012; Benink,1992).

Financial sector fragility can be described as the exposure of financial institutions to future financial volatility (Benink, 1992). Where volatility is caused by a change in levels of competition and system efficiency (Benink, 1992). An increase in competition can lead to dampen sector performance while increase efficiency leads to improve sector performance. Fragility theory points out the benefits and costs of innovation by insinuating that innovation leads to anomalies within the banking sector. Where anomalies can lead to better or worse sector performance. The effect on the banking sector can be seen through financial institute performance which can be signalled by performance ratios (Fung, Lee, Yeh, and Yuen, 2020). This effect on performance is however country specific and dependant on the size of securities market (Beck *et al.*, 2016). Different studies in emerging markets have found that FinTech does indeed have different effects within their respective countries of study (Lee *et al.*, 2021; Phan, *et al.*, 2020). This study will unpack what the country specific effects of FinTech linked innovation has on the RSA banking sector fragility through the lens of performance. In doing so it will thus add onto the literature of on financial sector fragility in emerging markets.

2.6 Concluding Remarks

This chapter focused on unpacking the underlying literature of the study. It started by defining the key term of the study. It then gave an overview of the South African Fintech sector followed by an overview of the banking and financial services sector by identified literature. Upon giving an overview of both sectors relevant to the study it then funnelled down and critically evaluated literature which investigated the relationship between FinTech and the banking & financial services sector. This section attempts to unpack FinTech debates and the banking sector performance, bank size and push factors of banking performance. The chapter also discussed about the theoretical dimensions of the study

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the empirical and strategic approaches used within the study to answer the set-out research questions. The chapter initially highlights the research design and methodological rationale which form the basis of this study. It also focuses on the ARDL model and the Granger causality model that were used for the purpose of investigating the dynamics of the relationship between FinTech and the banking sector performance.

3.2 Philosophical approach

The research argues on whether a long-run relationship between FinTech and banking performance exists. This shows the deterministic nature of the study. The study makes use of empirical observations in FinTech firms present each year, financial ratios obtained from published annual financial statement data and macroeconomic data from the past. The specific selection of these empirical observation is reductionist and is done to test the underlying theory that FinTech affects the fragility of financial institutions through the avenue of profitability. Therefore, this study is informed by the positivist philosophical approach, which Creswell (2009) states that it determines the cause and effect of a phenomenon understudy and is thus deterministic, reductionistic and based on empirical observation and measurement and tests the basis of a theory. This research considers the causality of FinTech firms and banking sector performance. The positivist worldview guided the research's approach, design and quantitative data collection techniques employed in this probe.

3.3 Research Design

This research used quantitative analysis methods to unpack the relationship between banking performance and FinTech firm presence in RSA. This method often use surveys, secondary data, and experiments (Verhoeven, 2011). What makes this study quantitative is that instruments used were numerical, and the data is analysed statistically (Remler & Van Ryzin 2011). This study used data bases, company websites, and social media biographs. Quantitative analysis was chosen because the data gathered was aggregated, summarised, and subjected to statistical analyses. The nature of the data analysed was such that it was framed in numerical packages or form such as

financial statements and the count of FinTech firms in RSA with a given period. More so, in using a quantitative method of analysis, the study leaned upon deductive reasoning which goes well with positivism. Soiferman (2010) pointed out that deductive reasoning works from general to specific analysis where the researcher works from hypothesis to data to contradict theory (Cresswell & Clark, 2007). The deductive nature of this study as implied. In line with Bradford (2017), this study tested the applicability and validity of existing concepts on FinTech effects on banking sector performance.

3.4 Population and sampling techniques

Population entails a group of variables in a study. This study's population was all the banks in South Africa. To dissect the population into researchable segments, this research utilised purposive sampling as it focused on Bloomberg, World Bank data bases, company websites and LinkedIn company profiles. These platforms contain professional and reviewed information that the researcher needed to conduct this study. Creswell and Plano-Clark (2018) define purposive sampling as intentional identification of variables with relevant information to answering the research questions which this researcher identifies with. The study also used convenience sampling the realm of purposive sampling as the databases, company websites, and LinkedIn profiles were easily accessible to the researcher in the process of data collection. This in line with Verhoeven (2011) who avers that convenience sampling is when research objects are accessed through availability to the investigator.

3.5 Research Approach, Data Characteristics, and Measurement

This research investigated the potential for a long-run relationship between banking performance and the presence of FinTech firms in RSA. The country was chosen as a model because it is one of the top three African countries, including Kenya and Nigeria in terms of attracting significant capital flows for FinTech developments (Shapshak, 2019). RSA is one of the countries with easily available statistics on FinTech firm presence, courtesy of research conducted by Genesis Analytics (2020). However, the banking sector in RSA has historically been highly consolidated, with four major banks [ABSA, First National Bank, Nedbank, and Standard Bank] which been argued to be in control of about 93 percent of the banking market (MarketLine, 2021). As a result, only data

from these firms was used in this analysis, as changes in their activities are likely to reflect a shift in the banking market.

3.5.1 Dependent Variable

The study's dependent variable was banking performance. Banking performance is determined by looking at multiple variables of analysis presented through the financial statements of the company. The variables adopted within this study are the ones used by Phan *et al*. (2020) in their study of FinTech and banking sector performances. These variables are NIM, ROA, ROE, and YEA. Data used to calculate the highlighted ratios was obtained using virtual Bloomberg terminal access provided through the University of Cape Town (UCT), Graduate School of Business in SA.

3.5.2 Variable of Interest

The study utilised FinTech presence as the variable of interest. The cumulative total firms in the Genesis Analytics (2020) firm directory were used to measure financial technology again following Phan *et al*. (2020). FinTech firms that provide payments, lending, savings and deposits, insurance technology, investment, financial planning and advice, capital raising, and business to business service providers are the focus on FinTech enterprises.

3.5.3 Control Variables

The empirical estimation included a set of bank specific variables and macro-economic variables. Control variables such as banking financial ratios, including bank size were sourced from Bloomberg and economic data was obtained from the WB databases.

3.5.3.1 Bank Specific Factors

These are internal factors that the bank has control over.

a) Bank Size

Bank size is measured by the natural logarithm of total assets (Al-Jafari & Alchami, 2014). Large-sized banks tend to gain from economies of scale (greater operational efficiency) and enjoy greater

economies of scope (greater diversification with respect to product and loan) compared to small banks. Therefore, a positive effect of bank size on profits is assumed, consistent with, Pasiouras and Kosmidou (2007) view. Djalilov and Piesse (2016) argue that large banks reduce their level of risk by diversifying their products and services, which contributes to higher operational efficiency, and stability. On the other hand, Chen *et al*. (2018) finds mixed results on the size and bank performance nexus; size alone does not guarantee performance.

b) Cost to Income

The cost to income variable is computed as operating costs scaled by total generated revenues following Dietrich and Wanzenried (2014). As cost to income increases, implying lower bank efficiency, it should negatively impact bank performance. This negative relationship is documented in previous empirical studies which include Athanasoglou *et al*. (2008) and Dietrich and Wanzenried (2014).

c) Loan Loss Provision

To proxy credit risk, loan loss provision was used, a variable considered a reserve to cover for any potential loans default, to protect bank positions in terms of profitability and capital losses (Betty & Liao, 2011). The level of loan loss provision indicates a bank's asset quality and can be used to judge changes in future performances. Though the loan loss provision is subjective to banks own internal assessment and adjusted on precedents. When banks are exposed to high-risk loans, they up the loan loss provision, thus hamper profitability. Similarly, Dietrich and Wanzenried (2014) suggest that increased exposure to credit risk is associated with decreased bank profitability, as bad loans are expected to reduce profitability. Therefore, a negative effect of loan loss provision on bank performance is expected.

d) Deposit Growth

Deposit growth was employed to measure bank growth. Deposits are the main source of bank-funding and are the lowest cost of funds. Ambar and Alper (2011) argue that the more deposits are transformed into loans, the higher the interest margins and profits. Therefore, deposits have a positive impact on profitability of banks. In contrast, when there is higher cost of funding, it negatively affects bank profitability.

3.5.3.2 Macro-economic factors

These are the external factors that influence bank performance.

a) Inflation

Inflation is the consistent increase in the general price level of goods and services in an economy (Parkin, 2014). As such, inflation negatively affects interest margins. Naceur and Kandil (2009) presented a theoretical explanation for this by illustrating that, given the primary function of commercial banks (giving out loans), inflation would reduce the demand for these loans because of the expenses involved. This would then cause banks to give fewer loans, and thus, reduce their profits obtained from the issuing of loans, thereby, reducing their performance. A fall in inflation has the opposite effect, until equilibrium is re-established. Likewise, Kijjambu and Ddumba-Ssentamu (2017) also reported the importance of inflation in enhancing the performance of banks in Uganda.

b) Gross Domestic Product Growth

The Gross Domestic Product (GDP) influences bank performance through the business cycle. When the economy is not doing well (recession), the quality of the loan portfolio worsens. This leads to credit losses, which reduces bank profits. In addition, profits are likely to be pro-cyclical given that economics influences the net interest income through lending activities. It is the demand for lending that is increasing (decreasing) in cyclical upswings (downswings) as argued by Dietrich and Wanzenried (2014). Additionally, there is vast literature that shows that economic growth stimulates the financial systems (Athanasoglou *et al.*, 2008; Albertazzi & Gambacorta, 2009). Therefore, it is expected that the GDP growth rate predicts bank performances positively. Hence, a summary of all the variables used within this analysis are given below in **Table 4.1** by the researcher.

Table 4.1: Summary Description and Measurement of Variables

Variable	Formulae	Data Source
Financial Technology Firms (Fintech)	Cumulative total firms	Genesis Analytics Report
Net Interest Margin (NIM)	$\frac{Interst\ Income - Interst\ Expense}{Earning\ Assets}$	Bloomberg Terminal
Return on Assets (ROA)	$\frac{Net\ Profit\ After\ Tax}{Total\ Assets}$	
Return on Equity (ROE)	$\frac{Net\ Profit\ After\ Tax}{Total\ Equity}$	
Yield on Earning Assets (YEA)	$\frac{Total\ Interst\ Income}{Average\ Earning\ Assets}$	
Bank Size (BS)	$\log(Total\ Assets)$	
Cost to Income (CTI)	$\frac{Total\ Expenditure}{Total\ Revenue}$	
Loan Loss Provision (LLP)	$\frac{Loan\ Loss\ Provision}{Total\ Loans}$	
Deposit Growth (DG)	$\frac{Deposit_1 - Deposit_0}{Deposit_0}$	
Inflation (CPI)	Annual Consumer Price Index	World Bank – World Development Indicators
Gross Domestic Product Growth (GDPG)	Annual GDP percentage growth rate	World Bank – World Development Indicators

3.6 Analytical Framework

The analytical framework outlines the model specification, econometric estimation technique and diagnostic tests to be conducted by the study, specifically the ARDL and the Granger Causality models.

3.6.1 Econometric Estimation

The study utilised a panel ARDL model to analyse the possible for long-run relationship between FinTech presence and banking performance. Pesaran, Shin, and Smith, (2001) built on ARDL model as an ideal model of use to carry out a long run statistical analysis between multiple variables. The reason behind the choice of the ARDL model is that, firstly the technique can produce both short-run and long-run coefficients of the variables specific to this study. Secondly, ARDL is appropriate under variables stationary at either level or after first differencing or mixed order of stationary, it still yields robust results. Furthermore, the model can address issues of endogeneity and heteroskedasticity, hence these econometric problems are not of any concern under this estimation technique. Consequently, the ARDL model can be presented as follows:

$$\Delta Y = \alpha_0 + \sum_{i=1}^{m} \beta_1 \Delta Y_{t-1} + \sum_{i=0}^{n} \emptyset_i \Delta EC_{t-1} + \sigma_1 EC_{t-1} + \varepsilon_t$$

Where Δ symbolises the first difference operators, α_0 is the operator intercept, β_1 is the coefficient of variation for the operator ΔY_{t-1}, $\emptyset$ is the coefficient of variation for ΔEC_{t-1} and ε_t is the error term of the equation. The optimal lag length for each variable is selected using ARDL bound testing that follows an estimation of regression techniques based on Akaike Information Criterion. The bound's testing procedure is based on the F-Statistic or Wald statistic that tests a null hypothesis of no cointegration amongst the tested variables. This null hypothesis can thus be represented as H_0: $\sigma_1 = \sigma_2 = 0$ whilst the aligned alternative hypothesis can be represented as H_1: $\sigma_1 \neq \sigma_2 \neq 0$. One set assumes that all critical values tested are I (0) whilst the other test assumes I (1). If cointegration is found in the long run the conditions for our long-term ARDL model must be thus represented as below:

$$Y = \lambda_0 + \sum_{i=1}^{m} \alpha_1 Y_{t-1} + \sum_{i=0}^{n} \vartheta_i EC + \mu_t$$

The short-run dynamic parameter is thus obtained through estimating an error correction model derived from the stated long-run estimate shown in the equation below.

$$\Delta Y = \chi_0 + \sum_{i=1}^{m} \beta_i \, \Delta Y_{t-i} + \sum_{i=0}^{n} \theta_i \, \Delta EC_{t-i} + \rho ECM_{t-1} + e_t$$

Where ECM_{t-1} is the error correction term, ρ is the coefficient of variation that shows the speed adjustment to restore equilibrium in the dynamic model? The error correction coefficient shows how quickly variables converge/diverge to equilibrium and it should have a statically significant coefficient with a negative/positive sign. The highly significant Error Correction Term further confirms the existence of a stable long-run relationship. The term e_t is normally distributed around a mean of zero and constant variance.

3.6.2 Diagnostics Tests

This study employs multiple diagnostic tests on the variables included in the study. The diagnostic tests were employed included the descriptive statistics test, multicollinearity test as known as Pairwise Correlation matrix, unit root test, heteroskedasticity test and auto correlation test.

3.6.2.1 Descriptive Statistics Test

This test assists in obtaining a general overview of the patterns the data is following. It gives the basic understanding and knowledge about the variables before performing serious statistical inferences through observation of the maximum, minimum, mean and standard deviation of the data. This analysis forms the base for the analysis techniques to follow in this study.

3.6.2.2 Multicollinearity Test

Pearson's (1920) correlation test was used to determine the relationship the presence of multicollinearity between independent terms. The use of this test is important as to not include redundant variables which serve the same purpose in a study. The variables are indeterminate and need not be jointly included in the study. The criteria for significance in terms of multicollinearity were any terms with a correlation value of 0.8 or above. This significance figure is guided by Gujarati (2004) who argues that multicollinearity is an always present phenomenon, thus what is more important is to investigate the level of correlation between the terms.

3.6.2.3 Panel Unit Root Test

Unit root testing is important to ensure that the variables under study are stationary. Non-stationary variables open the study to misleading results being used to conclude the study. To that end, this study makes use of a combination of Levin, Lin, and Chu (2002) as well as Im, Pesaran and Shin (2003) unit root tests which are derived from the Augmented Dickey-Fuller test (Dickey & Fuller, 1981). The testing parameters followed the hypothesis below.

$$H_0: p = 1$$
$$H_1: p < 1$$

The null hypothesis "H_0" indicates that all series in the panel have a unit root, whilst the alternative hypothesis "H_1" indicates the panel is stationary and satisfies the needs of the study. Levin, Lin, and Chu (2002) test implicate homogeneity on the autoregressive coefficient "p" showing the presence of unit root through an observation aligned with our null hypothesis.

3.6.3 Model Specification

The empirical model employed by this study is motivated by literature on determinants of bank performance (Köster & Pelster, 2017; Shaban & James, 2018; Phan *et al*., 2020). The conventional model of performance was augmented with the FinTech variable. The study thus makes use of the following model:

$$Y_{it} = \alpha + \beta X_{it} + \delta Z_{it} + \mu_{it} \quad (1)$$

Where Y_{it} is the dependant variable, α is the constant term, X_{it} is the independent variable with β as its coefficient of variation, Z_{it} is a matrix of control variables in this case where δ is its coefficient of variation whilst μ_{it} represents the error term.

The study looked at banking performance through the lenses of NIM, YEA, ROA, and ROE. These four elements of banking performance are thus expressed as functions of FinTech, micro-control variables, this is, bank size (BS), cost to income ratio (CTI), loan loss provision ratio (LLP), and deposit growth (DG) and macro-specific variables, Inflation (CPI) and GDP growth (GDPG). The following equations address first objective linked to the first research question.

$$NIM_{it} = \alpha + \beta FinTech_{it} + \delta_1 BS_{it} + \delta_2 CTI_{it} + \delta_3 LLP_{it} + \delta_4 DG_{it} + \delta_5 CPI_{it} + \delta_6 GDPG_{it} + \mu_{it} \quad (2\_1)$$

$$YEA_{it} = \alpha + \beta FinTech_{it} + \delta_1 BS_{it} + \delta_2 CTI_{it} + \delta_3 LLP_{it} + \delta_4 DG_{it} + \delta_5 CPI_{it} + \delta_6 GDPG_{it} + \mu_{it} \quad (2\_2)$$

$$ROA_{it} = \alpha + \beta FinTech_{it} + \delta_1 BS_{it} + \delta_2 CTI_{it} + \delta_3 LLP_{it} + \delta_4 DG_{it} + \delta_5 CPI_{it} + \delta_6 GDP_{it} + \mu_{it} \quad (2\_3)$$

$$ROE_{it} = \alpha + \beta FinTech_{it} + \delta_2 BS_{it} + \delta_3 CTI_{it} + \delta_4 LLP_{it} + \delta_5 DG_{it} + \delta_8 CPI_{it} + \delta_9 GDP_{it} + \mu_{it} \quad (2\_4)$$

The research hypothesis is stated as there is no significant long-run relationship between FinTech firm presence and banking sector performance. The decision rule was meant to reject null hypothesis if the probability value (p-value) of β is less than 5% level of significance and conclude that a significant long-run relationship exists between FinTech firm presence and banking sector performance.

The second objective was also worked out. An interaction term between FinTech and BS was introduced to capture the phenomena. The interaction term is denoted as FINBS in the estimation equations stated below.

$$NIM_{it} = \alpha + \beta FinTech_{it} + \delta_1 BS_{it} + \delta_2 CTI_{it} + \delta_3 LLP_{it} + \delta_4 DG_{it} + \delta_5 CPI_{it} + \delta_6 GDP_{it} + \delta_7 FINBS_{it} + \mu_{it} \quad (2\_5)$$

$$YEA_{it} = \alpha + \beta FinTech_{it} + \delta_1 BS_{it} + \delta_2 CTI_{it} + \delta_3 LLP_{it} + \delta_4 DG_{it} + \delta_5 CPI_{it} + \delta_6 GDP_{it} + \delta_7 FINBS_{it} + \mu_{it} \quad (2\_6)$$

$$ROA_{it} = \alpha + \beta FinTech_{it} + \delta_1 BS_{it} + \delta_2 CTI_{it} + \delta_3 LLP_{it} + \delta_4 DG_{it} + \delta_5 CPI_{it} + \delta_6 GDP_{it} + \delta_7 FINBS_{it} + \mu_{it} \quad (2\_7)$$

$$ROE_{it} = \alpha + \beta FinTech_{it} + \delta_1 BS_{it} + \delta_2 CTI_{it} + \delta_3 LLP_{it} + \delta_4 DG_{it} + \delta_5 CPI_{it} + \delta_6 GDP_{it} + \delta_7 FINBS_{it} + \mu_{it} \quad (2\_8)$$

The decision rule was meant to reject null hypothesis if the p-value of β is less than 5% level of significance and conclude that the interaction between FinTech firm presence and bank size affect relationship with banking sector performance.

3.6.4 Granger Causality Test

The study conducts the Granger Causality test to determine whether FinTech firms' presence can forecast (cause) banking sector performance (Gujarati, 2004). In order to determine whether FinTech presence causes banking sector profitability, the test calculates how much of banking sector profitability can be explained by past values of Granger Causality test was developed from the view that past events can cause occurrence of future events, but not vice FinTech presence, as a result, its presence is argued by Granger causing banking sector profitability, if FinTech helps in the prediction of banking sector performances. Therefore, the test follows the bivariate regressions, assuming that ROA, ROE, NIM and YEA are the only measure of banking sector performance. As such, the third objective was met through the following equation.

$$ROA_t = \alpha_0 + \alpha_1 ROA_{t-1} + \cdots + \alpha_l ROA_{t-1} + \beta_1 FINTECH_{t-1} + \cdots \beta_l FINTECH_{t-1}$$

$$ROE_t = \alpha_0 + \alpha_1 ROE_{t-1} + \cdots + \alpha_l ROE_{t-1} + \beta_1 FINTECH_{t-1} + \cdots \beta_l FINTECH_{t-1}$$

$$NIM_t = \alpha_0 + \alpha_1 NIM_{t-1} + \cdots + \alpha_l NIM_{t-1} + \beta_1 FINTECH_{t-1} + \cdots \beta_l FINTECH_{t-1}$$

$$YEA_t = \alpha_0 + \alpha_1 YEA_{t-1} + \cdots + \alpha_l YEA_{t-1} + \beta_1 FINTECH_{t-1} + \cdots \beta_l FINTECH_{t-1}$$

$$FINTECH_t = \alpha_0 + \alpha_1 FINTECH_{t-1} + \cdots + \alpha_l FINTECH_{t-1} + \beta_1 ROA_{t-1} + \cdots \beta_l ROA_{t-1}$$

$$FINTECH_t = \alpha_0 + \alpha_1 FINTECH_{t-1} + \cdots + \alpha_l FINTECH_{t-1} + \beta_1 ROE_{t-1} + \cdots \beta_l ROE_{t-1}$$

$$FINTECH_t = \alpha_0 + \alpha_1 FINTECH_{t-1} + \cdots + \alpha_l FINTECH_{t-1} + \beta_1 NIM_{t-1} + \cdots \beta_l NIM_{t-1}$$

$$FINTECH_t = \alpha_0 + \alpha_1 FINTECH_{t-1} + \cdots + \alpha_l FINTECH_{t-1} + \beta_1 YEA_{t-1} + \cdots \beta_l YEA_{t-1}$$

For all pairs of FINTECH and ROA, FINTECH and NIM, FINTECH and ROE, FINTECH, and YEA as well as series are grouped together in the study. The Wald statistics for the joint hypothesis $\beta_1 = \cdots \beta_i = 0$ for each equation is the reported F-Statistic. The tests hold the following hypothesis for the first regression equation.

Null hypothesis (H_0): FinTech does not Granger-cause banking sector performances

Alternative hypothesis (H_1): FinTech Granger-cause banking sector performances.

The decision criteria are that reject the null hypothesis if the probability value is less than 0.05 (5%) significance level.

3.7 Reliability and validity

The reliability and validity of the data used in this research was implicitly implied in the records investigated in this research. Banking performance data used in calculation of financial ratios was obtained from a Bloomberg terminal and WB database through the UCT. The reliability and validity of data collected has been implicitly implied by Bloomberg and WB which are globally accredited sources of financial and economic data.

FinTech firm presence data was obtained through a process of corroborating the existence and establishment date of firms included in Genesis Analytics' (2020) directory with their website and LinkedIn pages. This process was repeated twice to ensure the correct establishment date was obtained. The validity and reliability of this information is however subject to when the company was established.

3.8 Ethical considerations

The researcher tried to use accurate information obtained from the Bloomberg and World Bank databases and different company websites and LinkedIn company profiles without ulterior motive but only for academic purposes.

3.9 Concluding Remarks

This chapter focused on unpacking the relevant philosophical worldview, research design and approaches used in this study. Justification for the positivist worldview, research design and approach were also highlighted. The use of bank specific performance models that contain FinTech an independent variable was also expanded upon and justified. Specifically, the ARDL and the Granger Causality models were discussed in this chapter. The validity and reliability of data collected were also highlighted as well as the ethical aspects of how the research was done.

CHAPTER 4: PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

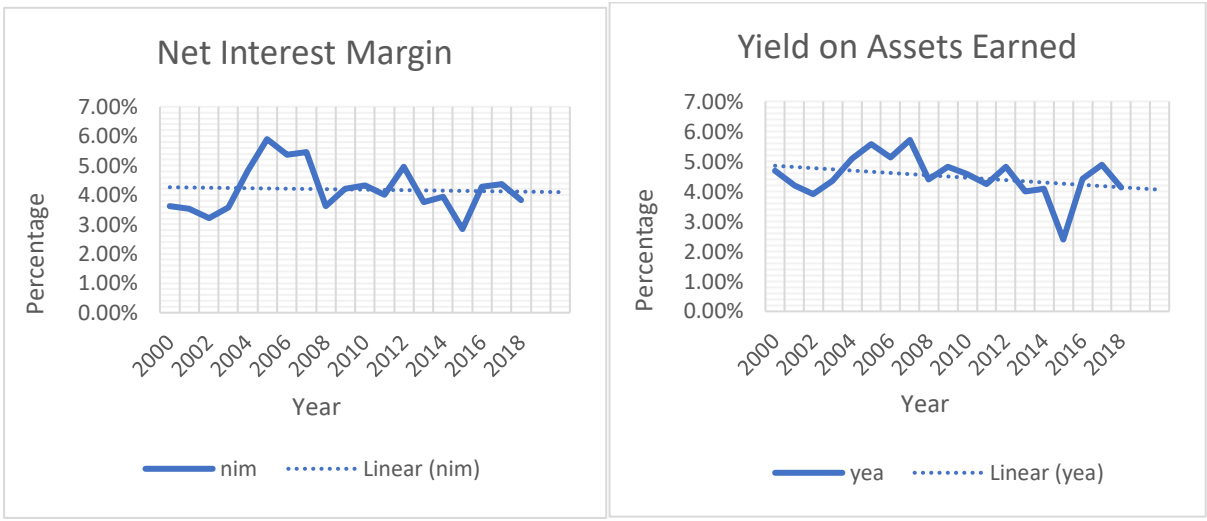
This chapter presents and discussed the research results. The chapter has been sub-divided into two parts, the first comprises of a brief description of the descriptive statistics, summation of the multicollinearity test and unit-root test findings for the variables included in regression analysis. The second part comprises of a presentation and discussion of results of the ARDL and Granger Causality analysis.

4.2 Graphical Analysis

This section outlines the graphical analysis of the variables included in regression analysis in four segments that is banking performance, variable of interest (FinTech), internal control variables and lastly external variables.

4.2.1 Banking Performance

Figure 4.1 shows that the South African banking sector is performing well, and banks are able to turn total assets, shareholder equity, into profits for the period understudy. The graphical trends also highlighted that the RSA banking sector is an emerging market. Additionally, from 2007 to 2009, it has been characterised by a sharp decline in banking performance which is due to the effects of the global financial crisis.



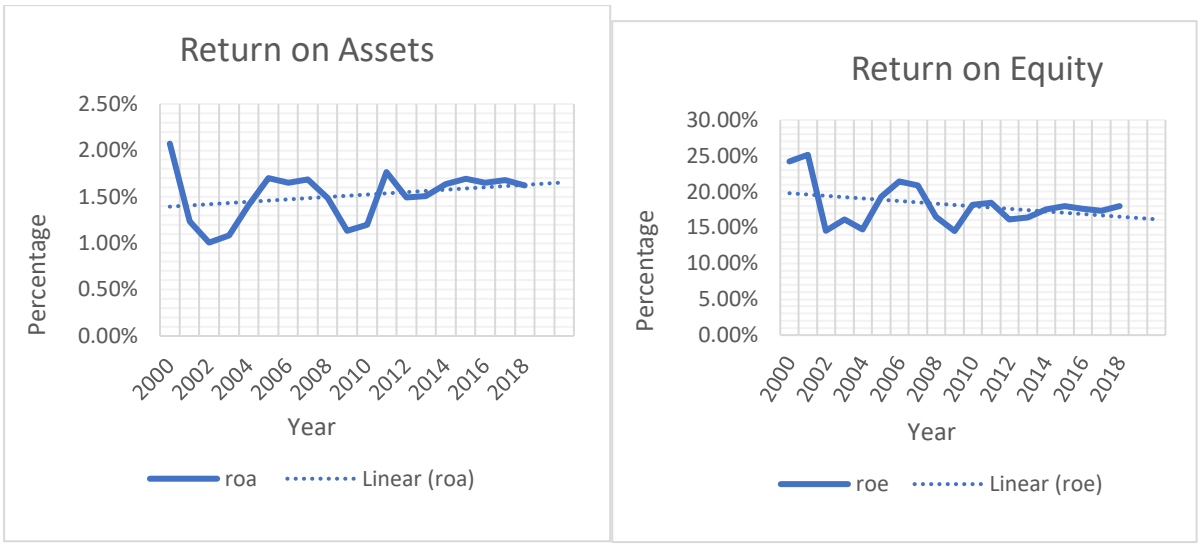


Figure 4. 1: Graph for Banking Sector Performance

Source: Researcher Computation from research data

4.2.2 Financial Technology Firms

The study attempted to understand the potential for a long-run relationship between FinTech and banking sector performance. It analysed the cumulative total FinTech firms in the South African economy during the period under study.

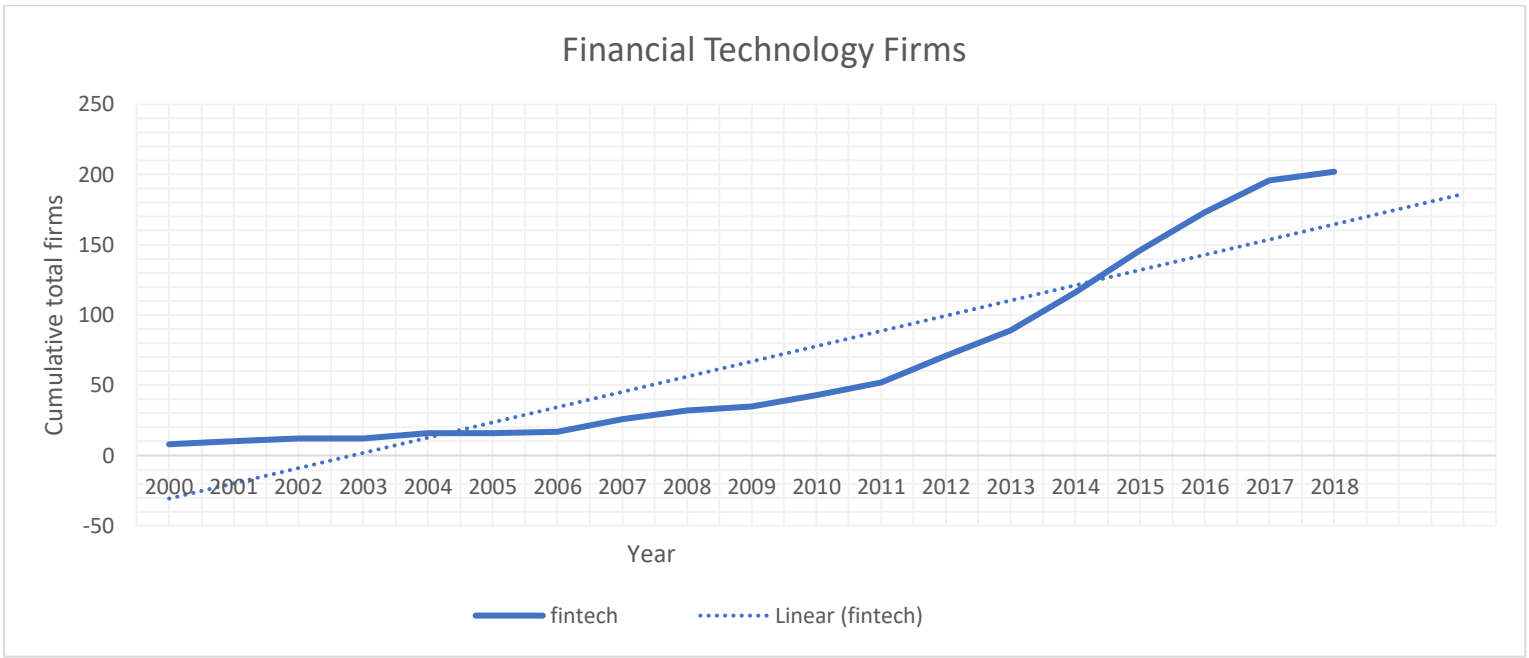


Figure 4. 2*: Graph for Cumulative Financial Technology Firms*

Source: Researcher Computation from research data

As depicted in Figure 4.2 above, the number of FinTechs in RSA are increasing annually with the record high in 2015. The increasing number of FinTech firms in the country suggests that the market is still in its initial stages and there is room for further growth within the sector.

4.2.3 Internal Control Factors

It was also of high importance to examine the trends and behaviour of internal control variables for the period understudy to answer the first and second research questions. Figure 4.3 below indicated that well established banks tend to perform well as they enjoy economies of scale as signified by increase in deposit growth and bank size accompanied by decline in cost to income and loan loss provision.

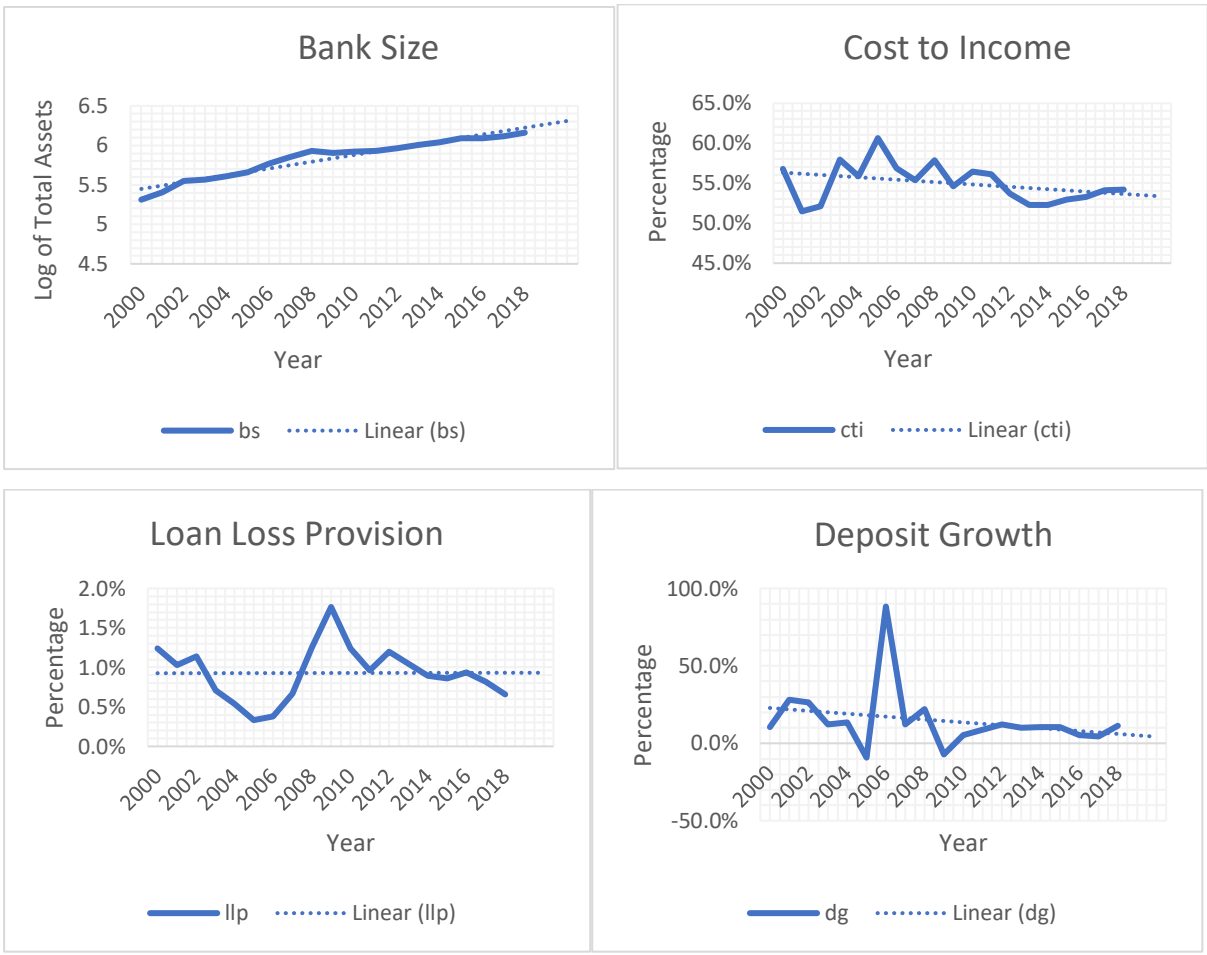


Figure 4. 3*: Graph for Internal Control Factors*

Source: Researcher Computation from research data

4.2.4 External Control Factors

From Figure 4.4 below, it can be noted that there is high fluctuation in inflation rates as measured by consumer price index suggesting policy inconsistency whereas decline in GDP growth (dotted blue line) insinuate that the South African economy is an emerging economy facing stagnating growth.

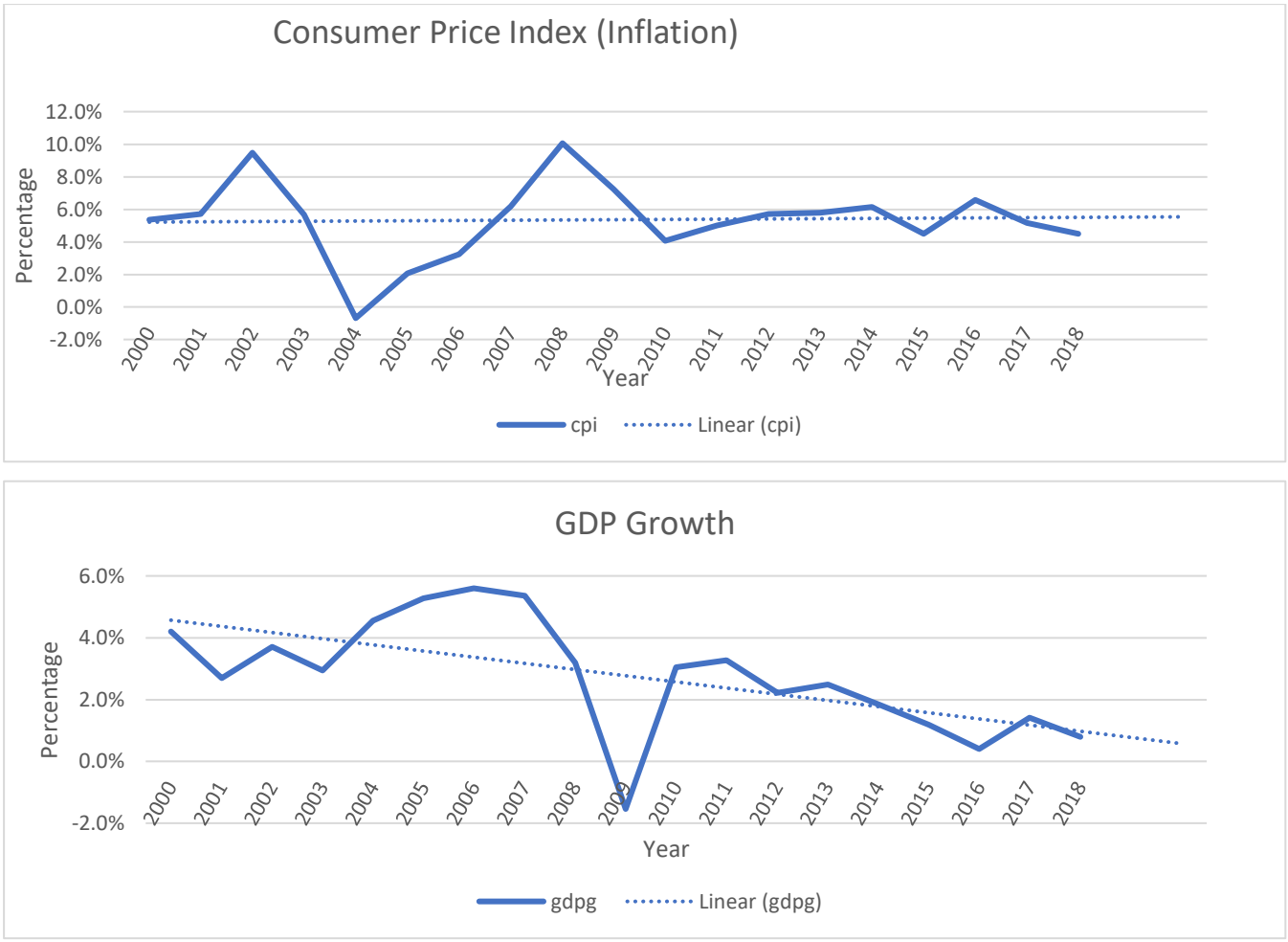


Figure 4. 4: Graph for External Control Factors

Source: Researcher Computation from research data

From the graphical analysis, a snapshot of the characteristics of the data is given necessitating the need for a more detailed analysis through descriptive statistics approach whose results are presented in the forthcoming section of the study.

4.3 Descriptive Statistics

Results of the descriptive statistics for the sampled four RSA top banks covering nineteen-years from 2000 to 2018 are presented in Table 4.1 below. As is depicted, the average NIM over the

period of analysis amongst the observed banks is 4.12% with a standard deviation of 2.15% suggesting that the RSA banking sector has positive interest rate spread indicating banks are turning savings into interest bearing financial products at a profitable rate. The fact that the standard deviation is smaller than the average NIM also indicates that NIM variation among RSA banks is substantial, but not to the point where NIM would go below zero. The same conclusion is reached when observing other measures of banking performance ROA measured as a percentage of total assets, ROE and YEA are 1.48%, 18.27% and 4.56% respectively. This indicates the RSA banking sector has on average been performing well.

In the period understudy, the average number of FinTech firm presence within the market can be rounded up to sixty-seven firms per annum. This is relatively low when comparing to the global presence of FinTech showing that RSA is an emerging market in the context of the sector. Amongst emerging markets within Sub-Sahara Africa, FinTech presence in the country is high showing that the country is an industry leader within the region.

Table 4. 1: Descriptive Statistics Results

	ROA	ROE	NIM	YEA	FINTECH	GDPG	CPI	BS	CTI	DG	LLP
Mean	0.0148	0.1827	0.0412	0.0456	67.4079	0.0274	0.0531	5.8295	0.5480	0.1456	0.0091
Median	0.0137	0.1941	0.0349	0.0367	35.0000	0.0295	0.0568	5.8795	0.5569	0.1026	0.0094
Maximum	0.0402	0.4045	0.1384	0.1152	202.0000	0.0560	0.1006	6.2982	0.8529	1.4496	0.0198
Minimum	-0.0051	-0.0734	0.0000	0.0000	8.0000	-0.0154	-0.0069	5.1994	0.3765	-0.3084	0.0000
Std. Dev.	0.0064	0.0772	0.0215	0.0208	66.3715	0.0184	0.0233	0.2683	0.1038	0.2538	0.00042
Skewness	0.5130	0.0438	2.4747	0.9771	0.9987	-0.3909	-0.3046	-0.4397	0.2629	3.5325	0.2080
Kurtosis	6.2397	4.7033	9.9391	3.4759	2.5152	2.7403	4.1395	2.3961	3.3398	19.3468	3.4591
Obs	76	76	76	76	76	76	76	76	76	76	76

Source: Researchers Calculations using Eviews 9.1

As for bank specific factors, deposit growth within the RSA banking sector is on average 14.56% with a standard deviation of 25.38% per annum. This reflects an extremely high variation in client's savings indicating a high disparity between established and emerging banks. The average cost-to-income ratio across banks is 54.80%, with a standard deviation of 10.38%, indicating an oligopolistic character in RSA banking sector which allows established banks to exercise tight control over their expenses, resulting in stable working capital expenditure. The log of total assets which represents the size of the banks, ranges from 5.199

to 6.298, with a standard deviation of 0.268 and a mean of 5.830, indicating that the banks studied are large and benefit from economies of scale. More so, loan loss provisions amongst banks average 0.91% per annum indicating that the banking sector expects to lose on average ninety-one cents for one hundred Rand, showing low risk client preference within the region

4.4 Correlation Analysis Results

This study adopted the Pairwise Correlation matrix for evaluating the presence of high correlation between the variables understudy (that is, severe multicollinearity). Table 4.2 below results indicate that the variables do not suffer from significant multicollinearity hence all the explanatory variables were included in regression analysis as concurred by Kennedy (2008) who argued that if a correlation value is above a threshold of 0.8.

Table 4. 2: Pairwise Correlation Matrix Results

	ROA	ROE	NIM	YEA	FINTECH	GDPG	CPI	LLP	DG	CTI	BS
ROA	1.0000										
ROE	0.3119	1.0000									
NIM	0.4010	-0.0460	1.0000								
YEA	0.2563	0.3822	0.3822	1.0000							
FINTECH	0.1106	-0.1273	-0.0451	-0.1267	1.0000						
GDPG	0.1250	-0.1254	0.1092	0.0062	0.3703	1.0000					
CPI	-0.0673	-0.1290	0.0314	0.0511	-0.1943	-0.1346	1.0000				
LLP	-0.0708	-0.0463	-0.0004	-0.0612	0.0605	0.0018	-0.1118	1.0000			
DG	0.0146	0.0973	0.0953	0.0747	-0.2243	-0.1666	-0.0163	-0.1410	1.0000		
CTI	0.3177	0.3703	0.2900	0.5011	-0.0965	0.0060	-0.0011	-0.0015	-0.0844	1.0000	
BS	0.2760	-0.1901	0.3131	0.0139	0.4370	0.3780	-0.1884	0.1351	-0.1281	0.1104	1.0000

Source: Researchers Calculations using Eviews 9.1

4.5 Stationarity Test Results

The Levin-Lin-Chu test was utilised to investigate the presence of unit root (stationarity of variables) within the variables of analysis and the Im-Pesaran & Shin test was performed as a corroborative test. The results are reflected in Table 4.3 below.

Table 4. 3: Stationarity Test Results

	Levin-Lin-Chu		Im -Pesaran & Shin		Decision
	Level	**1st Difference**	**Level**	**1st Difference**	
ROA	3.0769	-6.7379***	-0.7716	-2.807***	Stationery after first difference
ROE	-5.1378***	-8.6056***	-6.1020***	-6.395***	Stationery at level
NIM	-2.1018**	-8.5466***	-2.0548**	-5.4742***	Stationery at level
YEA	-2.0646**	-8.5562***	-1.7853**	-5.4546***	Stationery at level
FINTECH	-0.6023	-2.4726***	-0.2272	-1.9405**	Stationery after first difference
GDPG	-2.2651***	-5.4749***	-2.465***	-6.7330***	Stationery at level
CPI	-5.1961***	-9.825***	-3.3092***	-4.7291***	Stationery at level
LLP	-0.3978	-6.9631**	-0.4320	-2.4243**	Stationery after first difference
DG	-2.5475***	-10.1874***	-2.6629***	-5.3867***	Stationery at level
CTI	-0.546	-8.3719***	-0.6821	-3.4988***	Stationery after first difference
BS	-1.9736***	-5.2353***	-3.5508***	-4.7766***	Stationery at level

Source: Researchers Calculations using EViews 9.1

ROA, FinTech, loan loss provision and cost to income were found to be stationary after first differencing thus can be said to exhibit first order stationarity (that is, integrated of order *I(1)*) whilst the remaining variables, ROE, NIM, YEA, GDP growth, inflation rate, deposit growth and bank size were stationary at level (that is, integrated of order *I(0)*). The same conclusions were reached by Im-Pesaran & Shin test for unit root suggesting presence of mixed order of integration (that is, *I (0) & I (1)* variables). All variables under study, hence reflect properties of stationarity required to conduct an ARDL model as it requires data to have level first order stationarity. For this reason, the study proceeded to use ARDL method of analysis.

4.5 Estimated Regression Analysis Results

The ARDL technique as a method of regression analysis was used to evaluate the possible long run relationship between FinTech firm presence and RSA banking sector performances with the results been illustrated in Table 4.4 below. The results are presented column-wise, detailing each of the four banking sector performances measures employed by the study. The ARDL has an inbuilt ability to generate cointegration results through an Error Correction Term (ECM),

short run estimates and long run estimates. However, the study focused on presenting ECM results and the long-run estimates since FinTech bears a long-term effect on banking sector performances.

The ECT entails the speed of adjustment at which short run dynamics converge to the long run path in the model. The coefficient for the error correction term, *ECT*, estimated at -0.8662 for ROA, -0.9586 for ROE, -0.6601 for NIM, and -0.4644 for YEA signify presence of cointegration within the variables included in regression analysis as indicated by statistical significance as well as the negative sign of the error correction term. The coefficient value of the ECT indicates that a percentage of disequilibrium in bank performances caused by previous year shocks is offset by the short run estimates in the current year.

As for the bank specific factors, all the control variables with the exception of BS and DG were seen to be highly significant having a 1% level of significance in determining ROA and YEA. BS and DG are not significant in determining ROE and ROA, respectively. These significance levels are moderately different from the level of significant bank specific factors have in determining NIM and ROE where the majority of independent variables are significant at a 1% level. The results further review that both bank size and deposit growth have a positive impact on bank performances. Large-sized banks are set to gain from greater operational efficiency and enjoy greater diversification with respect to financial products, services and loans as compared to small banks (Phan *et al*., 2020; Pasiouras & Kosmidou, 2007). Djalilov and Piesse (2016) argue that large banks reduce their level of risk by diversifying their products and services, which contributes to higher operational efficiency and profitability as found out in the study.

Additionally, the negative coefficient of cost to income (CTI) implies better performance is still being obtained from high bank cost efficiency thereby positively impacting bank performances. The inverse relationship is recognised in earlier empirical studies such as Dietrich and Wanzenried (2014), Athanasoglou *et al*. (2008). Athanasoglou *et al*. (2008), Sufian (2009), and Dietrich and Wanzenried (2014) who suggest that increased exposure to credit risk is associated with decreased bank profitability, as bad loans are expected to reduce profitability. This further explains the inverse relationship between loan loss provision and bank performances as higher provisions signify more risk being absorbed by financial institutes and likelihood of bad debts being incurred. Phan *et al*. (2020) study of the FinTech and banking relationship in Indonesia had varying levels of significance amongst dependant variables with bank size, similarly not

been significant in determination of ROE whilst deposit growth was significant to the 10% level.

This study also factored in the role of macroeconomic variables as determinants of bank performances, inflation (CPI) and GDP growth, as external control variables. The results of the study reveal that a negative relationship exists between banking sector performances and inflation throughout all the measures of banking performance. The negative relationship was highly significant for dependent variables. This is so because the impact of inflation on bank profits depends on whether the rate of increase in inflation outweighs that of operating expenses or not (Phan *et al*., 2020). Therefore, the reasons behind the negative relationship might be because RSA banks are failing to adjust interest rates thereby heartening costs compared to revenue as a result of unanticipated inflation. As for GDP growth, this affects bank performances through the business cycle. A significant positive relationship exists between GDP growth and bank profitability throughout all the indicators of bank performances. During the times of economic booms, loan portfolio quality improves leading to credit gains, which in turn encourages bank performance. Dietrich and Wanzenried (2014) argue that profits are more likely to be pro-cyclical given that economic growth influences banking sector performances through lending activity as supported by Albertazzi & Gambacorta (2009).

With respect to presence of FinTech, the results highlight that a positive and highly significant relationship exists between its presence and RSA banking performances. The level of significance and effect of FinTech has on performance differs according to the measure of performance. FinTech is significant at 1% level in determining ROA, ROE and YEA whilst NIM seen to be significant only at a 10% level. These findings oppose those of Nkosi (2018) who found an insignificant relationship between banking in RSA and FinTech start-ups in the country. This, therefore suggests that the presence of FinTech does in fact contribute to banking performances. The study can reject the null hypothesis for the first objective as FinTech was a significant determinant of three out of four measures of banking performances

A negative coefficient of -21.30% in determining ROE shows that FinTech firm presence has a negative effect on the net profit per Rand contribution of equity holder in the RSA banking sector in the long run. This finding is aligned with that of Phan *et al*. (2020) which found a negative relationship between all measures of banking performance and FinTech firm presence in Indonesia. This study however, discovered the opposite with respect to ROA, YEA and NIM's relationship with FinTech coefficient of variation been shown to be 1.10%, 1.08% and

2.62%, respectively. These suggest that internal banking performances have in fact improved as the presence of FinTech increases.

Table 4. 4: ARDL Long Run Estimates Results

	ROA	ROE	NIM	YEA
ECT	-0.8662***	-0.9586**	-0.6601***	-0.4644**
	(0.3089)	*(0.4547)*	*(0.2086)*	*(0.2049)*
FINTECH	0.0110***	-0.2130***	0.0108*	0.0262***
	(0.0039)	*(0.0511)*	*(0.0059)*	*(0.0057)*
GDPG	0.0184***	0.0253***	0.0227**	0.0149***
	(0.0037)	*(0.0021)*	*(0.0093)*	*(0.0027)*
CPI	-0.0054***	-0.0038**	-0.0016***	-0.0085***
	(0.0020)	*(0.0018)*	*(0.0005)*	*(0.0012)*
BS	0.0242***	0.0392	0.0110***	0.0130***
	(0.0089)	*(0.0241)*	*(0.0036)*	*(0.0024)*
CTI	-0.0262***	-0.0345***	-0.0198***	-0.0296***
	(0.0093)	*(0.0059)*	*(0.0059)*	*(0.0042)*
DG	0.0102	0.0132***	0.0194***	0.0182***
	(0.0092)	*(0.0012)*	*(0.0051)*	*(0.0040)*
LLP	-0.5589***	-0.3921***	-0.1119***	-0.3387***
	(0.1884)	*(0.1214)*	*(0.0149)*	*(0.1146)*

Source: Researchers Calculations using EViews 9.1; *** ** (*) denote significance at 1%, 5% & 10% level respectively, in parenthesis are the standard errors

Table 4.5 below shows the results of the ADRL analysis with the inclusion of an interaction term between FinTech and bank size. In terms of control variables, deposit growth was seen to not be significant to a model for predicting ROE, whilst GDP was also seen to not be a significant variable of analysis when predicting NIM. With the exception of these two cases all other variables were seen to be significant in predicting ROA, ROE, YEA and NIM. The interaction term is seen to have a positive influence on ROA, ROE, and NIM suggesting that the influence of FinTech on bank performance varies with the size of the bank. YEA are influenced negatively by this interaction. This means that banks are making less interest income for the earnings assets on their books showing how RSA banks take advantage of their size to compete with firms trying to encroach on their core business activities. This, however, translates to a positive NIM influence which indicates higher net income from core activities implying that banks are offering depositors lower returns on their funds. This is possible due to the tight grip large established banks have on banking in the country as they service over 90% of the corporate and retail banking populous in RSA (MarketLine, 2021).

From Table 4.5 below, FinTech has a positive coefficient of variation with respect to determining ROE, whilst a negative coefficient of variation was observed with respect to NIM. This is different from results in Table 4.4 above. NIM had a positive coefficient and ROE had a negative coefficient. These results are materially different from those of Phan *et al*. (2020). FinTech's significance to predicting NIM additionally, improved from 10% to 5%. The hypothesis of being accepted was that the FINBS variable be significant at a 5% level for the set determinates of banking performances. All variables in this study can reject the null hypothesis as interaction between FinTech and bank size has a significant relationship with bank performances. The coefficient of variation aligns with FinTech for predicting ROE is 23.98% and is thus most influenced measure of performance by its presence. The direction of influence is different from that which was shown in Table 4.4 above. FinTech had a negative influence on banks prior to taking into consideration how the interaction between bank size and its presence would help productivity of banking assets.

The results align to those of Kana (2017) who postulates that bank size is an influence on banking profitability though the direction of influence after interaction is positive as seen by the inclusion of the interaction term (FINBS) for ROA, ROE and NIM. This research's findings suggest that banks are figuring out how to leverage their size and the innovation brought about by FinTech firms to increase asset efficiency and profitability, converting this productivity into returns for their equity holders. This is usually accomplished by collaborating with FinTech providers who complement the services provided by banks, or by implementing similar business models to run concurrently with existing established business models. This practice is not new to well-established banks, which have previously been seen to adapt to modern technologies such as implementation of online data bases with their services, ATMs, and credit card systems within the banking and financial services sectors in order to solidify their position in the sector. Such a finding speaks to those of Arner, Barberis and Buckley, 2015) who conceptualised that FinTech development is the third phase of a technological evolution within the banking sector adding on to the already existing way banks operate than replacing the banking system completely.

As the country's FinTech presence grows, this study's findings suggest that banks are likely to decongest their balance sheets from brick-and-mortar assets to adapt new mobile and internet assets that are more cost-effective. This is similar to what has been seen in China, where banks that embrace technological progressions brought about by FinTech perform better (Lee, et al.,

2021). The scholars' conclusion is backed by the fact that as the interaction between FinTech firms and the size of banks increases, banks become more efficient internally which translate to better equity holders' return in the long-term.

Table 4. 5: Interaction Results

	ROA	ROE	NIM	YEA
ECM	-0.8326***	-0.8834***	-0.5917***	-0.5213**
	(0.1107)	*(0.0966)*	*(0.1371)*	*(0.2032)*
FINTECH	0.0149***	0.2398***	-0.0131**	0.0195***
	(0.0018)	*(0.0234)*	*(0.0059)*	*(0.0033)*
FINBS	0.0247***	0.0288***	0.0199**	-0.0233***
	(0.0028)	*(0.0049)*	*(0.0078)*	*(0.0052)*
GDPG	0.0165***	0.0267***	0.014110	0.0305***
	(0.0015)	*(0.0058)*	*(0.0018)*	*(0.0030)*
CPI	-0.0051***	-0.0039**	-0.0029**	-0.0022**
	(0.0004)	*(0.0015)*	*(0.0013)*	*(0.0009)*
BS	0.0204***	0.0370**	0.0155**	0.0147***
	(0.0027)	*(0.0131)*	*(0.0067)*	*(0.0050)*
CTI	-0.0587***	-0.0032***	-0.0209***	-0.0197**
	(0.0039)	*(0.0011)*	*(0.0082)*	*(0.0090)*
DG	0.0076***	0.0107	0.0167***	0.0197***
	(0.0003)	*(0.0024)*	*(0.0037)*	*(0.0071)*
LLP	-0.4509***	-0.4010***	-0.1304***	-0.3534***
	(0.0176)	*(0.0517)*	*(0.0193)*	*(0.1180)*

Source: Researchers Calculations using Eviews 9.1; *** ** (*) denote significance at 1%, 5% & 10% level respectively, in parenthesis are the standard errors

4.6 Granger Causality Analysis Results

In providing answers to the third and final question, the Granger test was utilised. The Granger Causality test results showed that FinTech does not granger cause banking sector performance for all our performance indicators suggesting that its presence cannot be used to determine the future performances of the banking sector as represented by Table 4.6 below. This is likely due to coming up of new markets, the introduction of FinTech has brought to the banking industry such as low-cost ways to perform small scale transactions and new models of lending.

Table 4.6: Granger Causality Test Results

Null Hypothesis:	F-Statistic	Decision
FINTECH does not Granger Cause ROA	1.7923	Do not reject null hypothesis
ROA does not Granger Cause FINTECH	0.0337	Do not reject null hypothesis
FINTECH does not Granger Cause ROE	0.0126	Do not reject null hypothesis
ROE does not Granger Cause FINTECH	0.0125	Do not reject null hypothesis
FINTECH does not Granger Cause NIM	0.7398	Do not reject null hypothesis
NIM does not Granger Cause FINTECH	0.0767	Do not reject null hypothesis
FINTECH does not Granger Cause YEA	0.4882	Do not reject null hypothesis
YEA does not Granger Cause FINTECH	0.5256	Do not reject null hypothesis

Source: Researcher Calculations * ** (***) reflects statistical significance at 1%, 5% & 10%

4.7. Concluding Remarks

This chapter discussed the research findings. The chapter outlined that there is a significant relationship between FinTech and banking performances which is magnified upon by including an interaction term between bank size and FinTech. In this regard, ARDL model were used to ascertain the possibility of a link in the long run between FinTech and the banking sector performance. FinTech, however does granger cause banking performances.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter gives the research conclusions and policy recommendations in line with the findings. It also gives suggestions as to what future research should be conducted.

5.2 Summary of Study and Conclusions

The primary objective of the research was to examine the potential of the long-run relationship between FinTech firms' presence on RSA banking sector covering a nineteen-year period from 2000 to 2018 employing ARDL and Granger Causality approaches. The study used financial data sourced from Bloomberg terminal, macro-economic data sourced from World Development Indicators and FinTech firm data sourced from Genesis Analytics research for review purposes. The dependent variables that represented banking performance were ROA, ROE, NIM, and YEA, whilst cumulative total FinTech firms was employed as a proxy for FinTech and the following control variables, cost to income, loan loss provision, bank size, deposit growth, inflation, and GDP growth.

This study highlighted that FinTech firm presence does not granger cause banking performance but is significantly positively related to banking sector performances in RSA This suggests that RSA banking sector performance may improve as FinTech firms' presence increase which aligns with the positive side of Beck *et al*. (2016) innovation-fragility debate in that innovation in the financial sector leads to more efficient banking. The study findings additionally align itself well with Vives' (2017) concept that application of new FinTech techniques in banking could result in lowering of the cost of banking and impact products provided to consumers thereby improving banking sector performance. The study also found that a model built with the interaction between bank size and FinTech firm presence is a better predictor of banking returns than one that does not consider the interaction between bank size and FinTech in RSA However due to the results produced by the Granger Causality analysis, the designed model is not an ideal for predicting future returns.

Furthermore, the research indicates that banks are evolving with the industry choosing to also adopt FinTech within their operations to improve internal efficiency and give better returns to equity holder. Such behaviour is enabled by the large nature of the top four banks in the country thus likely lead to well established banks coming out of this third phase of the banking evolution

even stronger. Additionally, increased FinTech firm presence has been seen to contribute negatively to NIMs suggesting banks are competing with new FinTechs through maintaining tight interest rate spreads to appear more attractive to clients. This implies that banks are not going out to riskier markets to bolster up NIMs leaving FinTech firms to seek returns in these riskier markets.

5.3 Recommendations

The study recommends that the South African government should set a policy that encourages financial technology firms' presence to encourage banks to perform their role more efficiently. The importance of an efficient banking system can never be understated given that the depth of the banking sector is complementary to industrial development in the country. Such a policy will also encourage FinTechs to reach areas where there is little access to credit and banking thus encourage establishment of necessary industries in these areas. Given the thinning out of NIMs government may want to investigate quality of loans issued out by both FinTechs and well-established banks to ensure no reckless lending is taking place as the dark side of FinTech firms presence is that companies tend to take more risk to gain market share.

FinTechs are likely to bring about change in areas that assist banks operate more efficiently as banks will likely buy-out clients or work with them to improve performance. Those who have been holding long positions within large banks will likely, still, see returns affected positively, assuming economic fundamentals in RSA complement operations. This is likely to leave established banks in an even more commanding position given their size. As for those invested in FinTechs are likely to be more productive in sections of the population that are considered higher risk as banks tend to shy away from these areas due to stricter regulation post the 2008 financial crisis in RSA

Further Research

- Further research may be required to investigate the impact of FinTech firms' presence on banking sector performances considering their heterogeneity.
- Further studies may also be necessary to examine whether FinTech firms' presence has a positive bearing on performance of small banks in RSA
- Further research can be done to investigate the effect of FinTech firm presence on transaction costs in RSA

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