

**The value of economic capital as an indicator to
protect prospective and existing ordinary
shareholders**

Tendai Day Chonzi

G14C6083

A thesis is submitted in the fulfilment of the
requirements of the degree of **Master of Commerce**
(Financial Markets) (Half Thesis)

In the Department of Economics and Economic History

Rhodes University

Supervisors: Mr Daniel Mokatsanyane

Dr Sibanisezwe Khumalo

December 2019

Abstract

South African banking sector is one of the most dominating banking sectors in Africa. The banking sector is privately owned and involves a lot of different stakeholders, who risk losing their investments. One of the stakeholders who are the bottom of the repayment chain are existing ordinary shareholders because they risk losing all their investment in the result of bankruptcy, liquidity crises or the inability of the bank to repay their shareholders. Regulators in the banking sector only protect the depositor and the stability of the banking sector but not ordinary shareholders. An internal supervisory measure called economic capital has recently received more attention because of its aim to protect ordinary shareholders and thus, existing and prospective shareholders can use its value as a protective indicator.

Economic theory assumes that the higher the value of economic capital (the lower the economic capital shortfall), the lower the return on investment for existing ordinary shareholders. The aforementioned shows a trade-off between protection (economic capital) and returns. Literature by Larsson (2009) further suggests that banks are always reluctant with implementing internal measures to protect themselves because of the good regulatory regime in the sector, some banks think that they are “too big to fail” and the fact that the reserve banks are always on the standby as a bailout.

The purpose of this research is to examine which of the top five commercial banks in South African actively protect their existing ordinary shareholders using the value of economic capital and possibly attract prospective ordinary shareholders, locally and internationally. The banks under study are Absa, Capitec, FirstRand, Nedbank and Standard Bank over ten years, starting from June 2009 to May 2019 and in monthly frequency. The observations totalled 120 and two models that are under the Return Series Method were in used, namely; Historical Simulation Model and Variance Covariance Model.

Both models, although they were small deviations in the value of economic capital, concluded that Standard Bank protects its existing ordinary shareholders the most, followed by FirstRand, then Absa and last is Nedbank. Capitec was the only bank, after one financial shock that could not protect its existing ordinary shareholders. Moreover, evidence in the study shows a trade-off between economic capital and return on investment in the case of Capitec and Standard Bank. Standard Bank had the highest value of economic capital and second-lowest return on investment, while Capitec had the highest return on investment and lowest value of economic capital.

The significant policy implication of the research is that financial institution needs to strike a balance between protection and profits; thus, a way of protecting various stakeholders. Financial shocks have proven that regulatory measures are weak and they are in need for internal measures (economic capital) which indicate how financial institution can sustain in such cases.

Plagiarism Declaration

I **Tendai Day Chonzi student number (g14c6083)**. Hereby declare that this dissertation is my original work that all the references and citations used have been acknowledged and it has been in partial fulfilment for the degree of Masters of Commerce in Financial Markets at Rhodes University and that it will not be presented at any other colleges, business schools and universities for a similar or any other degree.



.....

Mr Tendai Day Chonzi

10 / March / 2020

Date

Acknowledgments

To my supervisor, Mr D. Mokatsanyane and Dr S. Khumalo, I would like to thank you for being great mentors, for sharing your knowledge and understanding. Your unwavering guidance, support, reassurance and constant motivation is greatly appreciated. Your point of view helped me to understand my research purpose, context, goal, paradigm and design.

Mr D Tarentaal, thank you for your constant support, encouragement and reassurance that you gave me whenever I felt overwhelmed. You were always available to lend a hand whenever I needed you. Thank you.

My dearest parents, Mr B. Chonzi and Mrs I. Chonzi, thank you for your constant emotional support, your love, your financial support and understanding. Thank you for always giving me advice and for being available to lend an ear whenever I needed it. I will forever be indebted and I am extremely grateful for all that you have done for me.

My siblings Ms J. Chonzi, Mrs C. Gorajena, Mr P. Chonzi, Ms P. Chonzi, Mr S. Chonzi and Mr T. Chuma thank you for the encouragement, advice, financial support, guidance, love and for your present in my life. I can never ask for better siblings, thank you.

Ms N. Mungoshi, Mr C. Watama, Mr T. Sanyanga, Mr T. Nyakonda, Mr M. Bwerinofa, Mr D. Mutede, Ms Y. Moyo, Ms R. Nxele and Mr S. Mutede, thank you for your encouragement, continuous advice, proof reading and for your constructive criticisms. I greatly appreciate it.

Above all, I would like to thank the Almighty God. Without you nothing would have been possible. Thank you for blessing me abundantly and providing me with this opportunity and allowing me to see it through even when it got tough in the pursuit for my Master of Commerce in Financial Markets Degree

Table of Contents

ABSTRACT	i
PLAGIARISM DECLARATION	iii
ACKNOWLEDGMENTS	iv
TABLE OF CONTEXT	v
LIST OF ACRONYMS	vii
LIST OF FIGURES	ix
LIST OF TABLES	x
CHAPTER 1: INTRODUCTION	1
1.1 Background	1
1.2 Problem statement	2
1.3 The Significance of the Study	4
1.4 Objectives	5
1.5 Methods, Procedures and Techniques	6
1.6 Outline of the Study	7
1.7 Ethical Considerations	7
CHAPTER 2: THE OVERVIEW OF THE BANKING SECTOR	8
2.1 Introduction	8
2.2 Debates and Acts	8
2.3 Banking Sector Trends	10
2.4 Top Five Banks' Trends	15
2.5 Bank Prices and Shares	17
2.5 Conclusion	20
CHAPTER 3: LITERATURE REVIEW	21
3.1 Introduction	21
3.2 Regulatory Capital	21
3.3 Economic Capital	24
3.4 Empirical Evidence	32

3.5 Conclusion	36
CHAPTER 4: METHOD, PROCEDURES AND TECHNIQUES	38
4.1 Introduction	38
4.2 Research Paradigm	38
4.3 Research Design	40
4.4 Conclusion	49
CHAPTER 5: RESULTS	50
5.1 Introduction	50
5.2 Diagnostic Test (Historical Simulation)	50
5.3 Diagnostic Test (Variance Covariance)	58
5.4 Financial Ratio Analysis	63
5.5 Other Banks Cases	64
5.6 Conclusion	66
CHAPTER 6: CONCLUSION AND RECOMMENDATION	69
6.1 Introduction	69
6.2 Key Findings	69
6.3 Recommendation	71
REFERENCE LIST	73

List of Acronyms

ABSA	Amalgamated Banks of South Africa
BCBS	Basel Committee on Banking Supervision
BUSA	The Business Unity of South Africa
CAMEL	Capital adequacy, Asset quality, Management, Earnings and Liquidity
CAR	Capital Adequacy ratio
COSATU	The Congress of South African Trade Unions
EC	Economic Capital
ECS	Economic Capital Shortfall
EL	Expect loss
FRA	Financial Ratio Analysis
FSCA	Financial Sector Conduct Authority
FSR	Financial Sector Act
HHI	Herfindahl Hirschman Index
HSBC	Hong Kong and Shanghai Banking Corporation
ICCAAP	Internal Capital Adequacy Process
ING	International Netherlands Group
JSE	Johannesburg Stock Exchange
NEDLAC	The National Economic Development and Labour Council
PA	Prudential Authority
PBR	Price to Book Ratio
PE	Price Earning Ratio
PI	Probability of Intervention

ROA	Return on Assets
ROE	Return on Equity
SARB	South African Reserve Bank
SEB	Scandinavian Individual Bank
TP	Turns of Protection
UBS	Union Bank of Switzerland
UL	Unexpected Loss
VAR	Value at Risk

List of Figures

Figure 2.1	Banking Sector Total Assets and Gross Loans	12
Figure 2.2	Banking Sector Total Assets	12
Figure 2.3	Quarterly Employment Statistics of the South African Banking Sector	13
Figure 2.4	The Herfindahl-Hirschman Index	14
Figure 2.5	Top Five Banks Market Share	16
Figure 2.6	Top Four Banks Market Share	17
Figure 2.7	Banks Share Prices	18
Figure 3.1	The Three Pillars of the Basel II	22
Figure 3.2	The Three Pillars of Basel III	23
Figure 3.3	The Loss Distribution	29
Figure 4.1	Historical Simulation Model	43
Figure 4.2	Variance Covariance Model	46
Figure 5.1a	Absa's Frequency and Cumulative Distribution	51
Figure 5.1b	Capitec's Frequency and Cumulative Distribution	51
Figure 5.1c	FirstRand's Frequency and Cumulative Distribution	52
Figure 5.1d	Nedbank's Frequency and Cumulative Distribution	52
Figure 5.1e	Standard Bank's Frequency and Cumulative Distribution	52
Figure 5.2	Worst Percentage Change in Shareholders' Equity	53
Figure 5.3	Worst Absolute Change in Shareholders' Equity as at 31 May 2019	53
Figure 5.4	Worst Absolute Change in Shareholders' Equity as at 31 December 2018	54
Figure 5.5	Tier 1 Capital, Required Tier 1 Capital and Excess Tier 1 Capital as at 31 December 2018	55
Figure 5.6	The Turns of Protection of the Top 5 Commercial Banks	56

Figure 5.7	Banks Shareholders' Equity Volatility from 31 June 2009 - 31 May 2019	58
Figure 5.8	The Distance to Intervention Threshold for the Top 5 Commercial Banks	59
Figure 5.9	The Probability of Intervention	60
Figure 5.10	The Distance to Threshold and Economic Capital Shortfall for the Five Commercial Banks	62

List of Tables

Table 2.1	Other South African Banking Acts	9
Table 2.2	Types of Banks in the South African Banking Sector	10
Table 2.3	Descriptive Statistics of the Top 5 Commercial Banks Shares	19
Table 3.1	Economic Capital for a sample of International Banks	33
Table 3.2	International Banks in South Africa and Economic Capital Shortfall	35
Table 5.1	The Rate of Change in Shareholders' Equity	50
Table 5.2	The Odds of Worst-Case Turn	56
Table 5.3	Economic Capital Shortfall using Historical Simulation Model	57
Table 5.4	Target Turns	57
Table 5.5	Economic Capital Shortfall using Variance Covariance Model	61
Table 5.6	Economic Capital at Various Confidence Intervals	63
Table 5.7	Financial Ratio for the Top Five Banks	64
Table 5.8	Economic Capital for the two models	66

Chapter 1. Introduction

1.1 Background

Endless shocks in the financial sector have left shareholders and prospective shareholders looking for additional indicators that they can use when deciding on which bank to invest (Inman, 2019). According to JSE (2017) and Wall Street (2014), there are two types of shares, namely ordinary shares and preference share. Ordinary (or common) shares holders only receive dividends after preference shareholders receive their share of profit and because of that, their rate of dividend varies. On the other hand, preference shareholders receive some fixed amount of dividend, but only after taxes, working expenses and interests have been paid (JSE, 2017). In the event of a loss, even the preferred shareholders do not get any dividend (JSE, 2017). According to Pearson (2013), the owners of shares are entitled to five fundamental rights, which include the right to vote, sell shares, right to receive the dividend, right to pre-emption and the right to liquidation. It is evident that ordinary shareholders receive their remunerations last and they deserve to invest in a company with higher economic capital for their protection (Pearson, 2013; Farid, 2015).

Ordinary shareholders are the worst affected shareholder group based on the hierarchical structure of share pay-outs, they are the last ones to receive a pay-out (Larsson, 2009; Farid, 2015 and Kaylene, 2016). There is, therefore, a need for them to know how long their business entity can withstand both anticipated and unanticipated shocks in the financial sector. Financial shocks can be on a macro or micro level and they can come in different forms. Macro-level financial shocks tend to have a ripple effect the financial globe (Kaylene, 2016). A well-known macro-level shock emanates from a poorly regulatory structured system, for example, a Basel II measure to give mortgage loans based on credit rating which resulted in The Lehman brothers giving numerous subprime-related loans, triggering the 2008 Global financial crisis (Wall Street, 2014). On a micro-level, these shocks emanate from poor management and improper accounting to liquidity management problems (Tjiane, 2015). An example can be the current issues with the collapsing of the Deutsche Bank, as stated by Deutsche Bank (2019) and Elliott (2019) and the reasons behind the curatorship of the Africa Bank in South Africa in 2015 (Tjiane, 2015).

1.2 Problem Statement

Initiatives such as increasing leverage ratios, price to earning, price to book and decreasing market value of common equity to assets are indicators that are pointing towards increased riskiness behaviour of banks, synonymous with pre-crisis period actions. However, these indicators have not always been good, yet potential ordinary shareholders and existing ordinary shareholders still rely on these financial ratios when making an investment decision (Sarin and Summers (2018)). Ordinary shareholders have also collectively used capital adequacy, asset quality, management, earnings and liquidity (CAMEL) as a model of evaluating bank performance (Ifeacho and Ngalawa, 2014). Elton et al. (2014) cite that in the case of investing in a bank, ordinary shareholders and potential shareholders should look specifically at the price to book ratio. In an article by Hendrick (2014), before Goldman Sachs invests in a company, it looks at the market for the product or service, defensive barriers, the growth opportunities of the company and the management team. Ordinary shareholders should know the business model, competitive advantages opportunities, revenue streams, profit margins, price to earnings ratio and net income. Furthermore, the price to earnings ratio is a valuing investing approach that Warren Buffett uses and it has been wildly successful Hudspeth (2018). The ways mentioned above have proven to be successful, but economic capital has various advantages over these methods.

A recently developed indicator that can be used to protect ordinary shareholders or help them make a more informed decision is the concept of economic capital (Greenspan, 2007; Fiordelisi and Molyneux, 2010; Farid, 2015 and Kaylene, 2016). Economic capital, as defined by Al Janabi (2011), is the minimum amount of equity capital a financial business or entity needs to set aside to absorb worst losses with a certain confidence level over a specified time horizon. Cartwright (2009) cites that economic capital is sufficient surplus, which covers a given risk tolerance level at a specified time against potential losses over a given time horizon. Basel Committee (2003) defines economic capital as a method that attempts to assess the amount of capital needed to support a given set of business activities or risks. These business activities include investing in bonds, long term debt, equity and tangible equity. Moreover, Kaylene (2016), defines economic capital as the amount of capital a bank should hold to absorb significant unexpected losses from a portfolio over one year at a given confidence level $\alpha\%$. Although economic capital is of importance since it is an internal measure, it is not restricted by regulations. However, it is closely linked to regulatory capital due to the identical elements used in the calculation of regulatory capital that is also used in economic capital.

According to Larsson (2009), regulatory capital is capital required by the state to protect the banking system and depositors. Larsson (2009); Kaylene (2016); Li et al. (2018) and Majumder and Li (2018) all agree that regulatory capital takes into account credit risk, operational risk and market risk. One major similarity between regulatory capital and economic capital is the fact that they both take into account operational risk, credit risk and market risk in their calculation (Kaylene, 2016). However, there are more differences between regulatory capital and economic capital than similarities. Some of the differences include; Firstly, according to Larsson (2009) economic capital is internally supervised while regulatory capital is externally supervised. Secondly, economic capital is considered to be pillar 2 (Supervisory Review Process) and regulatory capital is considered to be pillar 1 (Minimum Capital Requirements) (Achterberg and Heintz, 2010). Thirdly, on the top of the Larsson (2009) and Kaylene (2016) states that economic capital included diversifying risk and business risk, while regulatory capital only included life risk. Lastly, according to Larsson (2009) and Achterberg and Heintz (2010) regulatory capital is aimed at reducing the effect of another financial crises or preventing the crisis while Larsson (2009) and Kaylene (2016) believe that the economic capital is aimed at protecting ordinary shareholders as they are the worst affect stakeholder in the case of business liquidation or bankruptcy. The concept of economic capital can be used by ordinary shareholders to give them an approximation of the loss bearing capacity of the financial institute (Farid, 2015).

According to Larsson (2009), a higher amount of economic capital is needed to protect ordinary shareholders, but this means that there are lower diversification effects, a higher correlation between risks and fewer returns. Larsson (2009) further adds that, while it is of great importance for a financial institution to protect its ordinary shareholders from insolvency, maintaining little economic capital enables investment of capital at a higher rate of return. There tend to be a trade-off between economic capital and return and banks should aim to strike a balance between economic capital and the rate of return. A favourable economic capital is a positive or negative economic capital shortfall and prospective ordinary shareholders who value protection should invest in such a bank while existing ordinary shareholders who are already invested in the banks should stay invested (Farid, 2015). The opposite true; however, when existing ordinary shareholders are pulling out, they should do it in an orderly manner because a run to the exit, which is chaotic and disorderly, tends to start another financial shock (Farid, 2015).

Using the value of economic capital as an indicator for shareholder protection is advantageous because firstly, economic capital is a tailor-made protective concept that is specifically aimed at one specific stakeholder (existing ordinary shareholders) (Farid, 2015 and Kaylene, 2016). Secondly, economic capital incorporates more than one of the aforementioned methods of valuation. For example, when calculating economic capital, one makes use of financial statements and ratios (Larsson, 2009; Farid, 2015; Kaylene, 2016 and Majumder and Li, 2018). Thirdly, economic capital can be seen as a defensive barrier because it estimates the worst-case scenario; thus, it is an underestimate rather than to overestimate (Kaylene, 2016). Lastly, economic capital is a mathematical method. It is not subjected to as much subjectivity as with the case of trying to invest based on a business model or management team (Farid, 2015).

Farid (2015) states that an alternative method of calculating economic capital to the copula method is the return series methodology. According to Cherubini et al. (2005) and Semenov and Smagulov (2017) copulas are potent frameworks for modelling dependence between risky assets by generalising linear correlation. There are other methods of calculating economic capital which include formulating risk equation as stated by Majumder and Li (2018), using the copula method and leverage ratios as stated by Farid (2015) and Semenov and Smagulov (2017) and methodologies such as scenario analysis, regression analysis, Monte Carlo Simulation analysis as stated by Kaylene (2016). However, Basel Committee (2003); Admati et al. (2013); Kaylene (2016) and Li et al. (2018) all agree that the return series methodology is a more simplified, more visual expressing and easier way of calculating economic capital.

1.3 The significance of the study

Much has been written on ordinary shareholder protection methods, efficiency and performance indicators, which can assist in making an investment decision. Nonetheless, the research is of great significance for several reasons. Firstly, literature regarding economic capital as a measure for shareholders' investment decisions is still scarce, especially for South Africa. Furthermore, no studies have been done on the top five commercial banks in South Africa that use economic capital as an indicator to protect ordinary shareholders. Moreover, the collapse Deutsche bank as cited by Deutsche Bank (2019), the dumping of South African bonds as cited by Goko (2019) and the downgrading of the country's outlook to a negative as was stated by Naidoo, Yoo and Bloomberg (2019) has caused some shocks to the South African financial sector and there is need for potential and/or ordinary shareholders to know the number of shocks or odds that these banks can withstand.

Secondly, the estimation of the value of economic capital of the top five commercial banks in South Africa can be compared and added to Kaylene's (2016) finding. Kaylene (2016) research only managed to estimate economic capital for two of the top five banks in South Africa, namely Standard Bank and Nedbank. One of the shortcomings of Kaylene's (2016) research was that it was centred on business risk economic capital and First Rand Bank, Absa and Capitec did not publicly disclose their business risk definitions. Since Kaylene (2016) could not estimate business risk economic capital, she could not proceed to estimate the bank's total economic capital.

Thirdly, as literature classifies economic capital as a performance and efficiency indicator, as well as a holistic approach that factors in various measures, some financial ratio analysis will take place. The ratio taken into consideration include return on assets (ROA), return on equity (ROE), price to book value and price to earnings. The reason for the financial ratio analysis is to observe, be it a trend or a relationship that the ratios above have with the value economic capital.

Fourthly, the research will look if the concept of economic capital as a red flag that could have been used for some recently closed banks in South Africa. Questions addressed include; where there run to exits? and what sort of intervention took place (regulatory or market)?

Lastly, this research is mainly centred on total economic capital and all the data that is needed in the estimation using the return series method is publicly available. The availability of data improves off Kaylene's' (2016) study and the potential and/or existing ordinary shareholder in the South African financial sector are provided with a better decision making stance.

1.4 Objectives

The main goal of the study is to explore the potential value of economic capital as an indicator for shareholders in guiding their decision making around ownership within the banking sector in South Africa. The specific objective are as follows;

- To determine the target turns that can completely wipe out the respective value of economic capital for the respective banks that protect their ordinary shareholders
- To determine the value of economic capital at various confidence intervals
- To determine the relationship between the value of economic capital and return on investment.
- To determine the possibility of a relationship between the economic capital and other performance measures, especially financial ratios.

1.5 Methods, Procedures and Techniques

This research made use of secondary monthly data from IRESS (formally known as INET BFA) dataset, Thomson Reuters Data-Stream and banks' official websites over ten years from June 2009 until May 2019. The reason is mainly that the research seeks to look at the post-financial crisis. The study has 120 observations for each respective bank. Moreover, it is the period when Basel III was announced and started to be implemented in South Africa (SARB, 2019d).

The banks used in the research are Absa, Capitec, First Rand, Nedbank and Standard Bank. The research uses these five banks for three main reasons. Firstly, according to Tjiane (2015) investors are more willing to invest in the big banks because between 1990 – 2015, approximately 26 small banks were liquidated and then forced to exit the banking system. The liquidation left many investors unprotected. Secondly, according to Farid (2015) if big banks within an economy fail because of insufficient economic capital, market intervention, which is slower, disorderly and chaotic, can cause investors to panic, which could lead to another financial shock. A disorderly market intervention has the likelihood of a ripple effect on other dependent financial institutions and neighbouring countries. Furthermore, According to Amadeo (2019a) collapse of big banks in any country slows growth weakens the credit rating. Lastly, these five banks hold more than 90 percent of the total deposit and asset (SARB, 2019a).

The methodology used is quantitative and taxonomies are of a positivist approach (Kivunja and Kuyini, 2017). Moreover, the methodology used will follow that of Saita (2007) and Farid (2015) called return series methodology with two approaches. The first method uses a historical simulation model and the second uses the variance-covariance model (Saita, 2007 and Farid, 2015). These methods proceed in several steps: The first step in both methods is to calculate the ordinary share returns and the second step is to create a histogram for each bank according to its respective range. The methods differ in step three, as the first method finds the worst returns in both absolute terms and percentage terms. In contrast, the second method requires the calculation of volatility of changes in shareholders' equity by employing standard deviations (Farid, 2015).

The fourth step in both methods is to determine the intervention threshold. Absa Group (2019) states that from a capital adequacy perspective, this is a minimum base ratio in terms of requirements South African Reserve Bank is set at 10% of the risk-weighted assets. The methods differ again in step five as the first method determines the excess capital, which is the

difference between core capital (tier 1 capital) and regulatory capital, as defined by Farid (2015). In contrast, the second method requires the calculation of the number of sigma's needed until the intervention threshold. The last difference in the methods is step six as method one estimates the loss-bearing capacity of excess capital and method two estimates the probability of intervention by regulators. The last step in both methodologies is to estimate economic capital or economic capital short by incorporating the respective steps mentioned above, however, there is a substantial probability that they will be a deviation in the value (Farid, 2015).

1.6 Outline of the Study

The rest of the research is structured in the following way; Chapter 2 looks at the overview of the banking sector, explores the top five commercial bank trends, year to year bank prices and shares. Chapter 3 is the literature review and empirical evidence, with the main focus on economic capital, however, the chapter has other performance and efficiency measures as well as regulatory capital, a component that is closely related to economic capital. Chapter 4 is the method, procedures and techniques that will be employed in the research. The results of the research are in chapter 5, which are obtained from the diagnostic test of the two models. The last chapter concludes and recommends to better future on economic capital as an indicator to protect prospective and existing ordinary shareholders.

1.7 Ethical Considerations

The research made use of secondary data from IRESS, Thomson Reuters Data-Stream and banks' official websites, thus, no ethical application was made to the Department of Economics and Economic History Ethics Committee. However, adherence of the ethical use of data was practiced. Furthermore, no manipulation of data was practiced to align the desired results with data collected.

OPTIONS	SELECTION
NO ethics application form will be submitted using the Ethical Review Application System (ERAS) for publicly available data (low risk desktop research). Instead, complete and submit an ethics application form for DATA ONLY to the supervisor and Department /Business School Ethics Representative for noting and filing.	X
An ethic application form for HUMAN SUBJECTS will be submitted using the Ethical Review Application System (ERAS) to RUEESC via the Department /Business School Ethics Representative.	

Chapter 2. The Overview of the South African Banking sector

2.1: Introduction

This chapter is structured in the following way: first and foremost, it looks at the debates, background and acts in the South African banking sector. Secondly, it looks at statistics of the banking sector as a whole; it shows the types and number of banks in the country, the total assets, gross loans, employment and Herfindahl-Hirschman Index to provide factual evidence of some of the debates that were raised in the introduction. The third section analyses the top four and five banks in terms of market share. The last section looks at the overall bank share prices and individual banks share descriptive statistics.

2.2 Background and governing Acts

According to Quiding (2006) and Ifeacho and Ngalawa (2014) the banking sector of any country is responsible for the economic growth of that country. Quiding (2006) adds that banks encourage economic growth or transformation through encouraging private sector activities and enterprise development by issuing various types of products and services like loans, credit and asset management. According to Quiding (2006) the Banks Act that governs banks in South Africa is based similarly to legislations of Australia, the United Kingdom and Canada. Mabwe and Webb (2010) at the time of their study, the banks in South Africa had been using the 1990 Banking act, but because of Basel amendments, the act was amended in the year 2008. Currently, banks are using the 2010 Banking Act, which was an amendment of the 2008 Banking Act under the supervision of the South African Reserve Bank (SARB, 2019b).

The South African Reserve Bank's (SARB) primary objective was to promote economic growth, currency value protection and enhancing financial stability in the republic (SARB, 2015). According to SARB (2015) financial stability is the mitigation of macroeconomic cost of distractions, the resilience of systematic shocks and the facilitation of efficient financial intermediation so as to promote and maintain confidence in the system. On the 21st of August 2017, the National Treasury, the Financial Service Board, and the SARB signed the Financial Sector Act (FSR), which was supposed to pave the way for the Twin Peaks (SARB, 2019e). After the 2008 financial crisis, regulators in South Africa noticed that they were a reason to move away from light-touch regulation of the financial sector. According to Tjiane (2015); EY (2018) and SARB (2019) twin peak is the use of fast, practical and intrusive way to regulate and supervise the financial sector; one peak looks at Financial Sector Conduct Authority (FSCA) and the other looks at Prudential Authority (PA). In a nutshell, the FSCA replaced the

Financial Service Board (FSB) has its regulator, different from the reserve banks, which overlook customers in terms of the products and services (EY, 2018). The PA is mainly the SARB and deals with the healthiness of the banks in terms of regulatory capital (EY, 2018; SARB, 2019e).

The South African banking sector has evolved and some acts have been amended more than once. Table 2.1 shows some of the acts that govern and regulates the banking sector and their amendments.

Table 2.1: Other South African Banking Acts.

<u>Banking Act</u>	<u>Description</u>
<u>The SARB Act 90 of 1989</u>	The non-prudential instrument which is aimed at setting the cash reserves requirements (minimum reserves). It is a monetary policy instrument. Latest amended included in 2010, 2013 and 2017
<u>Banking Act of 1990</u>	Focused on the financial soundness of the banks. It is more of a prudential regulatory instrument which regulates how banks accept deposit from the banks. Latest amendments included in 2001, 2003, 2009, 2015 and 2017.
<u>The Financial Service Board Act 97 of 1990</u>	The act was to introduce a new governing board that would supervise, promote and advise various stakeholders which include the finance ministers, financial institutions and consumers. The board will have various division that focuses on capital markets, financial intelligence, retirement funds, financial advisory/ service and insurance. Latest acts amendments were in 2008, 2014 and 2018.
<u>The Mutual Bank Act 124 of 1993</u>	It allows for the registration of all mutual banks and regulates the assets (which are mainly residential property mortgages). There are is a 10 % minimum capital requirement for the mutual banks.

	Latest amendments included in 1999 and 2018.
<u>National Payment System of South Africa Act 78 of 1998</u>	The act sets out rules/regulations within the country on how clearing, payment and settlement take places. Latest amendments to the act were in 2008 and 2013.
<u>National Credit Act of 2005</u>	This is a consumer protective act, that was set out to protect the consumer (depositors mainly) with regards to collections cost, credit insurance cost, initiation fee, default administrative charges and service fee. The latest amendment in the act was in 2014, 2017 and 2019.
<u>Insurance Act of 2017</u>	It is prudential regulatory in nature and set out rules that promote a safe, fair and stable insurance market. The Act encompasses certain aspects of Short-term Insurance Act of 1998 and Long-term Insurance Act of 1998.

Source: Seeraj et al (2016)

2.3 Banking Sector Trends

The relaxation of some of South Africa's banking sector regulations and the promotion of international linkages have increased the number of banks in the country (Verhoef and Singleton, 2010). Table 2.2 shows the different types and respective numbers of banks in the South African Sector.

Table 2.2: Types of Banks in the South African Banking Sector.

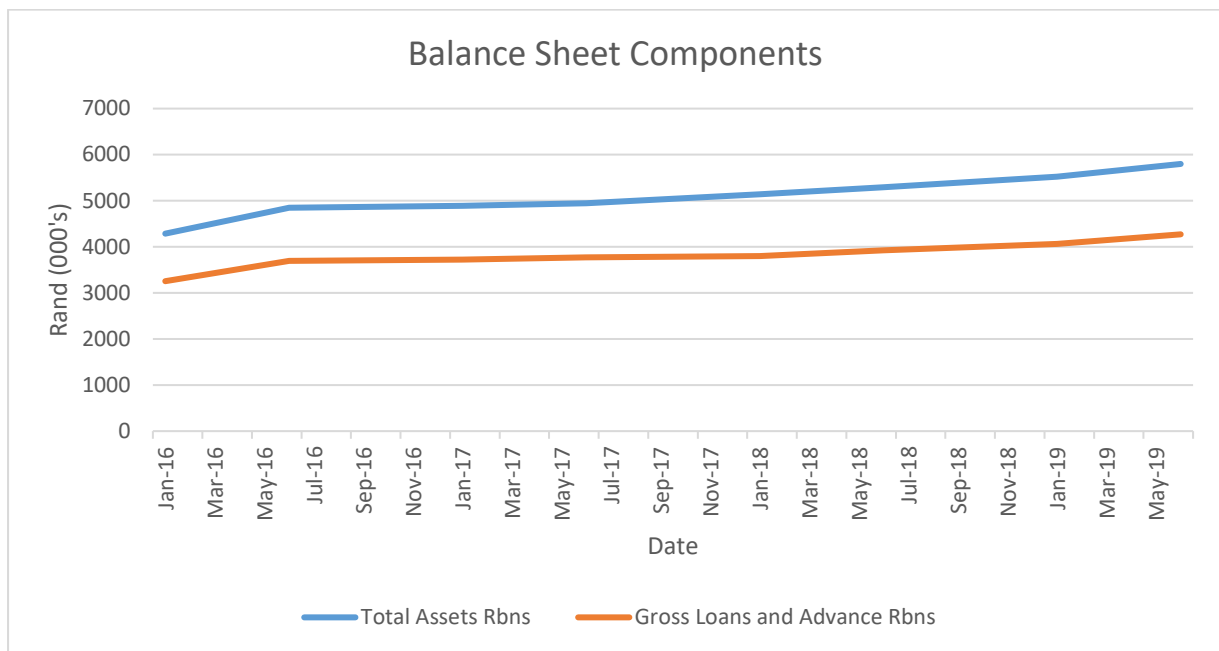
<u>Type of bank</u>	Jan-16	Jun-16	Jan-17	Jun-17	Jan-18	Jun-18	Jan-19	Jun-19
Registered Banks	17	17	17	17	19	19	19	19
Mutual Banks	3	3	3	3	3	3	4	4
Co-operative Banks	2	2	2	2	3	3	4	4
Local Banks of Foreign Banks	15	15	15	15	15	15	15	15
Foreign Banks with approved local representative offices	39	39	36	31	31	29	31	30

Source: SARB (2019c)

Table 2.2, the number of registered banks in South Africa has increased from January 2016 to January 2019. The main reason for the increase in registered banks is because the South African banking sector is seen as being safe, stable and a powerhouse in Africa (Quiding, 2006; Mabwe and Webb, 2010; Maredza, Kapingura and Mishi, 2013; Ifeacho and Ngalawa, 2014). Mutual Banks and Co-operative Banks have increased in numbers but at a steadier pace. Local Banks of Foreign Banks have remained the same from January 2016 to January 2019. Foreign banks with approved local representative offices had a sharp decline between January 2016 to January 2017; however, from June 2017 to January 2019, they are fluctuation in the numbers. According to Maredza, Kapingura and Mishi (2013) the cause of declining banks in 2013 was due to the new Basel III Accord requirements, which were considered as barriers to entry. The fluctuation in foreign banks with approved local representatives is mainly because of mergers and takeovers (Mlambo and Ncube, 2011). For example, Barclays Bank which took over Absa in the early 2000s as cited by Mlambo and Ncube (2011) and then sold Absa because of the extra cost due to falling rand (Salie, 2016). A reason that can put forward concerning the increase in banks is mainly that the banking industry has attracted foreign banks (Mabwe and Webb, 2010; Mlambo and Ncube, 2011; Ifeacho and Ngalawa, 2014). For example, The Industrial Bank of China bought a 20% stake from Standard bank (Ifeacho and Ngalawa, 2014).

Looking at the banking sector in general, the total assets and gross loan advances seem to be growing year by year (SARB, 2019c). The main reason behind the growth in these balance sheet component is likely because the top five banks in South Africa are growing in size and market share as well (Donnelly, 2019). (Donnelly, 2019) states that the big standouts are Capitec, which grew the most by approximately 22%, followed by FirstRand, which grew by 10% and lastly Standard bank, which grew by approximately 2%. Even though the percentage for Standard banks might seem low, Standard Banks is the leading bank in South Africa with R1.3 Trillion in assets as compared to Capitec, which is fifth with R87 billion when looking at commercial banks (Donnelly, 2019). In rand terms, a 2% growth of Standard Bank is approximately is R22 Billion (2% of R1.3 Trillion) and is greater than 22% growth of Capitec, which approximately R19 Billion (22% of R87 Billion). Therefore, Standard Bank is still doing better than Capitec but a slower rate. Figure 2.1 shows the total number of total assets as well as gross loan advances.

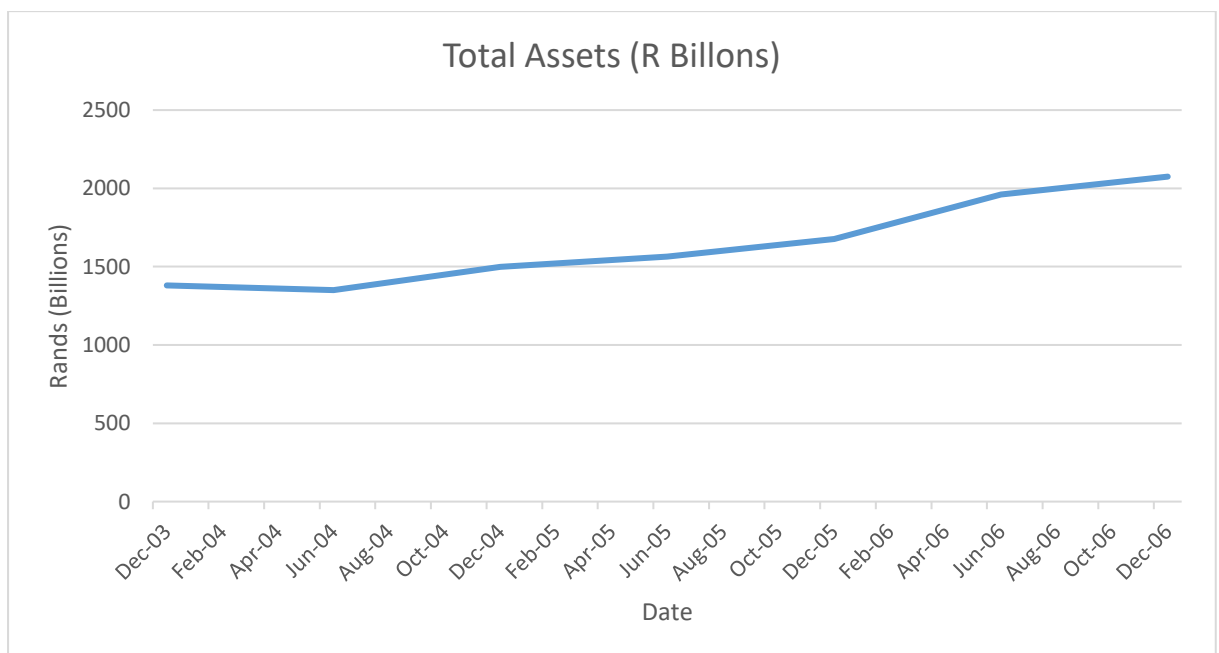
Figure 2.1: Banking Sector Total Assets and Gross Loans



Source: SARB (2019c)

The reason for the limited data range is because of the data available on the SARB website. It is worth noting that, prior to 2006, total assets were published in the Financial Stability Report and post 2016, total assets started being published in Selected Banking Trends by the SARB. Figure 2.2 below shows the total assets in the early 2000s.

Figure 2.2: Banking Sector Total Assets

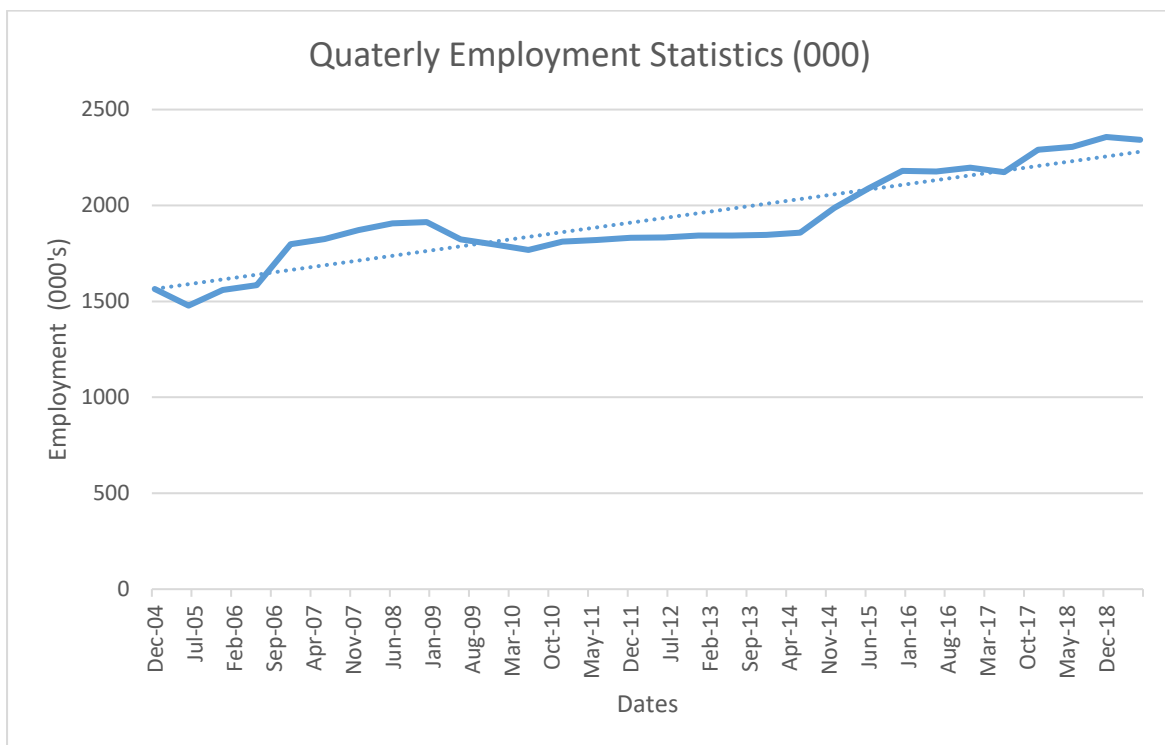


Source: SARB (2019a)

Looking at the total assets in the financial sector, it seems that, from 2003 to 2019, total assets have quadrupled and from 2006 to 2019, total assets have almost tripled. The increase in total assets is a sign of a reduction in the growth of the sector.

In terms of employment, research by Ifeacho and Ngalawa (2014) on the performance of the South African banking sector, showed that the banking sector is the third-largest employer in South Africa. Figure 2.3 shows the quarterly employment statistics in the banking sector.

Figure 2.3: Quarterly Employment Statistics of the SA Banking sector

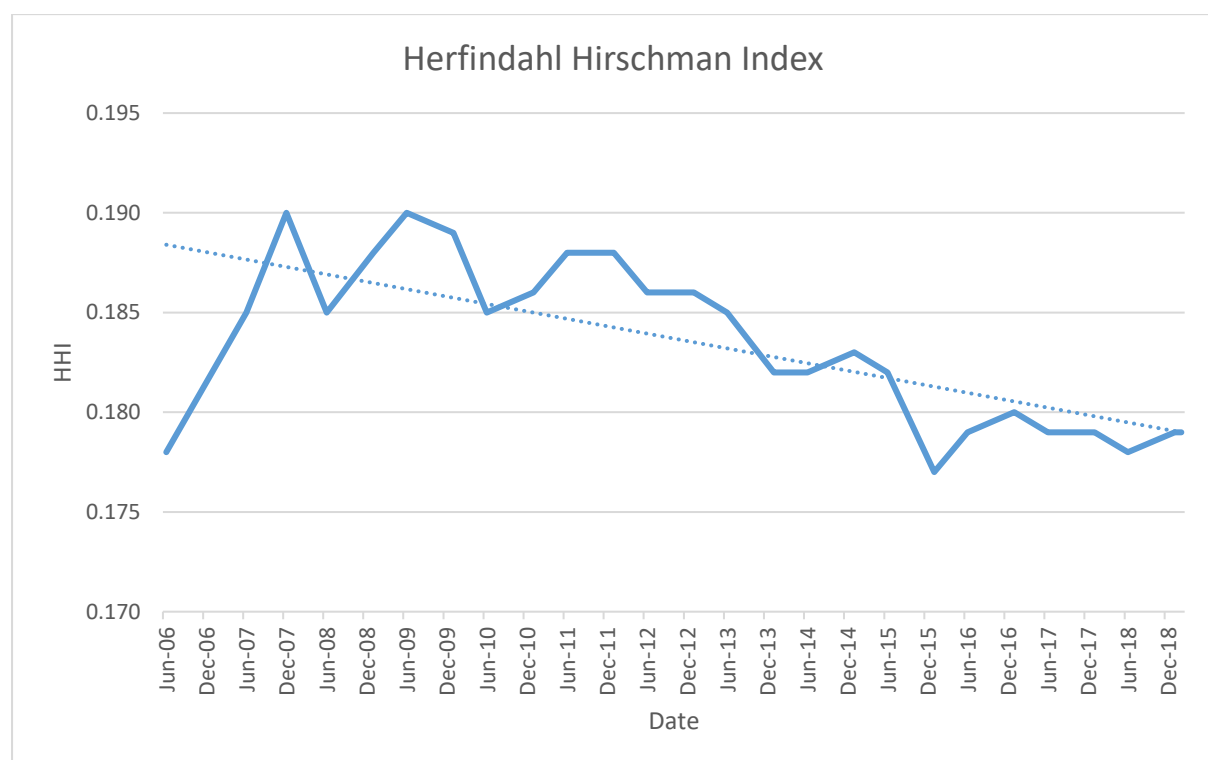


Source: Stats SA (2019)

Figure 2.3 shows an upward trend in total employment in the South African banking sector, especially from April 2014 – December 2018. However, there was a downward trend from December 2018 onwards. The downward trend in employment in the banking sector is what likely triggered the pressure to have a strike that was scheduled on the 27th of September 2019 (Omarjee, 2019; Pitjeng, 2019). Nonetheless, the strike didn't take place because the employees who were represented by The Business Unity of South Africa and Cosatu could not reach an agreement at Nedlac. According to the Labour Relation Act Section 77, if there is no agreement reached at Nedlac, a certificate for the strike cannot be issued and it becomes illegal to strike (Omarjee, 2019).

Figure 2.4 shows the Herfindahl-Hirschman Index for the banking sector in South Africa. In terms of the Herfindahl-Hirschman Index, Maredza, Kapingura and Mishi (2013) state that the index is used to measure the concentration levels within any industry. A Herfindahl-Hirschman index below 0.1 means that there is no concentration, while a Herfindahl-Hirschman Index between 0.1 and 0.18 means moderate concentration and a Herfindahl-Hirschman Index above 0.18 means highly concentrated. Moreover, the higher the Herfindahl-Hirschman Index, the little the competition that is exhibited in that respective industry (Maredza, Kapingura and Mishi, 2013). Mlambo and Ncube (2011) add that less competition in the banking sector means less risk-taking activities by banks, which means that the banking sector is much safer as there is a decrease in banking fragility.

Figure 2.4: The Herfindahl-Hirschman Index



Source: SARB (2019a)

Figure 2.4 shows that the South African banking sector is currently borderline moderate and highly concentrated. There is generally a downward trend in the Herfindahl-Hirshman Index. Mlambo and Ncube (2011) state that between 2006 and 2009, the banking sector was highly concentrated with a Herfindahl-Hirschman Index averaging 0.19 and believed that the sector was of monopolistic competition in nature. The evidence in figure 2.4 supports the aforementioned fact by (Mlambo and Ncube, 2011). Okeahalam (2006); Mabwe and Webb

(2010); Maredza, Kapingura and Mishi (2013) and Ifeacho and Ngalawa (2014) all stated that the South African banking sector is highly concentrated and is/was oligopolistic. According to Mabwe and Webb (2010) if an industry has a Herfindahl-Hirschman Index, which is above 0.18 (in the highly concentrated zone), that industry is oligopoly by nature. The Herfindahl-Hirschman Index trend line shows that the level of concentration moved from being high to moderate. Nonetheless, Figure 2.4 shows an upward trend from June 2018 to February 2019, meaning that there is still the probability of another transition from moderate to a high concentration.

2.4 Top Five Banks' Trends

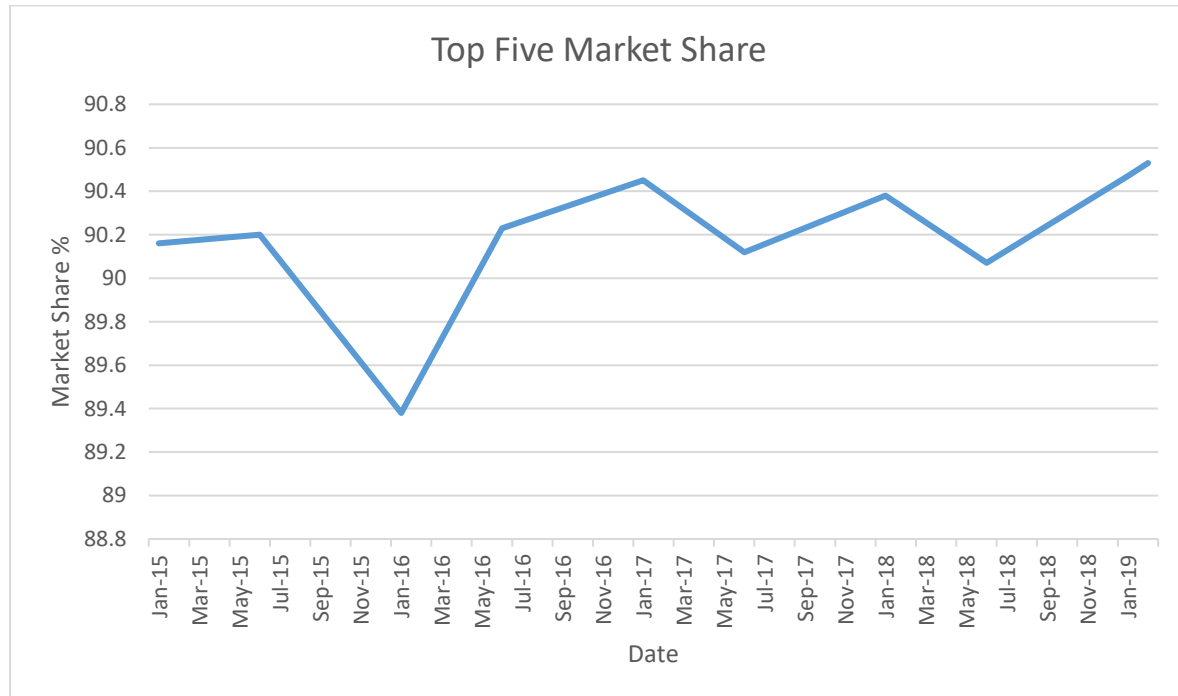
The big four commercial banks dominate the financial market in South Africa, when measured by total assets, then Investec and Capitec follow, respectively. In chronological order, Standard Bank is leading the banking sector, with R1.3 trillion in assets, followed by FirstRand with R1.1 trillion in assets. Absa is third with R983-billion, Nedbank fourth with R892-billion, Investec is fifth with R415-billion and Capitec with R87-billion. It is worth noting that there are some upcoming newcomers, for example, Discovery Bank and Tyme, which hold assets of about R622-million and R1.4-billion, respectively. In terms of growth, Capitec recorded the most significant growth in assets of about 21% and of the top 4 banks, only FirstRand recorded a double-digit of approximately 10%. Standard Bank's assets only grew by less than 2% (Donnelly, 2019).

One of the major problems in the banking sector was that big banks only catered for high and medium-income earners (Okeahalam, 2006; Ifeacho and Ngalawa, 2014). In rands, FirstRand banks lead as it grew by R110 Billion, followed by Standard banks with R22 Billion and R19 Billion for Capitec. Capitec's massive growth in assets is because of the target markets, which comprise of the low-income earners, highly populated areas and townships (Okeahalam, 2006; Manson, 2012; Ifeacho and Ngalawa, 2014; Vermeulen, 2018). According to Ifeacho and Ngalawa (2014) 37% of the total 33 million people in South Africa could not access banking services because of their location and income bracket. Nonetheless, Capitec catered for this blue ocean and that why it has a fast growth rate.

This research will use the top five commercial banks in the South African Bank Sector; therefore, it is worth looking at some indicators which specifically focus on the top banks. Financial Stability Review only started publishing the market concentration percentages for the top five banks in 2015; therefore trends for these indicators will only commence from then

(SARB, 2019a). Firstly, we will look at the market share for the top five commercial banks. Figure 2.5 shows the market share percentages for the top five commercial banks.

Figure 2:5 Top Five Banks Market Share

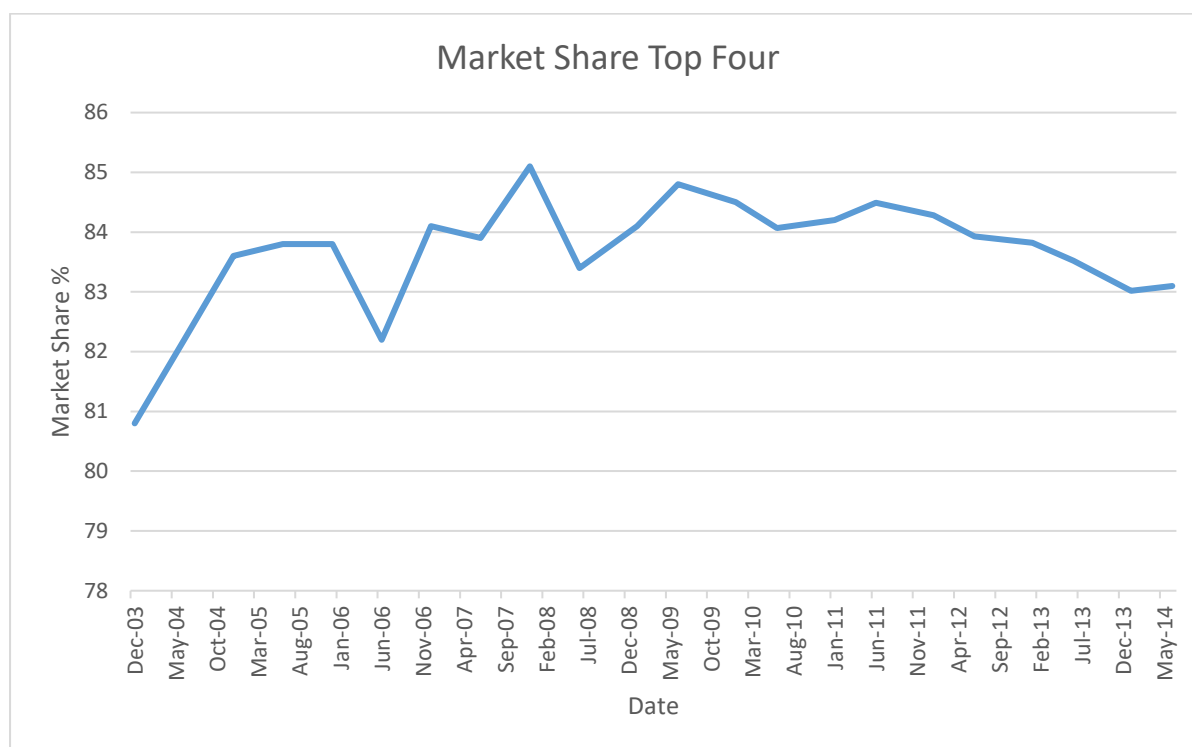


Source: SARB (2019a)

Figure 2.5 shows an upward trend in the market share percentage for the top five commercial banks. The massive drop in market share (June 2015 – January 2016) for the top five can be assumed to be the market share that new banks were absorbing that were not in the top five. The sudden increase in the market share for the top five banks from January 2016 can be accredited to Capitec, which was “The Best Bank in the World in 2016 and 2017,” according to The Lafferty Group (Vermeulen, 2018). Moreover, Smith (2019) states that Capitec has been the top industry bank for the sixth time in a row (in terms of the Customer satisfaction index).

Figure 2.6 below shows the market share for the top four banks before the publishing of the top five banks' market share. Researches that took place before 2015 only accounted for the percentage of the top four banks. For example, in a research by Okeahalam (2006) the top four banks had 85% of the total deposits and assets, Mabwe and Webb (2010) stated that the top four had 86.4%, Mlambo and Ncube (2011) states that they had 85%, Maredza, Kapingura and Mishi (2013) stated that they had 84% and Ifecho and Ngalawa (2014) stated that they had 70% of total deposit and assets. The fact mentioned above is true and in accordance with figure 2.6.

Figure 2:6 Top Four Banks Market Share



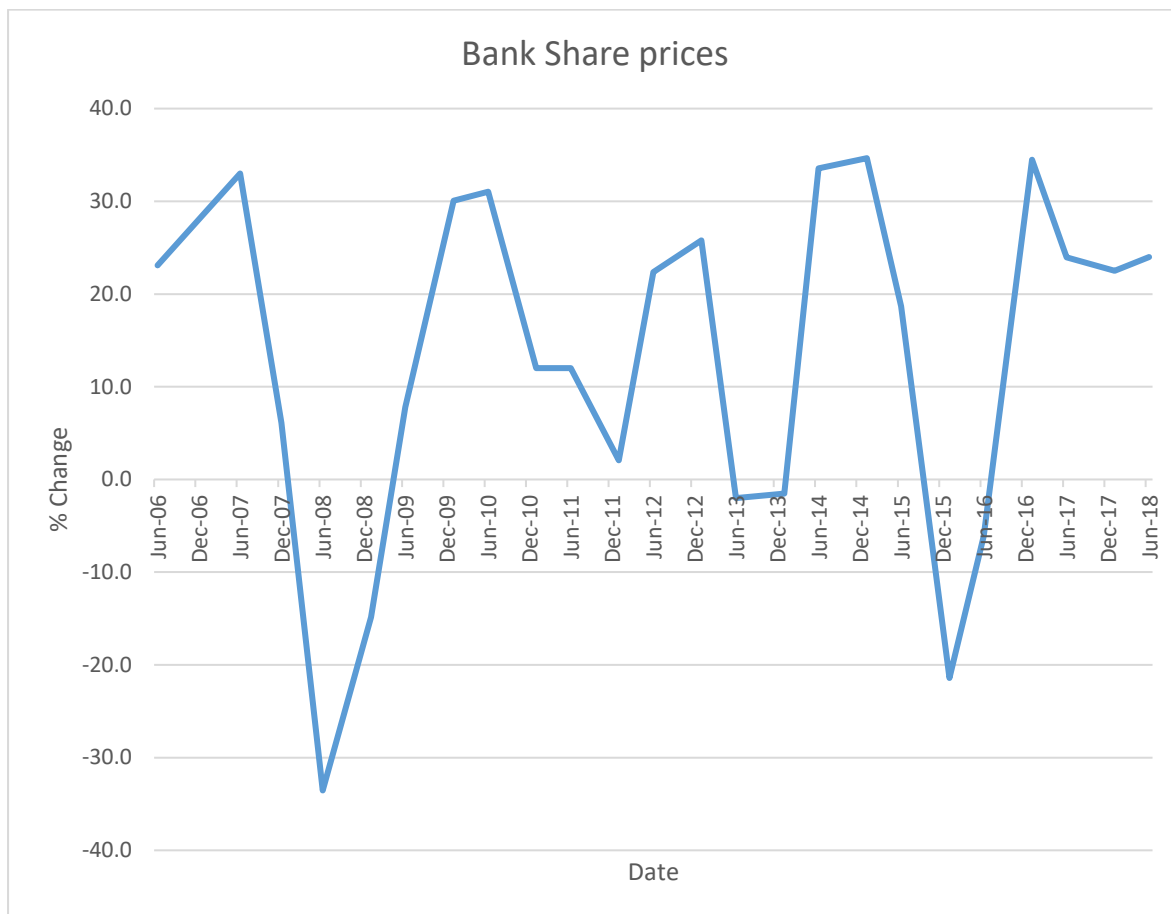
Source: SARB (2019a)

2.5 Bank Prices and Shares

Since this research takes into account shareholders' equity, another indicator that is worth noting is the banks' share prices, which are published in the Financial Stability Review. Banks' share prices are measured on a year-on-year percentage change (SARB, 2019a). Before we look at the trend of these banks' share prices, let us look at the definition of a share and its owners. According to JSE (2017) the total capital of any company is divided into convenient units of equal value, which are called shares. They are two main types of shares, ordinary and preference shareholders (JSE, 2017). Since this research takes into account the worst affected stakeholder groups because that is what economic capital is heavily inclined to, only ordinary shareholders and their rights will be discussed.

An ordinary shareholder is a common/stock shareholder who gets their dividend only after preference shareholders and because of the aforementioned, their rate of dividend received is varying (JSE, 2017). An ordinary shareholder is entitled to five fundamental rights, namely: the right to vote, sell shares, right to receive a dividend, right to pre-emption and the right to liquidation (Pearson, 2013; JSE, 2019). Figure 2.7 below shows banks' share prices on a year to year percentage basis.

Figure 2.7: Banks Share Prices



Source: SARB (2019a)

Figure 2.7 shows that the banks’ share prices are gradually increasing from 2016 to 2019. Moreover, the banks’ shares price percentages were negative during the 2008 Financial Crisis and the whole of the 2016 year, except December 2016. Since the Banks’ share prices are measured on a year-on-year percentage change, the most significant percentage point change was from January 2016 to January 2017 as the Banks’ share price percentage went from -21.4% to 34.5%. On the other hand, the worst percentage point change was experienced recently, from February 2018 to February 2019 and the banks’ share price fell from 32.1% to -1.9%. The recent fall in banks’ share price percentages questions the stability of the South African banking sector and ordinary shareholders are likely to sell shares of poorly performing banks to buy in better-performing banks. This research provides its relevance again since ordinary shareholders can use the value of economic capital of the top five banks to make a well-informed decision on which banks can withstand financial shocks and which one to invest in.

It will be inconclusive to look at the holistic banks' share price (year to year percentage change) without looking at the individual bank's share prices. Table 2.3 below shows the descriptive statistics of the top five banks under study.

Table 2.3 Descriptive Statistics of the Top Five Commercial Banks Shares

Description	Absa	Capitec	FirstRand	Nedbank	Standard Bank
Mean	15091	43788	3925	19721	13393
Standard Error	176	3169	155	464	299
Median	14838	22400	3983	19900	12752
Mode	13600	22200	6690	12000	11350
Standard Deviation	1931	34855	1700	5100	3287
Sample Variance	3729866	1214878391	2891589	26010906	10803166
Kurtosis	0	0	-1	-1	0
Skewness	0	1	0	0	1
Range	9736	130899	6025	20820	13618
Minimum	10155	4100	1365	8927	8250
Maximum	19891	134999	7390	29747	21868
Sum	1826056	5298338	474978	2386290	1620522
Count	121	121	121	121	121
Largest(1)	19891	134999	7390	29747	21868
Smallest(1)	10155	4100	1365	8927	8250
Confidence Level (95.0%)	348	6274	306	918	592

Source: IRESS (2019) and Author

Table 2.3 shows that Capitec has the highest mean, volatility (both variance and standard deviation), standard error and range in terms of its monthly closing share price for the last ten years (from June 2009 till May 2019). The main reason is the percentage growth of Capitec's monthly return due to its performance and its ability to attract more and more customers (Manson, 2012; Vermeulen, 2018; Smith, 2019). On the other hand, FirstRand has the complete opposite, with the lowest mean, volatility, standard error and range. The low values are mainly because FirstRand monthly closing share price, which tends to very steady

2.6 Conclusion

The South African banking sector seems to have increased more regulatory measures to assist with customer (depositors) protection and financial sector stability but at the cost of innovation in the sector by the implementation of the twin peaks. Economic theory suggests that bureaucracy destroys innovation; however, the protection is guaranteed. In contrast to what was suggested by Verhoef and Singleton (2010), the South African banking sector has decreased in the number of foreign banks with approved local representative offices even though they are in the international linkages have increased. However, the number of Co-operative banks, Mutual banks and registered banks has increased in the last three years because of the introduction of banks like Tyme Bank and Discovery Bank (Smith, 2019). The increase in the number of these banks can be used as justification that the banking sector is stable enough to attract the formation of other banks. The total assets, advance loans and gross loans have increased by at least 30% over the last three years (SARB, 2019c). Employment in the banking sector has also increased, showing an upward trend from March 2016 to March 2019; nonetheless, there were signs of a downward trend from March 2019 onwards. The upward trend can be used to justify the fact; the banking sector is the third-largest employer in the country (Ifeacho and Ngalawa, 2014). The downward trend can be the reason for the strike that wanted to take place on the 27th of September 2019 but was unsuccessful because the Business Unity of South Africa and Cosatu had insufficient legal paperwork (Omarjee, 2019; Pitjeng, 2019).

Looking at the top five commercial banks under study, the top five banks in South Africa manage to increase in terms of market share from 89.03% to 90.53% from January 2016 to February 2019 (SARB, 2019a). The massive growth by Capitec and moderate growth by FirstRand can be the reason for the increase in market share (Donnelly, 2019). In terms of concentration, the South African Banking sector can be said to be borderline moderate and highly concentrated because it had an HHI of 0.179 in February 2019. Lastly, the year to year bank prices show fluctuation but with an upward trend. The most significant positive fluctuation in bank prices percentage was January 2016 to January 2017, where it increased by 55.9 percentage points and the most prominent negative was from February 2018 to February 2019.

Chapter 3: Literature Review

3.1 Introduction

This chapter offers an overview of the theoretical background of the study and is organised into three sub-sections with the main focus on economic capital. The first section defines regulatory capital and examines the Basel III pillars. The second section provides a conceptual explanation of economic capital, looks at the similarities and differences between regulatory capital and economic capital; then describes economic capital in its different forms, what causes it, risks within economic capital and the different methods used to calculate economic capital; then proceed by reviewing other performance measures. The last section of the chapter will explore local and international empirical studies on economic capital. The study on economic capital and ordinary shareholder is not a new concept. However, with the South African economic environment, this concept is new and this study seeks to fill the knowledge gap in the South African context.

3.2 Regulatory Capital.

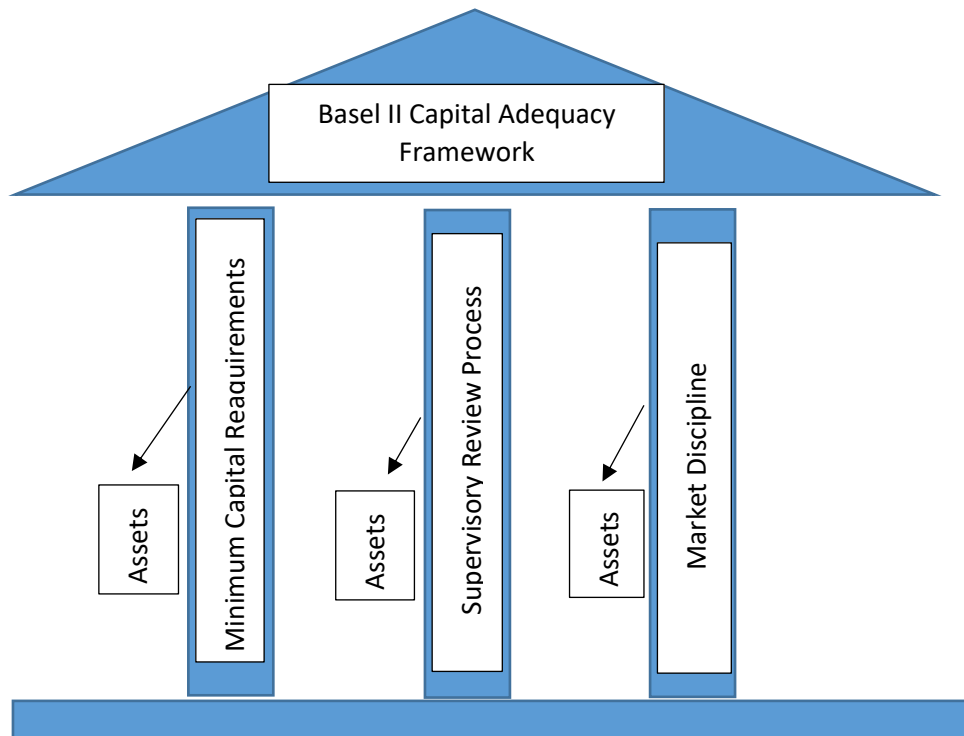
Larsson (2009) states that for banks to avoid bank insolvency, protect various stakeholders, cover changes in assets and unexpected loss, banks are required to hold a certain amount of capital. This capital comes in the form of Regulatory and Economic. Regulatory Capital is the minimum capital that is required by the National Supervisory Authorities to be kept so that the bank can protect the banking system as a whole and its depositors (Larsson, 2009). In the same vein, Absa Group (2019) defines regulatory capital as capital that a group holds, which is determined by the requirements of the Banks Act and regulations. Moreover, regulatory capital is externally supervised and every financial institution should abide by these requirements.

3.2.1 Basel Accords

Authors such as Achterberg and Heintz (2010) and Kaylene (2016) define regulatory capital as Basel I requirements of the Basel Accord of 1988, which were laid down on an international basis. Moreover, Basel accords are seen as improvements of each other rather than one accord abolishing another. With the aforementioned in mind, regulatory capital requirements are regarded as pillar one of the new Basel III accord. Kaylene (2016) further adds that regulatory capital is prescribed by regulators and is computed from the value at risk measures for operational risk, credit risk and market risk under pillar 1. Achterberg and Heintz (2010) state that Basel III sets out to strengthen the Basel II framework rather than replaces it by addressing

the liabilities side of the balance sheet since Basel II only addressed the asset side of the balance sheet. Figure 3.1 below shows the pillars of Basel II.

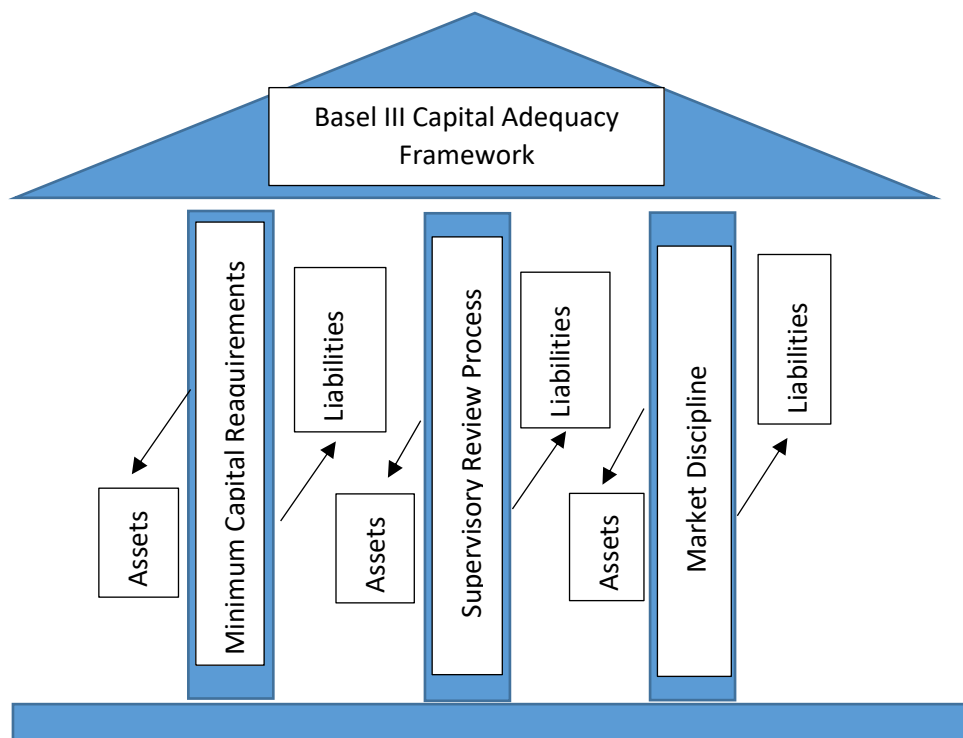
Figure 3.1: The three pillars of the Basel II.



Source: Adopted from (Kaylene, 2016) and modified by Author.

Figure 3.1 shows the Basel II framework, which only focused on the assets side and its shortcomings were exposed by the 2008 Financial Crisis. To promote global financial stability as well as overcoming some of these shortcomings, the Basel Committee resorted to looking at both the assets and liabilities of the Basel II pillars and came up with the Basel III.

Figure 3.2: The three pillars of the Basel III.



Source: Adopted from (Kaylene, 2016) and modified by Author.

From figure 3.3, pillar one is the minimum capital requirement that the Basel Committee on Banking Supervision (BCBS) states that any financial institution should hold. It should be noted that it sets out the calculations of regulatory capital requirements from both the asset and liability side for market, credit and operational risk (Achterberg and Heintz, 2010). The minimum requirement for common equity was raised from 2% level to 4.5%, Tier 1 capital requirement was raised from 4% to 6%, capital conservation buffer must be calibrated at 2.5% above the minimum regulatory requirement and countercyclical buffer should range between 0 - 2.5% of common equity. Wall Street (2014) further states that, under the Basel III, Tier 1 capital is always supposed to be higher in value than Tier 2 capital, the leverage ratio is supposed to be 3% for all countries and not for the United States of America only, stable funding is supposed to exceed what is required over a one-year extended stress period and that the financial institution is supposed to have enough liquid assets to cover net cash outflows over a thirty day period (Achterberg and Heintz, 2010) and Wall Street, 2014).

Pillar 2 suggests that financial institutions should internally supervise and assess themselves. Pillar 2, under Basel III Accord, sets out the process in which banks should review their overall capital adequacy, processes that supervisors can use to evaluate how well financial institutions are doing concerning their risks and the appropriate actions in response to the assessments (Achterberg and Heintz, 2010). Kaylene (2016) states that under pillar 2, financial institutions should employ Internal Capital Adequacy Process (ICAAP) to assess and supervise themselves internally. Pillar 2 can be seen as economic capital as it looks at the internal assessment and supervision (Kaylene, 2016). Although Economic capital will be studied in depth in chapter 3 of this research, the common definition is that it is the minimum amount of equity capital that a financial business or entity needs to set aside to absorb worst losses with a certain confidence level over a certain time horizon which is usually one year (Cartwright, 2009; Al Janabi, 2011; Kaylene, 2016; Joshi, 2018).

Moreover, Achterberg and Heintz (2010) state that, Pillar 3 under the Basel III Accord states that financial institutions should publish specific details concerning their capital, risk and risk management, to strengthen market discipline. To improve the quality, transparency and consistency of the capital base, the Basel III framework increased the standard for instruments that are classified as Tier 1 capital, increased requirements on Tier 1 capital, elimination of Tier three capital, harmonisation of Tier two capital and revision of appropriate capital deductions for example deferred tax assets and minority interests (Achterberg and Heintz, 2010; Farid, 2015). According to Greenlee et al. (2011) the Basel III framework is aimed to increase the capital ratio by increasing risk-weighted assets while reducing the available capital.

3.3 Economic Capital

According to Sarin and Summers (2018) and Amadeo (2019) financial institutes are still as risky as was before the 2008 financial crisis. The recent collapse of the Deutsche Bank, a big investment giant, can be used as evidence that surely the financial sector is still vulnerable to financial shocks (Deutsche Bank, 2019). Inman (2019) predicts that in the 2020's, the globe will witness yet another financial shocks. Mabwe and Webb (2010) are of the view that the South African banking sector is more risk because of deteriorating credit quality, falling profitability and low liquidity; on the contrary, Quiding (2006) and Mlambo and Ncube (2011) believe that the South African banking sector is much safer. Their argument is based on the logic that the South African Banking sector is largely a monopolist sector, thus less

competition, which in turn means less risk-taking. Prior knowledge and expectation is that, as competition increases, so does risk-taking (Mlambo and Ncube, 2011). Quiding (2006) argument is based on the fact that the South African banking sector is well developed and the banking act is similar to that of the United Kingdom, Canada and Australia, which is why the sector dominates in Africa. In light of financial shocks, ordinary shareholders are the last stakeholders to receive remuneration (JSE, 2015). According to Quiding (2006); Larsson (2009); Farid (2015); Kaylene (2016) regulatory capital is mainly there to protect depositors and the stability of the sector, while economic capital is there to protect shareholder. The reasoning behind their argument is that economic capital is an estimate of the worst-case scenario for the worst affected stakeholder (ordinary shareholder in terms of remuneration). For the aforementioned reason, economic capital is a new area of study and ordinary shareholders can use it as a performance indicator when making investing decisions.

According to Al Janabi (2011); (Cartwright, 2009); (Kaylene, 2016) and (Joshi, 2018) economic capital is the minimum amount of equity capital that a financial business or entity needs to set aside to absorb worst losses with a certain confidence level over a specified time horizon which is usually one year. Basel Committee (2003) and Larsson (2009) define economic capital as a method that attempts to assess the amount of capital needed to support a given set of business activities. These business activities include investing in bonds, long term debt, equity and tangible equity. It is worth noting that financial shocks primarily cause the worst-case scenario within the financial sector. As noted in the early chapters, financial shocks can be on a macro level (poorly structured regulatory measures), as was stated by Wall Street (2014) and on a micro-level (poor management and improper accounting to liquidity management problems) as was stated by (Tjiane, 2015). Gorton, Yale and NBER (2012) define a financial shock as a sudden event, a regime switch or a structured break which tends to occur at the peak of a business cycle and is preceded by credit booms. Moreover, a financial crisis occurs when bank debt holders run to banks, demanding their short debts claims into cash and the demand for cash become insufficient (Gorton, Yale and NBER, 2012). It is worth noting that the government or central bank is likely to intervene, but timing is of the utmost importance (Gorton, Yale and NBER, 2012).

3.3.1 Similarities and differences between Regulatory and Economic Capital

The main thrust of this research is centred on economic capital as an indicator to see the effects on shareholders and economic capital is closely linked to regulatory capital. Therefore, it is worth noting some of the similarities and differences between the two capitals. By definition, Regulatory Capital is the minimum capital that is required by the National Supervisory Authorities to be kept so that the bank can protect the banking system as a whole and its depositors (Larsson, 2009). In contrast, Economic Capital is the minimum amount of equity capital that a financial business or entity needs to set aside to absorb worst losses with a certain confidence level over a certain time horizon, which is usually one year in order to protect its ordinary shareholders. One significant similarity between regulatory capital and economic capital is the fact that they both take into account operational risk, credit risk and market risk in their calculation (Larsson, 2009; Kaylene, 2016). However, there are more differences between regulatory capital and economic capital than similarities. Firstly, according to Larsson (2009) economic capital is internally supervised while regulatory capital is externally supervised. Secondly, economic capital is considered to be pillar 2 (Supervisory Review Process) and regulatory capital is considered to be pillar 1 (Minimum Capital Requirements) (Achterberg and Heintz, 2010). Thirdly, on the top of the risk as mentioned earlier (credit, market and operational risk), Larsson (2009) and Kaylene (2016) states that economic capital included diversifying risk and business risk while regulatory capital only included life risk. Lastly, according to Larsson 2009 and Achterberg and Heintz (2010) regulatory capital is aimed at reducing the effect of another financial crises or preventing the crisis while, Larsson (2009) and Kaylene (2016) believe that the economic capital is aimed at protecting ordinary shareholders as they are the worst affect stakeholder in the case of business liquidation or bankruptcy. On the other hand, Wall Street (2014) believes that regulatory capital requirements were introduced so that a bank can absorb sufficient losses through shareholders' equity rather than through other funding sources or customer deposits.

3.3.2 Risks within Economic Capital

According to Kaylene (2016) financial shocks are a result of market failure, which can be caused by structural uncertainties and risks. According to Cartwright (2009) risk modelling, which helps in estimating economic capital is critical. Due to the nature of the business, banks are exposed to several risks that affect their functionality and performance (Basel Committee, 2003). Most of this risk is attached to their products and services and as a result, the capital

component (both regulatory and economic) of the banks carries the risk as well (Larsson, 2009; Kaylene, 2016; Li et al., 2018).

According to Larsson (2009); Kaylene (2016) and Li et al. (2018) the common risks that are included when calculating economic capital are credit risk, operational risk, market risk, business risk and life risk. Basel Committee (2000) and Larsson (2009) state that credit risk is the possibility that counterparties fail to fulfil their agreed obligations and that the promised collateral does not fully cover the Bank's claims. Credit risk is the probability of financial loss that should the Group's customers, markets or client counterparties fail to fulfil their contractual responsibilities (Absa Group, 2019). When one looks at credit risk within economic capital, they look at the capital required to cover unforeseen losses, based on the expected volatility of the annual loss rate over a one year time horizon at a specific confidence interval (Larsson, 2009). In the calculation of economic capital, Larsson (2009) and Majumder and Li (2018) treat the aforementioned risks as components and calculate them individually. For example, according to Majumder and Li (2018) credit risk is a variable that is part of the performance equation. According to Larsson (2009) since credit risk is quantified as the actual gross loss divided by the outstanding amount of the loans. This calculation is done in order to reflect the risk exposure of each division, province and country.

According to Absa Group (2019) operational risk is the probability of loss for banks, which results directly or indirectly from inadequate or failed internal processes, systems or external events and human factors. Operational risk includes risks associated with external suppliers, products, payments and transaction operations, premises and security, regulation, information, fraud risk, financial reporting, tax, technology, legal and people. Larsson (2009) has a similar definition to the aforementioned but looks at operation risk in terms of economic capital. Larsson (2009) cites that within economic capital, operational risk is the much-needed capital to cover unexpected losses that result from external suppliers, products, payments and transaction operations, premises and security, regulation, information, fraud risk, financial reporting, tax, technology, legal and people. Due to the difficulty in finding risk drivers for operational risk, Larsson (2009); Farid (2015) and Kaylene (2016) stated that historical simulations could not be made. Larsson (2009) only managed to calculate correlation figures with other risks; thus, the reason why the research will not individually calculate the risk, instead estimate economic capital using shareholder equity returns.

Market risk is the probability that the business earnings, objectives and capital will be adversely impacted by volatility fluctuation of market prices or rates such as interest rates, equity prices, foreign exchange rates, commodity prices and credit spreads (Larsson, 2009; Absa Group, 2019). Moreover, according to Larsson (2009) market risk consists of interest rate risk, commodity risk, equity risk and foreign exchange risk. Larsson (2009) asserts that within economic capital, market risk will be the capital needed to cover unexpected losses as a result of movements in financial market variables. Li et al. (2018) calculated market risk using financial statements, Larsson (2009) used macroeconomic variables, interest rate risk, stock indices and foreign exchange risk to calculate market risk and Farid (2015) and Kaylene (2016) collectively calculated all the risks together.

Life risk is defined as the likelihood of unexpected losses due to changes in longevity rates, mortality rates, selection effects and disability rates. The correlations between life risk with business risk and operational risk were assumed/quantified as zero (Larsson, 2009)

Kaylene (2016) defines business risk as the probability that the business earnings and margins may shrink, without the opportunity to offset the revenue declines with a decrease in costs. Business risk is a significant risk when it comes to financial institutions, especially when it comes to the bank. Kaylene (2016) uses the example of how businesses can lose value because customers can sharply curtail their activities in the event of a market downturn or because a new entrant bank takes market share away from an existing bank. Business risk is a pillar two strategy and it can be incorporated in the ICAAP framework. However, various banks define business risk differently; thus the different methodologies used capitalise and assess risk (Kaylene, 2016).

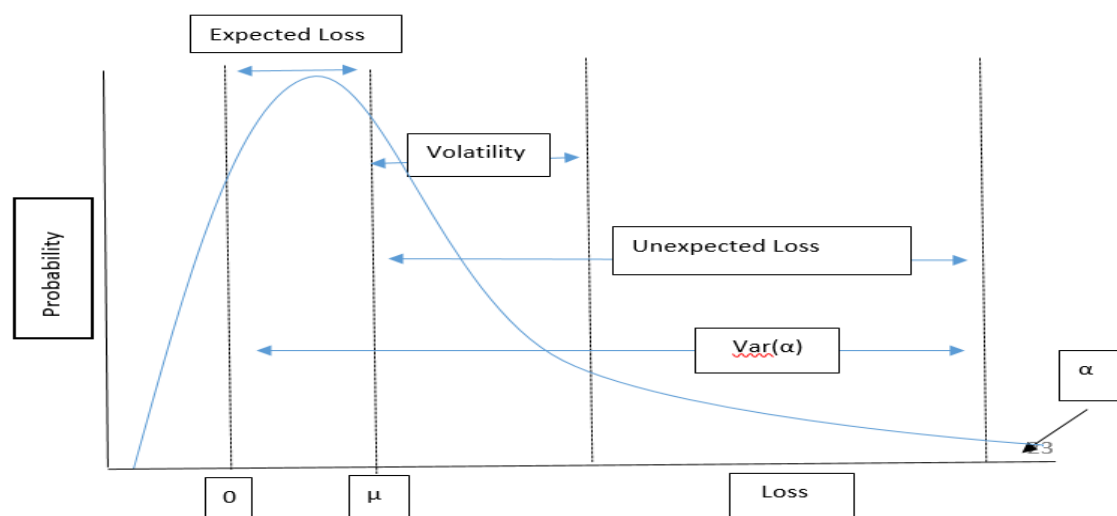
Doff (2008) defines business as a risk that occurs when operating income is lower than what is due to lower than expected revenues. Examples include when they are lower margins, market downturn and lower market share or a scenario where they are higher than expected costs, which are not caused by one of the other aforementioned risk types. They are two primary potential sources of business risk. Firstly, inflexible cost structures, which include pricing, uncompetitive products and structural inefficiencies and secondly, revenue volatility, which include macroeconomic conditions/factors (Doff, 2008). Kaylene (2016) cites two factors that affect the degree of business risk, namely the degree of systemic risk in the market and the competitiveness of the market.

Larsson (2009) defines business risk as the risk that is associated with uncertainty in the business conditions, which include technological progress market environment and client behaviour. The uncertainty in business conditions materialises through fees, earnings uncertainty in margins, costs, the size of the fixed cost base and volume. Moreover, business, market and credit risk are the significant risks within a bank and they correspond to approximately 92% of total risks within total economic capital (Larsson, 2009). The aforementioned findings by Larsson (2009) lines with Kaylene (2016) findings indicating that these are the major risk in calculating total risk within economic capital. Kaylene (2016) further states that banks should hold business risk economic capital of about 5-10% of the total economic capital. Larsson (2009) uses a regression model to calculate business risk, Doff (2008) used three methodologies, which included statistical methods, peers/analogue company approach and scenario method. Kaylene (2016) used earnings volatility models.

3.3.3 Methods used calculate Economic Capital

A common definition of economic capital by Larsson (2009); Al Janabi (2011); Baer, Mehta and Samandari (2011); Farid (2015); Kaylene (2016) and Joshi (2018) includes that economic capital is an internal measure, an estimate of the worst-case possible, a specified confidence interval within a particular time horizon. The first methods used to calculate economic capital is known as the loss distribution method and was highlighted by the work of Kaylene (2016), see figure 3.3 for the illustration of this method. The figure below shows the distribution of loss and can be used to estimate economic capital, depending on the chosen confidence interval.

Figure 3.3: The Loss Distribution.



Source: Kaylene (2016)

According to Kaylene (2016) unexpected loss, which is economic capital can be calculated by subtracting the expected loss from the value at risk at a certain alpha. Farid (2015) has a similar figure as that one shown in Figure 3.3, however, the space that is shown as volatility is not included. Farid (2015) figure only shows an expected loss (EL), unexpected loss (UL), the potential loss and value at risk. According to Farid, 2015 and Kaylene (2016) one of the many formulae to calculate economic capital is the one shown in Equation 3.1:

$$EC (\text{Unexpected Loss}) = \text{Value at Risk (VaR}_\alpha) - \text{Expected Loss (EL)} \quad (3.1)$$

Farid (2015) states that one can estimate economic capital using changes in shareholders' equity by employing the return series method, which will be used in this research. Farid (2015) adds that one can also use leverage ratio to estimate economic capital because economic capital is seen as an internal performance measure. According to Ifeacho and Ngalawa (2014) the use of financial ratios is the traditional performance measures that prospective shareholders can use to make investing decisions. However, the major drawback of using financial ratios is the fact that one needs to have an accounting background (Ifeacho and Ngalawa, 2014). Another drawback with the leverage ratio, especially when estimating economic capital, is that setting the threshold level was is very subjective (Farid, 2015).

Another method is calculating risks (credit, market, operation, business) within economic capital individually and then combine them (Larsson, 2009; Hu, Levy and Zhang, 2013; Kaylene, 2016). Nonetheless, the drawback of estimating these risks individually is assigning the respective variables (Larsson, 2009). Another drawback as stated by (Kaylene, 2016) who estimated business risk economic capital was that banks, for instance, ABSA, FirstRand and Capitec had not disclosed what they consider to be business risk. It worth noting that it was during the time of her study. Another drawback as stated by Hu, Levy and Zhang (2013) who tried to use credit models as a proxy for economic capital was that the range of study is restricted to one year for the estimation to be accurate. The return series method, which will be employed in the research, will estimate total economic capital without breaking them down as estimation of individual risks.

Another method used to calculate economic capital is to used copula methods (Farid, 2015; Semenov and Smagulov, 2017; Joshi, 2018). According to Cherubini et al. (2005) and Semenov and Smagulov (2017) copulas are robust frameworks for modelling dependence between risky assets by generalising linear correlation. Semenov and Smagulov (2017) add that copula methods include value at risk, conditional value at risks, Gaussian (normal) distribution and

other statistical methods. Kaylene (2016) states that statistical methods include scenario analysis, time series analysis, Monte-Carlo simulation and regression analysis. Basel Committee (2003) groups statistical methods as simulation methods (those which involve ranking by order), historical data methods (those that involve ordering by size and percentile) and analytic methods (those that involve maths formulae on historical data). The major disadvantage with estimating economic capital with copulas is that the methods are very technical and have various modelling assumptions, unlike the return series method, which is simplified (Farid, 2015).

Another way to estimate economic capital is by using a linear equation, as was stated by Majumder and Li (2018) in the Bangladesh case. Larsson (2009) argues that the major disadvantage with using linear models is that they are cases where the data in research is non-linear and the researcher tasked to employ non-linear models, for example, logit models and autoregressive models.

3.3.4 Other Performing Measures

Ordinary shareholders also look at other performance and efficient indicators to make investing decisions. According to Ifeacho and Ngalawa (2014) ordinary shareholders can collectively use capital adequacy, asset quality, management, earnings and liquidity (CAMEL) as a model of evaluating bank performance. Hendrick (2014) cites that, before Goldman Sachs invests in a company, it looks at the market for the product or service, defensive barriers, the growth opportunities of the company and the management team, of which these factors are similar to “CAMEL”. Another study that states the same factors as “CAMEL” factors is that of Hudspeth (2018), who states performance measures include business model, competitive advantages opportunities, revenue streams, profit margins, price to earnings ratio and net income. One major disadvantage with using management’s assessment, as was stated by Ifeacho and Ngalawa (2014), using business models as proposed by Hudspeth (2018) and management team as proposed by Hendrick (2014) is that these factors are qualitative and very subjective.

Moreover, the main disadvantage with trying to understand multiple factors to makes an investment decision is that it can be time-consuming and one needs to be well vested in the respective fields (Ifeacho and Ngalawa, 2014). Nonetheless, economic capital is an indicator that gives prospective and /or ordinary shareholders the number of worst-case odd and the probability of intervention of which this can be seen as a defensive barrier as was proposed by

(Hendrick, 2014). Economic capital also includes all of the “CAMEL” factors except the management aspect (Farid, 2015).

The tradition performance indicator that is used by most prospective shareholders is the use of financial ratios to make investment decision (Nachane and Ghosh, 2001; Elton et al., 2014; Ifeacho and Ngalawa, 2014; Farid, 2015; Ramadan, 2016; Majumder and Li, 2018). Elton et al. (2014) state that in the case of investing in a bank, ordinary shareholders and prospective shareholders should look specifically at the price to book ratio. Ifeacho and Ngalawa (2014) and Majumder and Li (2018) state that for bank performance, one should look at the Return on Assets (ROA) and Return on Equity (ROE). Majumder and Li (2018) further suggest also to use the Capital Adequacy Ratio (CAR). Nachane and Ghosh (2001) cite that one should look at the fixed capital to total assets ratio. Mabwe and Webb (2010) terms the use of ratio to make investment decisions; financial ratio analysis (FRA). The first disadvantage with financial ratio analysis is the fact that they need someone who understands accounting principles (Ifeacho and Ngalawa, 2014). Secondly, using CAR as suggested by Majumder and Li (2018) does not protect shareholders because CAR is a regulatory measure and according to Larsson (2009) and Kaylene (2016) regulatory measures only protect demand depositors and the financial sector as a whole. Economic capital is a better performance indicator because it incorporates some ratio and financial statements (Farid, 2015).

Due to the advancements in management, another performance measure/indicator/method in terms of efficiency is Data Envelopment Analysis (hereafter DEA) (Okeahalam, 2006; Mabwe and Webb, 2010; Mlambo and Ncube, 2011). According to Mlambo and Ncube (2011) DEA estimates the efficiency score for any business entity by solving linear programming. However, According to Ifeacho and Ngalawa (2014) the main disadvantage of the DEA methods is that it is imprecise and very subjective.

3.4 Empirical Evidence

The study on economic capital and ordinary shareholders is not a new concept. However, within the South African economic environment, this concept is new and this study seeks to fill the knowledge gap in the South African context. As a result, there is limited empirical literature that is available which are discussed and presented below.

3.4.1 International studies

Looking at internationally related studies, Farid (2015) investigated the top 5 Wall Street banks. These banks were Goldman Sachs, Citibank, JP Morgan Chase, Wells Fargo and Barclays Bank at the time of the study. It is worth noting the two alternative methods to Copulas that (Farid, 2015) used in the study will be employed in this research. The findings are tabulated in Table 3.1:

Table 3.1: International Banks in South African and Economic Capital (EC) Shortfall

<u>Bank</u>	<u>E.C Shortfall</u> <u>Method 1</u>	<u>EC Shortfall</u> <u>Method 2</u>	<u>Probability of</u> <u>Intervention (%)</u>
Goldman Sachs	-24	-11.1	0.05
Citibank	11	23.6	23.20
JP Morgan Chase	-7	85.5	31.23
Wells Fargo	-23	13.5	8.74
Barclays Bank	2	11.3	15.34

Source: Farid (2015)

From Table 3.1, there is no doubt that Goldman Sachs is the safest investment option for existing and/or potential ordinary shareholders in general. If we used Farid (2015) method one results, Barclays and CitiBank could not withstand three consecutive worst-case losses, thus there is in need for capital injection for these banks to protect their shareholders. Method one results prove that Goldman Sachs, Wells Fargo and JP Morgan actively protect their ordinary shareholder and there is no need for capital injection for these banks. As per method two results, except for Goldman Sachs, all the other four banks do not protect their existing ordinary shareholders and there is a need for a significant injection of economic capital. Since method two includes both economic shortfall and the probability of intervention, it is worth noting that, even though Wells Fargo needs capital injection, its probability of intervention is still in an acceptable range (Farid, 2015). This mainly because Farid (2015) used a z-score of 2.05, which is regarded by the author himself as high. According to Enders (2015) a z-score of 2.05 translate approximately to a 96% confidence interval.

Other studies included risk modelling and involved certain aspects of economic capital, which are worth noting at this point. Firstly, they was a case of Bangladesh that tested whether bank capital affected bank performance by Majumder and Li (2018) and included the concept of

economic capital. The study concluded that the higher the capital, the higher the performance. Another study was by Al Janabi (2011) where the author assessed economic capital under market liquidity risk. The finding after employing the value at risk concept was that Basel II requires credit, operational and market risk in the calculation of economic capital and not to single out one. Another study that looked at 16 Chinese banks and cited the concept of economic capital was by (Li et al., 2018). The author assessed bank risk aggregation using financial statements in an attempt to capture on and off-balance sheet risk. The findings included that off-balance-sheet activities affect total risk and off-balance credit risk is positively correlated to total credit risk. It is worth noting that the studies, by Al Janabi (2011); Li et al. (2018) and Majumder and Li (2018) included the concept of economic capital, but the authors did not explicitly look at the actual value of economic value

3.4.2 South African Studies

In her study, Kaylene (2016) found that two of the six major banks in South Africa hold and publicly disclose economic capital and business risk economic capital. Nedbank Group and Standard Bank Group had R41.1 million and R88.1 million total economic capital, respectively. According to these results, Standard Banks protects its ordinary shareholders more, can withstand worst-case shocks and its probability of intervention is likely to be low. Kaylene (2016) was mainly focused on business risk economic capital and recorded that from the above total economic capital, Nedbank Group and Standard Bank Group had R4.9 million and R5.88 million business risk economic capital, respectively. Percentage-wise, Nedbank and Standard Bank had 11.9% and 6.6% respectively and this was business risk economic capital as a percentage of total economic capital. FirstRand and, Barclays Africa, Investec and Capitec do not hold capital for business risk. Capitec Bank and First Rand only disclose business risk in the form of material risk, but both banks do not require capital, which can act as a buffer against the risk. Investec and Barclays Africa do not mention business risk at all in their public disclosures, which left suspense if the two banks considered business risk (Kaylene, 2016). There is not much research in the case of South Africa in general, which validates the need for this research.

Kaylene (2016) also went on to look at the international bank annual reports and found the following findings. The banks under her research were Nordea Bank, International Netherlands Group (ING Group), Royal Bank of Canada, Rabobank, Hong Kong and Shanghai Banking Corporation (HSBC), Union Bank Switzerland (UBS), Credit Suisse, Deutsche Bank,

Scandinavian Individual Bank (SEB) and Banco Santander (Spain). Even though all banks provide a business risk definition, only six of the ten banks hold business risk economic capital and these are were Nordea Bank, ING Group, Royal Bank of Canada, Deutsche Bank and SEB. Business risk economic capital as a percentage of total economic capital for these international banks ranged between 0% - 10% (Kaylene, 2016). The total economic capital for these international banks are shown in table 3.2:

Table 3.2: Economic Capital for a sample of International Banks

Bank	<u>Country of Origin</u>	<u>Total Economic Capital</u> <u>(R's in Millions)</u>
Nordea Bank	Sweden	23.9
ING Group	Netherlands	30.1
Royal Bank of Canada	Canada	45.6
Rabobank	Netherlands	23.4
HSBC	Germany	0
UBS	Switzerland	0
Credit Suisse	Switzerland	33.2
SEB	Sweden	108
Deutsche Bank	Germany	31.9
Banco Santander	Spain	66.8

Source: Kaylene (2016)

From table 3.2, of all the international banks, SEB protects its ordinary shareholders the most while, HSBC and UBS protect their ordinary shareholders the least. In the words of Farid (2015), SEB can withstand the most worst-case financial shocks and is likely to have the lowest probability of interventions (be it market-based or regulatory based intervention). On the other hand, HSBC and UBS have insufficient capital to protect exiting ordinary shareholders. They are likely to have the highest probability of intervention in the event of a financial crisis/shocks. Policy implementation is most likely to be capital injections for HSBC and UBS (Farid, 2015).

3.4.3 Other performance and efficiency indicators (South African Cases)

Various authors, including Okeahalam (2006); Mabwe and Webb (2010); Mlambo and Ncube (2011) and Ifeicho and Ngalawa (2014) have looked at the South African banking sector's performance and level of efficiency using various methods, models and tools. The most

common aspect in all these researches is the fact that they would use either the top four or five banks in the banking sector as a proxy for the whole sector because of their hold most of the total assets and deposits. The authors mentioned above did not individually compare the top four or five banks between themselves but wanted to see the sectoral performance, efficiency and/or establish relations between various variables or ratios.

Ifeacho and Ngalawa (2014) assessed the performance of the banking sector using CAMEL. They found out that capital adequacy was positively related to return on equity as expected by negative related to return on assets. Moreover, liquidity, asset quality and management are positively related to the performance of the sector. Mabwe and Webb (2010) used financial ratios, mainly ROA and ROE to analyse the performance before and after the 2008 financial sector. It is worth noting that at the time of the study, Imperial Bank was part of the top five banks alongside the usual Absa, FirstRand, Nedbank and Standard Bank. The findings of this research were as follows; from 2005 – 2007, performance increased due to high net interest, which generated more income, which leads to high ROA and ROE. However, from 2007 – 2009, there was a decrease in the performance which was exhibited by decreasing ROA and ROE.

Mlambo and Ncube (2011) researched competition and efficiency using Data Envelopment Analysis and Panzar-Rosse approach, respectively, on the South African banking sector. The main findings were that individual bank's efficiency was downward trending due to lack of competition, but the average industry efficiency was upward trending. Okeahalam (2006) looked at production efficiency using stochastic analysis. The main findings were that there is room for efficiency to be improved; however, the low level of competition is a hindrance.

3.5 Conclusion

It is a well-known fact that the financial sector is protected by a combination of regulatory capital and economic capital (Larsson, 2009; Farid, 2015; Kaylene, 2016). Regulatory capital is a pillar 1 of Basel III accord (Minimum Capital Requirements), which is aimed at protecting depositors. Moreover, the financial sector as a whole and economic capital have been equated to pillar 2 of the Basel III accord (Supervisory Review Process), which is meant to protect ordinary shareholders (Kaylene, 2016). Regulatory capital has had its shortcomings, which are evident through endless financial shocks, but at least there has been growing concern about the concept. There has been improvement introduced to always make the financial sector, especially depositors protection safety, unlike the concept of economic capital. Investors,

especially ordinary shareholders, are exposed daily to higher risk due to financial shock and since economic capital is not required, financial institutes tend to take advantage of this and not keep any.

The concept of economic capital can be seen as a performance measure, where an ordinary shareholder can measure the amount that is internal left aside for their protection after a worst-case loss is taken into account. The higher the economic capital, the less the diversifying risk, thus, the less the mean returns (Larsson, 2009). There is a trade-off between economic capital and return and banks need to strike some balance between the two and not neglect one. Besides diversifying risk, there are various risks within economic capital and these include operation, market, business and credit (Larsson, 2009; Kaylene, 2016; Li et al., 2018). A positive economic capital is equivalent to a negative economic capital shortfall and favourable and the opposite is true (Farid, 2015).

There are various ways to measure economic capital which include Copula, calculating individual risk within economic capital and combining them, regression analysis, scenario analysis, time analysis, Monte Carlo Simulation and Return Series Method (Larsson, 2009; Kaylene, 2016; Semenov and Smagulov, 2017; Majumder and Li, 2018). However, this research will employ two of the three return series models, because of the minimum level of requirement that South African abides by. The return series methods are heavily influenced by the minimum required level and South African regulators prefer capital adequacy ratio. In contrast, the United States of America regulators prefer to use leverage ratio and that why the Historical Simulation Model and Variance Covariance Models are used in this research and not the Leverage Ratio Model (Farid, 2015).

The use of both methods in the calculation of economic capital helps to make a concrete investment decision even though there are differences in the value of economic capital shortfalls. The difference in economic shortfall results is mainly due to the difference in confidence intervals and as mentioned by the author that method one is quite subjective (Farid, 2015). The lack of studies that look at economic capital, in general, provides a reason to undertake this research, let alone there has not been a study that looks at the economic capital in the case of South Africa using the shareholders' equity.

Chapter 4: Methods, Procedure and Techniques

4.1 Introduction

They are various methods/models of calculating economic capital, namely; Copulas, return series approach, Tier 1 leverage ratios as stated by Farid (2015), risk equation formulation as stated by Majumder and Li (2018) and as cited by Kaylene (2016), Monte Carlo Simulations, scenario analysis and regression analysis. It is worth noting that some of the methods overlap each other, and at the time, authors might have the same name with a completely different design. This study will employ an alternative to Copulas approach called the return series approach (Farid, 2015). The return series approach has advantages over other methods because, Firstly, it has more than one sub-model, thus if all the results in the sub-model calculations calculation, a better and more concrete decision can be made. Secondly, the return series approach is quantitative, thus less subjectivity. Thirdly, the approach encompasses some traditional methods performance methods that have can be used to make investment decisions, for example, financial ratio analysis. Lastly, the return series approach can be used in conjunction with other performance and efficiency models.

The return series approach has two sub-models under it, namely the Historical Simulation Model and Variance-Covariance Model (Farid, 2015). This chapter is structured in the following way; firstly, it is the research paradigm and then the research design follows. The research design consists of the theoretical framework, model specification, data source, size and description, estimation techniques and test. Variables under study are defined during the diagnostic test and the last part of the chapter is the conclusion.

4.2 Research paradigm

The most common definition of a research paradigm is “worldview” (Kivunja and Kuyini, 2017). The worldview aspect stems from the fact that it is a set of shared beliefs, or perspective, or school of thought, or thinking which informs the interpretation of meaning research data and findings. According to Jensen, Mautner and Silverman (2005) worldview is a set of logical assumptions and/or a pattern of thinking. This research is very quantitative and the taxonomy is a positivist (Jensen, Mautner and Silverman, 2005; Kivunja and Kuyini, 2017). Using Jensen, Mautner and Silverman (2005) criteria, this research is positivist is because it has a real given objective which is to calculate and compare the economic capital of the top five commercial banks in South Africa, as well determining a threshold level which protects ordinary shareholders. Moreover, the research has real measurable properties, which include ordinary

shareholder prices, price returns, respective tier 1 capitals and the actual capital adequacy ratio/requirements. Thirdly, the research employs two mathematically and statistically inclined models that emphasise on quantitative data.

Kivunja and Kuyini (2017) state that there are four validation criteria for positivity and these are internal validity, external validity, reliability and objectivity. According to Kivunja and Kuyini (2017) internal validity is when an independent variable is a cause in variation for the dependent variable. This research yields high internal validity because significant fluctuation in ordinary shareholders' prices increases the amount of economic capital that is needed to guarantee that ordinary shareholders will be protected. If we look at external validity, which is the degree to which the results found in a study can be generalized or models used can be used elsewhere, as was stated by Kivunja and Kuyini (2017). The return series method to calculate economic capital can be used by any prospective or ordinary shareholder to make an investment decision. However, there is a need for the share prices and/or returns to be publicly available or obtainable and the need for the company to state their required capital adequacy level (Farid, 2015).

Kivunja and Kuyini (2017) define reliability as stability or consistency of the results in the research and the method in the research was adopted from Farid (2015) who looked at similar study for Wall Street banks and produced consistent results. Objectivity is a broad criterion that can be simplified to the degree to utilise precise instruments, with honesty and approach the research without bias while remaining open-minded to suggestions from other participants in the research (Kivunja and Kuyini, 2017). The data used in the method and analysis in this research is obtained from a well-trusted source, for example, IRESS (formally known as INET BFA), Thomson Reuters Data-Stream and colleagues and supervisors input was significantly taken into account.

According to Kivunja and Kuyini (2017) if the taxonomy of research is positivistic in nature, then it can also be objective epistemology, beneficence axiology, experimental methodology and naïve realism ontology. It is objective epistemology because there is a need for human reasoning and understanding. It is beneficence axiology because of the need to come out with excellent results. It is experimental methodology because there is a need for manipulation of one variable to another variable and naïve realism ontology because facts exist, the knowledge is justified and there is perception independence. The aforementioned taxonomies tick all the boxes of validating that the research is positivistic. The debates on taxonomies/paradigms can

go on and on. Nonetheless, in simpler terms, this research is quantitative and follows positivistic taxonomies Kivunja and Kuyini 2017).

4.3 Research Design.

4.3.1 Model Specification

They are two models that are used in this research; namely, the Historical Simulation Model (method one) and Variance-Covariance Model (method two) were adopted from Farid (2015) paper. It is worth noting that Farid (2015) used three alternative models for calculating the value of economic capital to come up with a concrete decision on which bank protects its existing ordinary shareholders the most. However, the third method, which uses Leverage ratio, will not be employed in this research because leverage ratios are the preferred regulatory ratio in the United States of American, unlike in the South African case, which prefers risk-weighted assets. In both models to be employed in the research, the independent variable is the ordinary shareholders' equity prices and the depended is economic capital (Farid, 2015)

4.3.2 Theoretical framework of Economic Capital

Economic capital as stated by Larsson (2009); Farid (2015) and Kaylene (2016) is a reflection of the inner strength of a bank to withhold or withstand an unforeseen event. The standard definition of economic capital is, that it is the minimum amount of equity capital that a financial business or an entity needs to set aside to absorb worst losses with a certain confidence level over a specified period to protect its ordinary shareholders (Cartwright, 2009; Kaylene, 2016; Joshi, 2018). Basel Committee (2003) and Larsson (2009) add the economic capital is the amount of capital that is needed to support business activities, which include investing in bonds, equity and long term debt. The financial sector of any country is vulnerable to shock, which can come in the form of poorly regulatory measures or just poor management and there is a need for ordinary shareholders to be protected (Wall Street, 2014). Protection in the form of economic capital informs a prospective and existing ordinary shareholder how long a business can withstand shocks or turmoil (Farid, 2015). Economic capital is an excellent indicator because it takes into account business, credit, diversifying, market and operating risk (Larsson, 2009; Farid, 2015; Kaylene, 2016). The higher the economic capital or, the lower the economic capital shortfall, the better to protection on ordinary shareholders; however, this means there is low diversification and low returns for that business entity.

4.3.3 Definition of variables

Economic capital is the minimum amount of equity capital that a financial business or entity needs to set aside to absorb worst losses with a certain confidence level over a particular time horizon which is usually one year (Basel Committee, 2003; Cartwright, 2009; Larsson, 2009; Al Janabi, 2011; Farid, 2015; Kaylene, 2016; Joshi, 2018). A positive value of economic capital is equivalent to a negative value of economic capital shortfall and the more the economic capital, the safer the existing shareholders invested in that financial institutions and prospective ordinary shareholders who seek protection are attracted (Farid, 2015). There is a trade-off between the value of economic capital and return on investment (Larsson, 2009)

Net income is the difference between sale and expenses while at the same time, taking into account interest acquired and tax paid (Farid, 2015; Kaylene, 2016). Net income can be used to determine the profitability of a company; the higher the net income *ceteris paribus*, the more profitable the business.

Tier 1 Capital, also known as Core capital and consists of common shares, retained earnings', marketable debt, minority interest in the equity account of the subsidiaries, non-mortgage servicing rights and intangible assets less goodwill (where identifiable) (Farid, 2015). Basel III accord explicitly states that tier 1 capital should always be higher than tier 2 capital (Admati et al., 2013; Wall Street, 2014; Farid, 2015). According to Farid (2015) tier 1 capital can further be divided into two, namely; common equity capital and non-core tier capital

Tier 2 Capital is also known as supplementary or supplementary capital and it includes long term subordinated debt, bonds issued by corporations, non-qualifying hybrid instruments, lease losses, allowance and asset-backed securities (Wall Street, 2014; Farid, 2015). According to Farid (2015) tier 2 capital is also divided into two, namely upper and lower tier 2 capital

Excess Capital is the subtraction of regulatory capital from the core or tier 1 capital to remain with an amount which acts as a buffer against financial shocks (Farid, 2015).

Price to Book is a ratio that is obtained by dividing the share price of a business entity by its book value per share and a high price to book indicates overvalued stock (Elton et al., 2014). The ratio is calculated as follows:

$$\text{PBR} = \frac{\text{Share Price}}{\text{Book Value of Equity}} \quad (4.1)$$

Where: *Book value of Equity = Book Value of (Assets – Liabilities)*

Price to Earnings is a ratio that shows the amount that an investor is willing to pay for a single unit of earning (Elton et al., 2014; Ifeacho and Ngalawa, 2014). The following is how the ratio is calculated:

$$PE = \frac{\text{Price per Share}}{\text{Earning per Share}} \quad (4.2)$$

Return on Assets is a ratio that shows the ability of management to obtain deposits at an equitable cost and invest in profitable investments (Mabwe and Webb, 2010; Ifeacho and Ngalawa, 2014). It is the value of net income generated for each rand of an asset. The more the return on assets, the more the business entity is and it is calculated as follows:

$$ROA = \frac{\text{Net Profit}}{\text{Total Assest}} \quad (4.3)$$

Return on Equity is the ratio that shows the rate of return to shareholders and it shows the growth potential of a business entity or the profitability of a financial institute (Mabwe and Webb, 2010; Ifeacho and Ngalawa, 2014). It is the return on each rand of equity invested in the financial institute. The following equation is how it is calculated:

$$ROE = \frac{\text{Net Profit}}{\text{Total Equity}} \quad (4.4)$$

4.3.4 Data Description and Sources

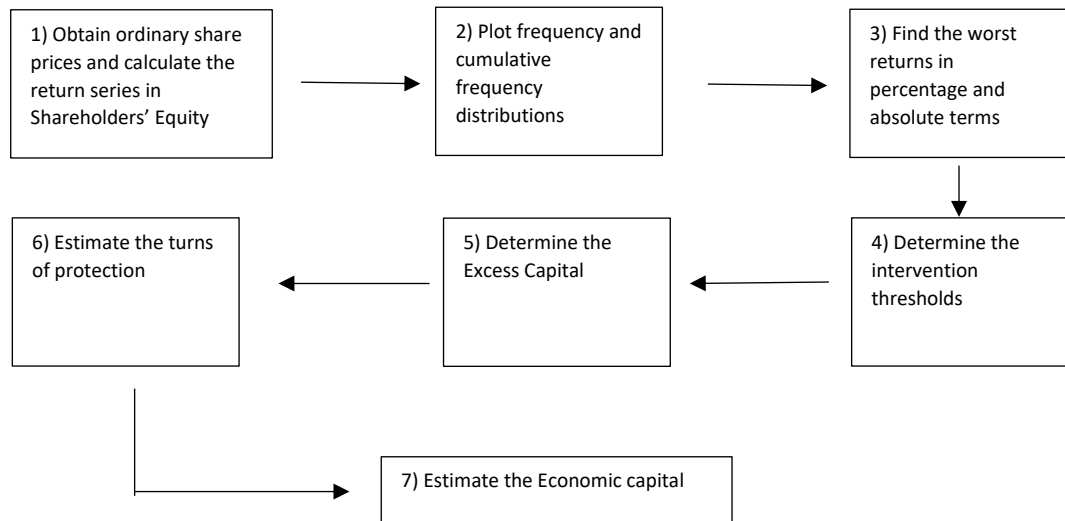
Group data for ordinary shareholders' equity prices were collected mainly from IRESS (formally known as INET BFA or by McGregor BFA) and Thomson Reuters DataStream was used to confirm the legitimacy of the data for the top five commercial banks over a ten year period. The coverage period was from June 2009 to May 2019 in month frequency and totalled 120 observations. The reason for the coverage period is mainly to cover the Basel III phase. Additional information, for example, financial statements and ratios, were obtained from IRESS for uniformity and the bank's respective site were used for confirmation. The five commercial banks under study are Amalgamated Banks of South Africa (ABSA), Capitec, FirstRand, Nedbank, and Standard Bank, which to a more considerable extent, represent the banking sector in South Africa. The five banks collectively account for an estimated 90.53% of the market share in South Africa (SARB, 2019a).

4.3.5 Estimation Techniques.

Historical Simulation Model (Method one) Steps

The following steps are what (Farid, 2015) terms as the historical simulation model, an alternative way of calculating economic capital. The steps are evidence that this model is simple and uses raw data.

Figure 4.1 Historical Simulation Model



Source: Farid (2015)

Assumptions, Advantages and Disadvantages of Method 1

Kivunja and Kuyini (2017) state that a positivistic worldview has some dependence on assumptions and Farid (2015) states the following as the assumptions of historical simulation. The first assumption is that there is no mid-year balance sheet, even though technological advances have managed to change that; however, for consistency sake, absolute changes in shareholders' equity are as at 31 December 2018. Secondly, best intervention models believe that regulators and the market will act before capital fully depletes. The third assumption is that each bank has its distribution and not all of them are considered to be normally distributed. The last assumption is that the amount that will act as a buffer for future losses is the stock of excess capital. These assumptions raise some advantages and disadvantages. The major advantages of the historical simulation are that it is a simple calculation and the fact that it works with the correct underlying distribution. However, the model is rigid in calculating the probability intervention and tends to have some subjectivity when it comes to choosing a fair number of consecutive shocks (Farid, 2015).

Step 1: Calculate the monthly returns for the changes in shareholders' equity

After the data is collected from IRESS Database, the first step was to calculate the monthly return over the ten years for the five commercial banks. The measuring rate of change from one month to another was approximated manually by finding the difference between the two months closing prices and then dividing by the closing previous month closing price as a percentage, as was stated by Farid (2015). The historical simulation model seeks to keep data as raw as possible, thus the reason why the logarithmic returns or compounded returns were not taken into account for calculating returns. Moreover, Model A does not make the assumption of normality for the distribution of banks and when logarithms returns are used, the returns tend to be normalised

Step 2: Plotting the Frequency and Cumulative distribution

The second step is to plot the frequency and cumulative frequency distribution of the five commercial banks (Farid, 2015). To come up with a frequency distribution or cumulative distribution graph, they is need to come up with a table consisting of the intervals, the frequency in-between the ranges, cumulative frequency and cumulative frequency percentages. The intervals emanated from the ranges, thus the difference between the minimum and maximum changes in shareholders' equity. The ranges were then divided by the 16 to create 16 groups or classes. Cumulative frequency were calculated next by the count-if function in excel and the count-if function was set to count of the changes were below the upper bound of the interval. The cumulative frequency was tabulated and frequency for the interval was calculated. The frequency for each interval as calculated by subtracting the previous frequency from the previous one and results were recorded. The cumulative percentage was calculated next by dividing the cumulative frequency by total observation as a percentage.

Step 3: Worst Returns in Percentage and Absolute terms

The worst return in percentage terms is/was the minimum return percentage in the 120 observation. The minimum function in excel was used to find the worst series return and the frequency and cumulative distribution graphs were used as confirmation as the worst return for each bank was the lowest bound on the graph.

Step 4: The Determination of the Intervention Threshold

According to Farid (2015) the intervention threshold is the minimum capital adequacy requirement level. Farid (2015) assumed it to be 10% of their risk-weighted assets. The reason he assumed it to be 10% is that his study was on top five Wall Street Banks who are governed and use leverage ratio as their minimum capital adequacy. This research is on South African banks who abide by the 10% of risk-weighted assets; thus, there is no need to assume 10% (Absa Group, 2019). Absa Group (2019) states that risk-weighted assets is calculated by assigning a certain degree of risk to assets according to international standards. One assumption concerning this model is that regulators and the market will intervene before capital has fully depleted (Farid, 2015). The aforementioned means that the stock of capital will not, in any case, be watched until it is fully depleted to zero.

Step 5: The Determination of Excess Capital

According to Farid (2015) excess capital, in general, is when you subtract regulatory capital from core capital and in the future, this excess capital acts as a buffer stock for losses. Another name for core capital is tier 1 capital and consisting of ordinary share capital, equity capital, intangible assets and audited revenue reserves (retained earnings). Farid (2015) questions what this buffer stock protects? and how many unlikely events can fully deplete it? Excess tier 1 capital is the difference between tier 1 capital and the required tier 1 capital (which was the 10% of the risk-weighted assets) (Farid, 2015).

Step 6: Estimating Turns of Protection

According to (Farid, 2015) the turns of protection are the loss bearing capacity of excess capital that a financial institute can withstand. The formula for turns of protection is as follows:

$$TP = \frac{\text{Excess Tier 1 Capital}}{\text{Net Income} * \text{Annualised Volatility}} \quad (4.5)$$

The turns of protection are how fast excess tier 1 capital is depleted by annualised volatility multiplied by net income. The higher the value of turns of protection, the safer the bank is at protecting its ordinary shareholder (Farid, 2015).

Step 7: Estimating Economic Capital.

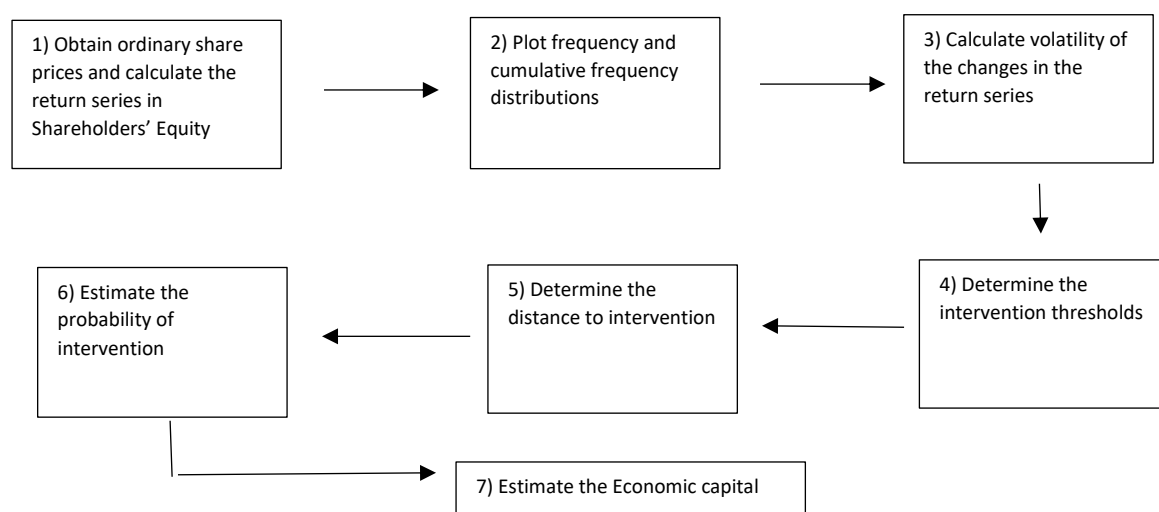
According to Larsson (2009); Farid (2015) and Kaylene (2016) economic capital is depended mostly on the number of worst cases (which in this case are represented by consecutive shocks) and the chosen confidence interval. We shall start with one shock, which is represented by one

target turn and according to Farid (2015) a single worst-case loss has a probability of an occurrence of 2.04, which coincides with a confidence interval of 98%. The estimation of the value of economic capital is estimated in four sub-step. The first sub-step is to assign the target turns to be one since we are assuming one shock at a 98% confidence interval. The second sub-step is to find the target buffer, which merely the absolute amount of one shock at the 31 December 2018 share price (for consistency sake with other balance sheet components). The third sub-step is to calculate the total required capital, which is adding the target buffer to the required tier 1 capital (the 10% of the risk-weighted assets). The last sub-step is to estimate the economic capital shortfall by subtracting tier 1 capital from the total required capital. Farid (2015) states that it is a known fact that tier 1 capital will always be higher than the total required capital thus, a negative economic capital shortfall is favourable and prospective ordinary shareholders should invest in such a bank. Whereas, a positive economic capital shortfall is unfavourable and prospective ordinary shareholders should look for better investment opportunities. In terms of ordinary shareholders who are invested in a bank with a negative economic capital shortfall, they are likely to continue with their investment, while those who are invested in a positive economic capital shortfall are likely to pull out of that investment but should in an orderly manner.

Variance Covariance Model (Method two) Steps

The second models’ steps are more or less like the first models’ step except for three steps and these include calculating volatility, determining the distance to intervention and estimation the probability of intervention. The steps for the model are shown in figure 4.2:

Figure 4.2: Variance Covariance Model



Source: Farid (2015)

Assumptions, Advantages and Disadvantages of Method 2

Similarly to the first method/model, the worldview for the second model is positivistic as well and it has its assumptions. According to Farid (2015) the assumptions for the second model are that the model assumes that the bank's distribution are normally distributed and similarly to the assumption of the first model, the model assumes regulators and the market will act before capital fully depletes. The main advantages of model two are that it provides flexibility in the estimated probability of intervention and model two has fewer assumptions than model one. Nonetheless, the variance-covariance model is affected by extreme scenarios, which in turn, then affects averages. The second disadvantage is assuming that all the bank's distributions are normally distributed. The last disadvantage is the subjectivity when it comes to choosing the number of sigma movements (Farid, 2015).

Diagnostic test for Model B

As was stated earlier, four steps of Model B are similar to those of Model A and these steps are step 1 which is about calculating the return series, step 2 which is deals with plotting distribution, step 4 which states our intervention threshold and step 7 which deals with economic capital (Farid, 2015). Step 1, 2 and 4 will be omitted; however, step 7 will be included because of the difference in the value of economic capital shortfall.

Step 3: Calculating Volatility and Annualised Volatility of the Changes in Shareholders' Equity.

According to Farid (2015) volatility is measured by standard deviation and it is a simple extension of the value at risk of the return series model. Since the frequency is monthly, the volatility is calculated from month to month. The excel sample standard deviation function will be employed on each of the bank's 120 return series observations to come up with the volatility of each bank. To annualise volatility, the volatility will be multiplied by the square root of 12 because of the monthly frequency.

Step 5: The Determination of the Distance to Intervention Threshold.

According to Farid (2015) there are three sub-step to obtain the distance to intervention threshold. The first sub-step is to obtain the absolute annual amount of a one-unit movement by multiplying the annualised volatility by the most recent shareholders' equity. For the sake of consistency and as stated earlier in the chapter, the shareholders' equity that will be used will be as at 31 December 2018. The result of a one-unit annualised volatility multiplied by the

ordinary shareholders' price as at 31 December will be termed as a one sigma loss (Farid, 2015). A two-sigma loss is when the unit of annualised volatility doubled and then multiply by the closing share price. A three-sigma loss follows suit and so does a four sigma loss. The second sub-step is to calculate the excess tier 1 capital and it is the same as the historical simulation model. As was mentioned earlier, Farid (2015) defined excess tier 1 capital as the difference between tier 1 capital and the required tier 1 capital (which was the 10% of the risk-weighted assets). The last step is to calculate the distance to the intervention threshold, which is merely found by dividing the excess tier 1 capital by the one sigma movement in this case. Model B becomes different in the sense that Model A divided excess tier 1 capital by annualised volatility multiplied by net income. The assumption at this point is still that banks will experience one financial shocks.

Step 6: The Estimation of Probability of Intervention

The probability of intervention is the likelihood of the market or regulatory interfering (Farid, 2015). Banks might have a small distance to intervention threshold, but that does not mean that there is going to intervention. To obtain the probability of intervention, the NORMSDIST excel function was used to find the likelihood of getting a value less or an equivalent within a series that is normally distributed (Farid, 2015). The research estimated the probability of intervention using the formula below to obtain the estimates for the probability of intervention:

$$PI = 1 - [\text{NORMSDIST} (\text{Distance to intervention threshold})] \quad (4.6)$$

Step 7: Estimation Economic Capital

According to Larsson (2009); Farid (2015) and Kaylene (2016) economic capital is depended mostly on the number of worst cases (which in this case are represented by sigma movements) and a chosen confidence interval. For consistency sake, firstly, we will consider a one sigma movement at a 98% confidence interval as was proposed by Farid (2015) and we will calculate the corresponding economic capital shortfall.

Concerning the variance-covariance model, economic capital was obtained in three sub-step after estimating the probability of intervention. Firstly, a target buffer was calculated by multiplying volatility of shareholders' equity by the required distance. According to Farid (2015) a required distance of 2.05, which can be taken as a z-value coincides with a 98% confidence interval. The second sub-step is to calculate the total capital required and this is obtained by adding the target buffer to the required tier 1 capital (10% of risk-weighted assets).

The last sub-step is to calculate the economic capital shortfall, which is obtained by subtracting tier 1 capital from the total capital required.

The same description applied to the historical simulation model still applies to the variance-covariance model. For instance, the fact that tier 1 capital will always be higher than the total required capital thus, a negative economic capital shortfall is favourable and prospective ordinary shareholders should invest in such a bank. Whereas, a positive economic capital shortfall is unfavourable and prospective ordinary shareholders should look aside. Moreover, the existing ordinary shareholders who are invested in a bank that has negative economic capital shortfall should continue their investment. In contrast, those who are invested in a positive economic capital shortfall should pull out of that investment in an orderly manner (Farid, 2015).

Farid (2015) stated the addition of two critical aspects after the calculation of economic capital, firstly, a joint graph with distance to the threshold and economic capital shortfall can be constructed and secondly, to calculate the value of economic capital shortfall at various confidence interval. The higher the line of distance to the threshold from economic capital shortfall line, the safer the existing ordinary shareholders, or in other words, the lower the economic capital shortfall, the safer the existing shareholders in that bank. The confidence interval and the number of sigma movements can be increased as per the author's preference. One recommendations was to keep the number of sigma movements constant and increase the confidence intervals to be certain about the results (Farid, 2015).

4.4 Conclusion

In conclusion, the chapter was able to provide a mind map of how the value of economic capital is going to be estimated using two models, namely; Historical Simulation and Variance-Covariance from The Return Series Method. The variables used to achieve the goals in the earlier chapters have been defined, the taxonomies were been identified, assumptions have been stipulated and the respective steps to be taken. Chapter 5 will report the results, discuss results and find the possibility of links between certain variables.

Chapter 5: Results

5.1: Introduction

The purpose of this chapter is to report, discuss and provide possible economic variable relations. The main objectives which are addressed in this chapter are to calculate the value of economic capital (negative economic capital shortfall) at various confidence intervals, to find out the target turns that are required to wipe the respective value of economic capital and to find the possibility of a relationship between financial ratios and economic capital. The chapter is organised in the following way; the first section reports the steps of calculating the value of economic capital using the historical simulation model, then the second section reports the value of economic capital using the variance-covariance model and the third section reports the top five commercial banks financial ratios. The fourth section looks at the case of banks that have closed and the last section concludes the chapter.

5.2 Diagnostic Test for the Historical Simulation Model

5.2.1 Step 1: Calculate the monthly returns for the changes in shareholders' equity

Table 5.1 shows a snippet of return series for the top five commercial banks. The rate of change was calculated on a monthly frequency over ten years.

Table 5.1: The Rate of Change in Shareholders' Equity.

Group Returns					
Date	Absa	Capitec	FirstRand	Nedbank	Standard Bank
31/05/2019	2.89%	-1.31%	-1.49%	-1.50%	-0.13%
30/04/2019	7.99%	-0.99%	7.86%	5.90%	7.43%
31/03/2019	-15.78%	3.35%	-2.08%	-11.66%	-4.40%
28/02/2019	-2.27%	12.01%	-7.34%	-0.48%	-0.64%
31/01/2019	14.19%	4.31%	5.84%	4.02%	9.05%
31/12/2018	5.08%	1.64%	-1.86%	3.35%	2.07%
30/11/2018	3.28%	11.04%	3.87%	6.79%	7.26%
31/01/2010	4.47%	-2.37%	1.69%	-1.65%	6.72%
31/12/2009	0.78%	11.08%	5.58%	9.78%	6.47%
30/11/2009	2.40%	10.94%	-2.36%	-4.56%	-2.44%
31/10/2009	3.76%	4.92%	7.75%	-0.92%	1.08%
30/09/2009	-5.33%	10.91%	3.97%	3.67%	-3.33%
31/08/2009	7.87%	14.58%	4.68%	7.68%	7.62%
31/07/2009	6.82%	13.07%	7.89%	9.18%	5.28%
30/06/2009	8.32%	3.54%	3.00%	9.84%	7.52%

Source: Author

From the return series, Capitec had the highest mean return of 3.26%, followed by FirstRand, which had 1.50%, then Nedbank with 1.06%, then Standard bank with 0.90% and Absa last with 0.61%. A prospective ordinary shareholder who is return driven should invest in Capitec as it has the highest return and Absa should be the last option. An existing ordinary shareholder invested in Capitec, who is return driven, will continue invested in Capitec. However, an existing ordinary shareholder with the same goal but invested in Absa has a higher probability of pulling out their investment for the financial institute.

5.2.2 Step 2: Plotting the Frequency and Cumulative distribution

The second step is to plot frequency and cumulative distribution curves. The minimum return for each bank that was observed over the ten years was the starting point, then the range was divided into 16 data point and the upper bound was the maximum return. Below are the frequency and cumulative frequency distribution of the top five commercial banks under study;

Figure 5.1a: Absa

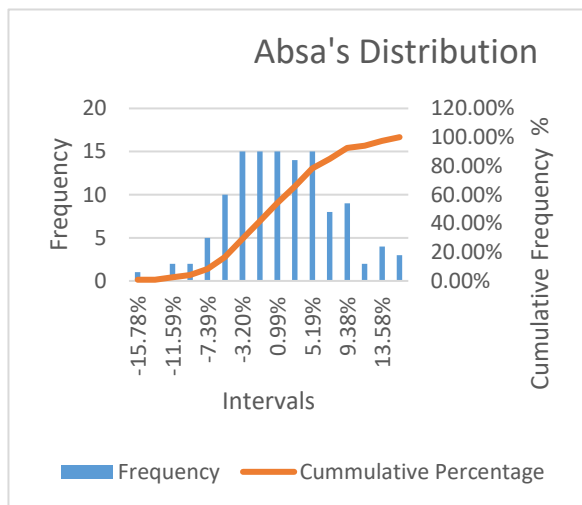


Figure 5.1b: Capitec

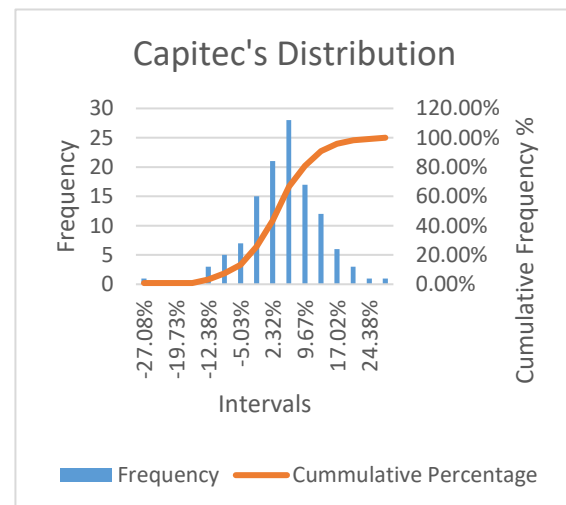


Figure 5.1c: FirstRand

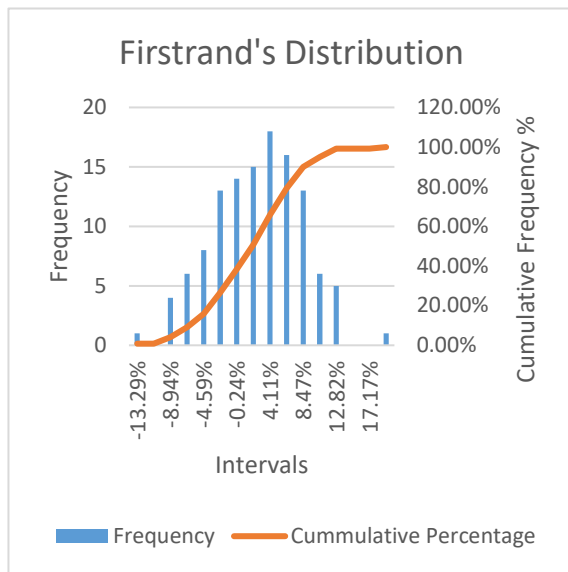


Figure 5.1d: Nedbank

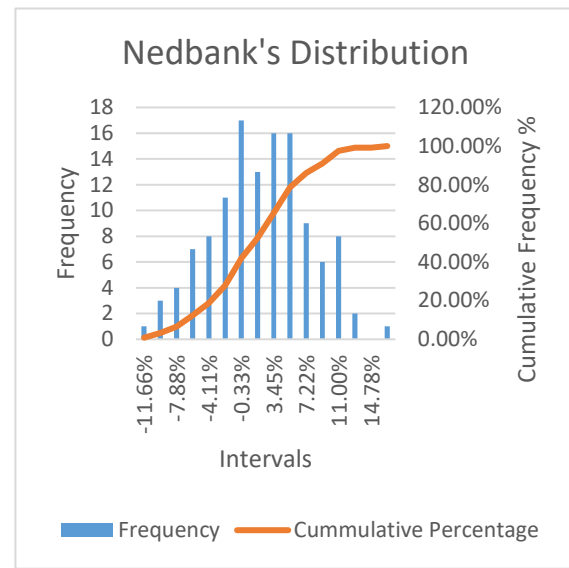
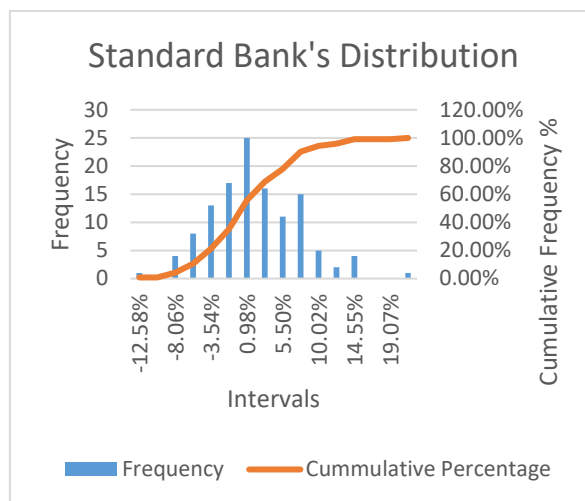


Figure 5.1e: Standard Bank



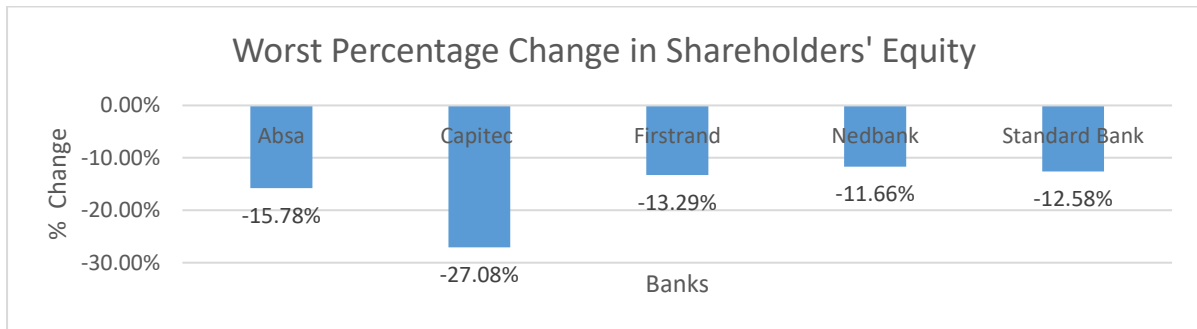
Source: IRESS (2019)

Of all the frequency and cumulative frequency distribution graphs show above, the Capitec distribution graph stands out, it seems to take the form of a normally distributed graph with a mean of approximately 6% (graphically). The distance between the worst-case change and best case change is the highest for Capitec (range), with the other banks ranging between 28 and 34 percentage points. Capitec has the probability of the most significant positive and negative change over the ten years. The reason being that, in the early 2000s, Capitec was still an underdog, however in the last 6 years, Capitec has dominated the banking sector especially in terms of customer satisfaction with lowest complaint incident ratio, less documentation, less red tape, more efficiency and convenience (Vermeulen, 2018; Smith, 2019).

5.2.3 Step 3: Worst Returns in Percentage and Absolute terms

Figure 5.2 below shows the worst returns in percentage terms. The worst returns for each bank was the minimum experienced returns over the ten years.

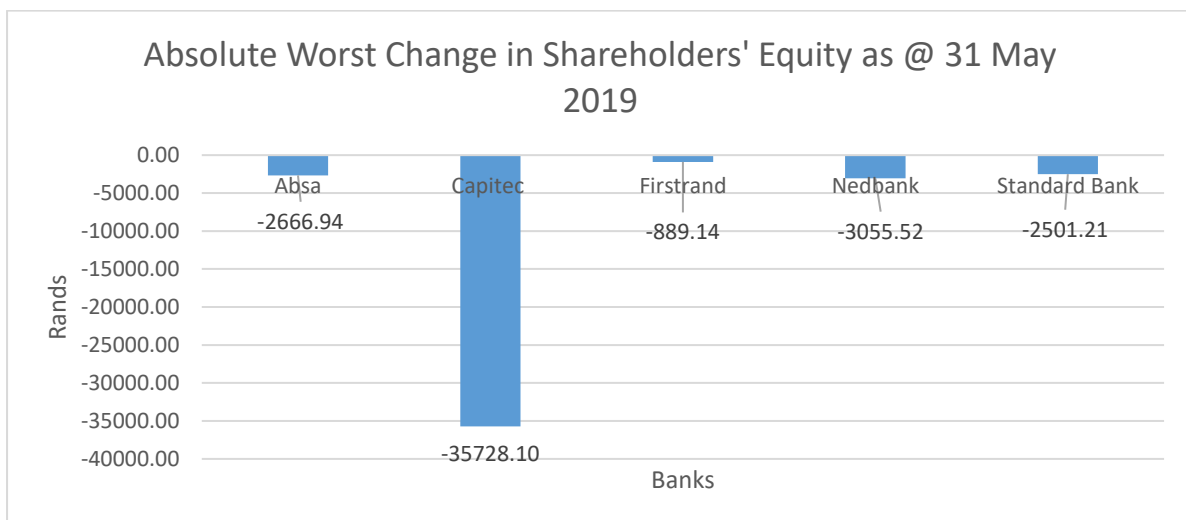
Figure 5.2: Worst Percentage Change in Shareholders' Equity



Source: Author

As was explained in step 2, out of all the top five banks, Capitec has the highest worst percentage change, reaching -27.08% and Nedbank has the lowest worst percentage change. Farid (2015) states that these respective figures will be assumed to be the worst-case scenario for each of the banks. To obtain the worst-case in the change of shareholders' equity, the worst-case percentage is multiplied by the latest closing ordinary shareholders price, which at the time of the study was 31 May 2019. Figure 5.3 shows the worst absolute change in shareholders' equity on 31 May 2019.

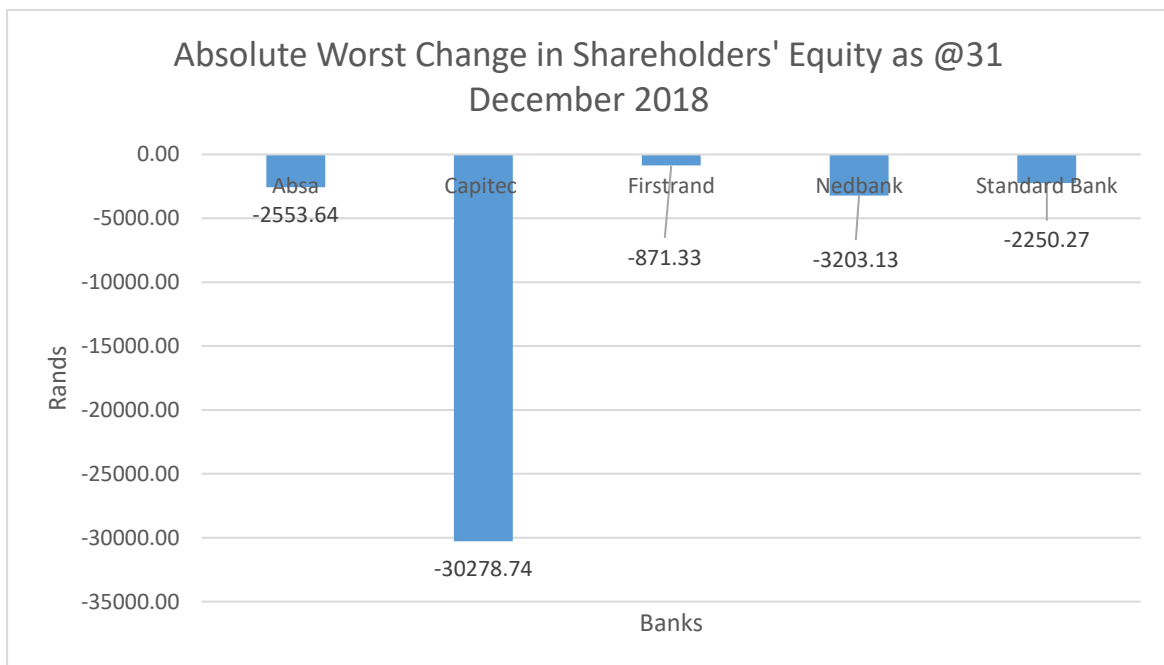
Figure 5.3: Worst Absolute Change in Shareholders' Equity as at 31 May 2019



Source: Author

Figure 5.3 shows the absolute change, which can be termed the worst-case loss. It is worth noting that this is a worst-case loss as at 31 May 2019. Capitec still tops because it has the highest worst percentage and the highest ordinary shareholder's ordinary closing price. Although Nedbank has the lowest worst percentage return in shareholders' equity, FirstRand has the least absolute worst change because of FirstRand's ordinary share price. The historical simulation model includes other financial statement components for example, net income and total equity, which are usually published at the end of the financial year. Therefore the worst-case loss taken in this calculation will be as at 31 December 2018 for consistency sake. Figure 5.4 shows the worst absolute change in shareholders' equity as at 31 December 2018.

Figure 5.4: Worst Absolute Change in Shareholders' Equity as at 31 December 2018



Source: Author

From the above figure, Capitec has the highest worst-case loss and FirstRand has the least. It is worth noting that the difference in worst-case losses between 31 May 2019 and 31 December 2018 are negligible for all the other banks except for Capitec. The differences are as follows, Capitec has the highest difference, which is R5449.36, followed by Standard Banks, which was R250.94, then Nedbank with R147.61, Absa with R113.31 and last is FirstRand with R17.81.

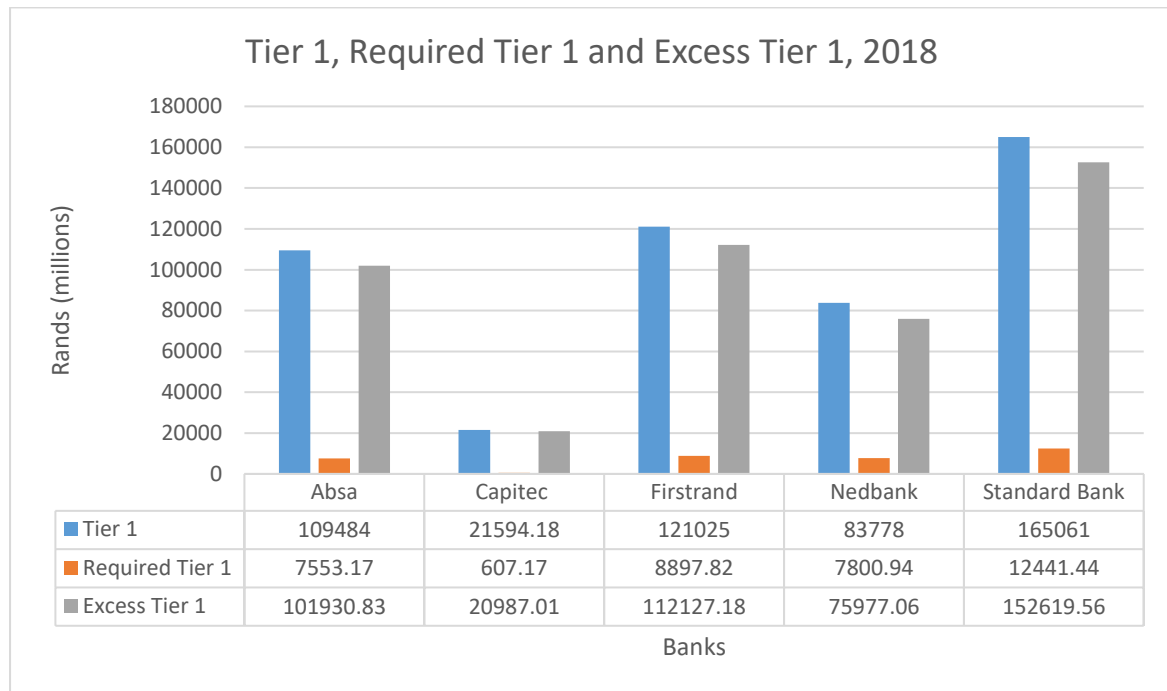
5.2.4 Step 4: The Determination of the Intervention Threshold

The intervention threshold was set at 10% of the risk-weighted asset and once this level is reached or breached, the market or regulatory will intervene.

5.2.5 Step 5: The Determination of Excess Capital

The excess capital shown in figure 5.5 will act as a buffer for losses that occur due to shocks. Excess capital is the difference between core capital and regulatory. The tier 1 capital, required tier 1 capital and excess tier 1 capital for the top five banks in 2018 is shown in figure 5.5:

Figure 5.5 Tier 1 Capital, Required Tier 1 Capital and Excess Tier 1 Capital as at 31 December 2018



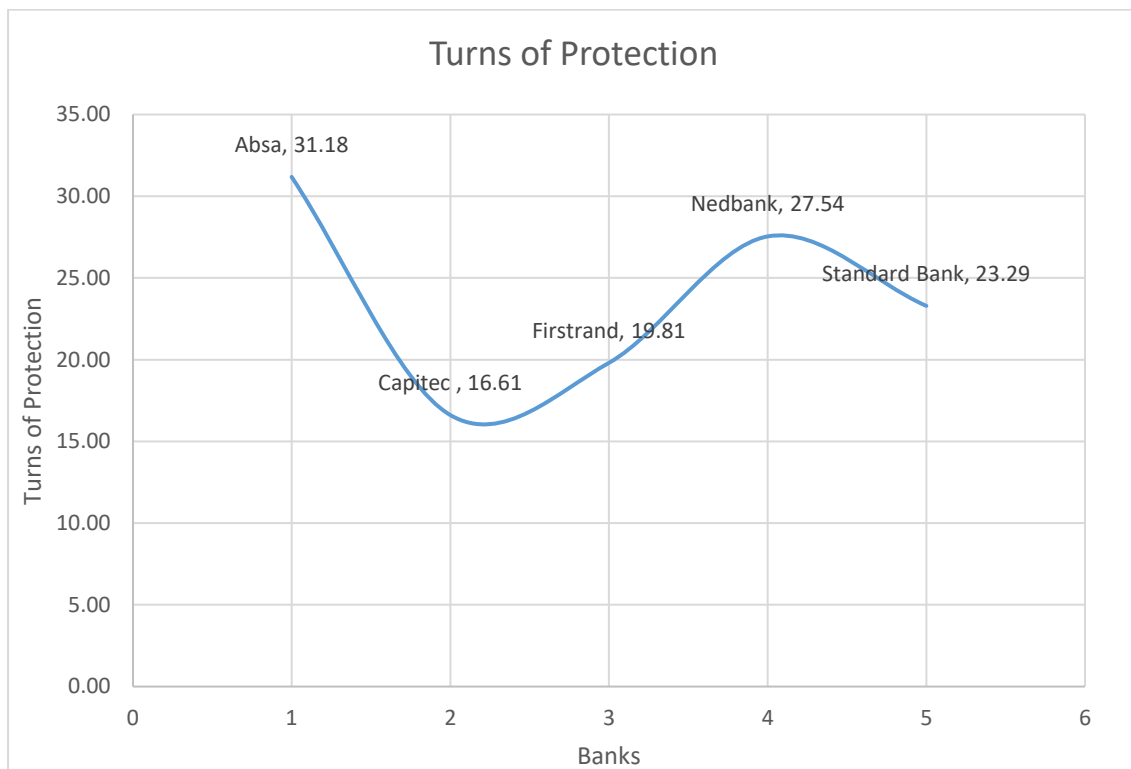
Source: IRESS (2019) and Author

Figure 5.5 shows that Standard Bank has the most buffer stock, which will guide against future losses, followed by FirstRand, which is competing with Absa, then Nedbank and last, is Capitec. The reason behind Standard Bank being on the pole positions can be attributed to what Donnelly (2019) and Smith (2019) stated that Standard Bank has the most assets and total deposits in the industry thus, there is the need for a large buffer stock to guide against future losses. The same applies to FirstRand; however, Capitec has fewer assets compared to the rest, thus maybe the reason why it keeps little or less buff stock to protect against future losses (Donnelly, 2019; Smith, 2019).

5.2.6 Step 6: Estimating Turns of Protection

The turns of protection are how quickly excess tier 1 capital can be depleted and it shows the loss bearing capacity. Figure 5.6 below shows the turns of protection of the top five commercial banks in South Africa.

Figure 5.6: The Turns of Protection of the Top 5 Commercial Banks



Source: Author

Figure 5.6 shows Absa having the highest turns of protection, followed by Nedbank, then Standard Bank, then FirstRand and lastly, Capitec. The highest turns of protection mean that Absa takes the longest to exhaust its excess tier 1 capital and Capitec takes the shortest. Nonetheless, turn of protection is just a number which can be very subjective as was cited by Farid (2015), to overcome the issue of subjectivity, a probability of the turn of protection is constructed. This probability is the odds of a worst-case turn, as was stated by Farid (2015). Table 5.2 below shows these probabilities.

Table 5.2 The Odds of Worst-Case Turn

The Odds of a Worst-Case Turn					
	Absa	Capitec	FirstRand	Nedbank	Standard Bank
Model A Worst Case Loss Buffer Wipe Out	0	0	0	0	0

Source: Author

Table 5.2 shows that the probability of a buffer (excess tier 1 capital) wipe out for all the five banks and the probability is zero for all the banks. A zero probability means that the turns of protection for all banks were quiet high, surpassed the required turns of protection and removed

the element of subjectivity. Moreover, Enders (2015) stated that taking the probability of a value above four will give a probability of 100%, thus taking a probability of are lower tail will equal 0. This is the reason why all the banks have odds of a worst-case being 0 because they have high probabilities (see figure 5.6).

5.2.7 Step 7: Estimated Economic Capital.

The value of economic capital was estimated in 4 sub-step, namely; setting up target turns, finding the target buffer, calculating the total required capital and then estimating the value of economic capital. Table 5.3 shows the economic capital shortfall of the top five commercial banks with a single worst-case loss at a 98% confidence interval.

Table 5.3: Economic Capital Shortfall using Historical Simulation

	Absa	Capitec	FirstRand	Nedbank	Standard Bank
EC Shortfall	-99377.19	9291.73	-111255.84	-72773.93	-150369.29

Source: Author

Table 5.3 shows that Standard Bank protects its ordinary shareholders the most, therefore ordinary shareholders who are already invested in the bank should instead continue their investment there. FirstRand is the second most protective bank, followed by Absa and then Nedbank is last. After one shock at a 98% confidence interval, Capitec does not protect its ordinary shareholders and ordinary shareholders who are invested in the bank are likely to pull out and invest in other banks, especially those that are protection driven. However, for ordinary shareholders who are customer satisfied driven, they would stay invested in Capitec as it has been the number one most satisfying bank for the last six years (Smith, 2019). It is worth noting that the target turns needed to remove any form of protection of each bank at 98% confidence intervals are shown in table 5.4 below

Table 5.4: Target Turns

Bank	Target Turns Range Using Model A
Absa	39.9 – 40
Capitec	0.69 – 0.7
FirstRand	128 – 129
Nedbank	23 – 24
Standard Bank	67 – 68

Source: Author

Table 5.4 shows target turns that are needed for either market or regulatory intervention and to extinguish existing ordinary shareholder protection. Except for Capitec, the probability of the other banks to reach such target turns is zero because it is close to impossible to have such a high number of consecutive shocks. A prior expectation was that Standard Bank would have the most target turns since it had the lowest economic capital shortfall. However, there are various inputs in calculating economic capital shortfall besides target turns. For example, the worst change as at 31 December 2018 for Standard Banks is double that for First Rand and the required tier 1 capital for Standard Bank is twenty times that of FirstRand. When these factors are taken into account, it will plainly explain why Standard Bank will have lower target turns than FirstRand. Farid (2015) recommended the use of the variance-covariance model in conjunction with the historical simulation model to make a concrete decision; thus, the variance-covariance model is next.

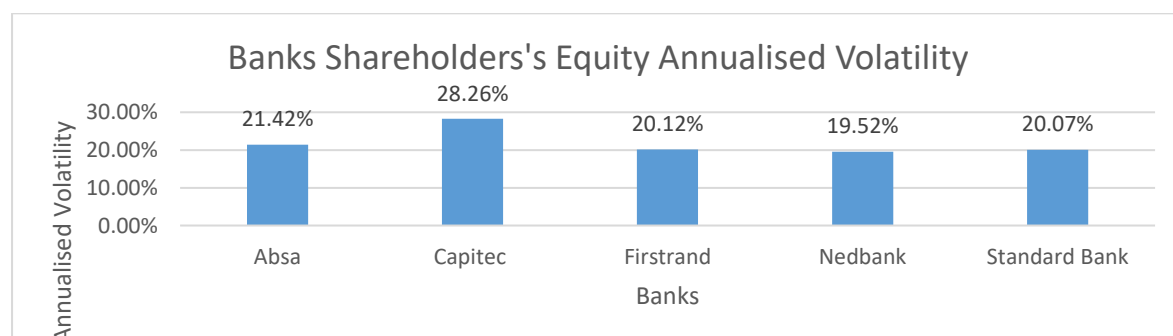
5.3: Diagnostic Test for the Variance Covariance Model.

Due to the similarities between the two models (Historical Simulation and Variance Covariance), steps 1, 2 and 4 will be omitted. Even though step 7 is the same in both models, the difference in the estimated value of economic capital validates the need for the step to be reported.

5.3.1 Step 3: Calculating Volatility and Annualised Volatility of the Changes in Shareholders' Equity.

Volatility was calculated by finding the standard deviation of the return series and because of the monthly frequency, to annualise the volatility, the standard deviation was multiply by the square root of 12. Figure 5.7 below shows the annualised volatility of each bank for the ten years.

Figure 5.7: Bank Shareholders' Equity Volatility from 31 June 2009 to 31 May 2019



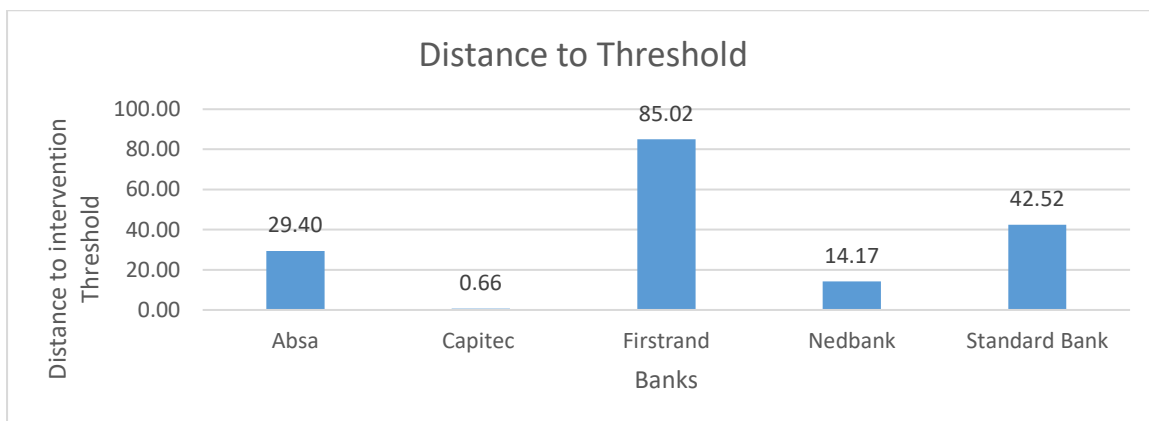
Source: Author

Capitec return series seem to be more volatile than the other four commercial banks. The returns of Capitec have both positive and negative outliers and this is one of the disadvantages that was stated by Farid (2015). Farid (2015) stated that the variance-covariance model is affected by extreme scenarios, which in turn then affects averages and if you look at figure 4.1, Capitec Group returns have extreme jumps. Not much can be said about the other four commercial banks annualised volatility as they are more or less the same and are in the early twenties range.

5.3.2 Step 5: The Determination of the Distance to Intervention Threshold.

The distance to intervention threshold was calculated in 3 sub-steps, namely; by find a one sigma movement, then calculated excess tier 1 capital and lastly, estimated the threshold distance of intervention. Figure 5.8 below shows the distance to the threshold for the top five commercial banks

Figure 5.8: The Distance to Intervention Threshold for the Top 5 Commercial Banks



Source: Author

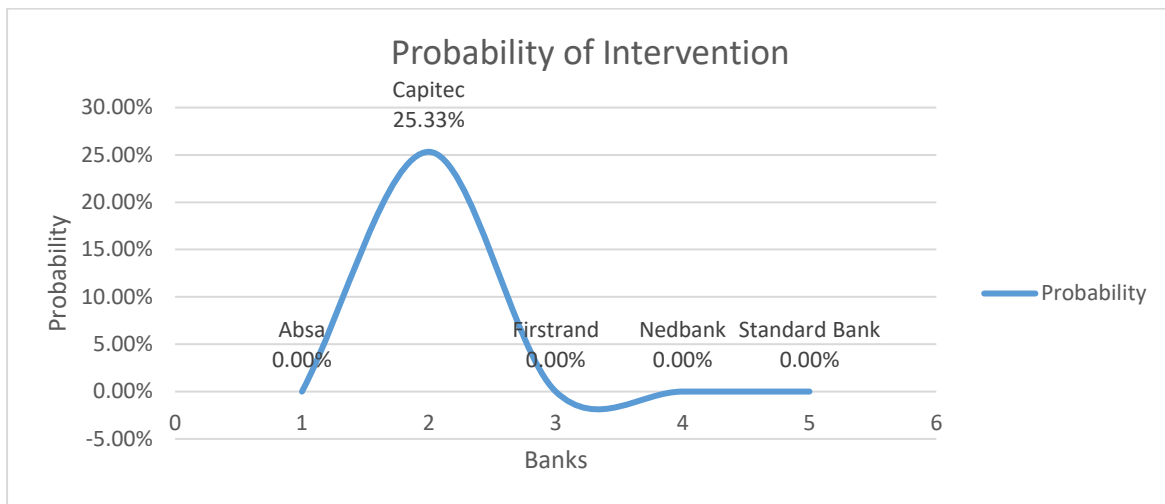
Figure 5.8 shows that FirstRand is the last bank to receive some intervention since it has the highest distance to threshold. As for Capitec, if it so happens that they are two consecutive shocks in the financial sector, the bank is likely to receive some intervention. Keeping in mind that one of the assumptions is that regulators or the market will intervene if banks fall below the minimum capital adequacy requirements. Farid (2015) states that regulatory based intervention tends to work better and faster than market-based intervention, while market intervention tends to be disorderly and chaotic as counterparties run to the exit. Nedbank is prone to receive some intervention in the event of a prolonged shock. However, the probability of intervention will give us a more vivid answer on whether they are going to be interventions or not. As for Absa and Standard Bank, we can conclude that it will take some time before they

receive intervention, be it market or regulatory. Existing ordinary shareholders are protected by the bank's internal measures above the minimum requirement and below the minimum requirement level, regulators are protecting the depositors and the financial sector as a whole (Farid, 2015). Prospective ordinary shareholders are likely to invest in a bank, for instance, FirstRand, because of the safety that it offers its ordinary shareholders.

5.3.3 Step 6: The Estimation of Probability of Intervention

This step shows the likelihood of whether these banks will receive market or regulatory intervention after one financial shocks. Figure 5.9 below shows the probability of intervention for the top five commercial banks.

Figure 5.9: The Probability of Intervention



Source: Author

Capitec has the highest probability of intervention and this because it has a short distance to threshold after one sigma loss (0.66). Nedbank had the second-lowest distance to the threshold of about 14.17. However, it has 0 probability of interventions after a one-sigma loss. The other three banks had can be said to be a safe investment option for existing ordinary shareholders as they have both high distance to the threshold and a 0 probability of intervention. At this point, a prospective ordinary shareholder decision choice between Absa, FirstRand and Standard Bank is highly due to preference. Nonetheless, a concrete answer can be given once the value of economic capital is calculated in the last step.

5.3.4 Step 7: Calculating Economic Capital.

The value of economic capital was estimated with one-sigma shock and at a 98% confidence interval. The calculation took place in three sub-steps, namely calculating the target buffer,

then the total capital required and then the value of economic capital. Table 5.5 shows the value of economic capital of the top five commercial banks with a one-sigma loss at a 98% confidence interval.

Table 5.5: Economic Capital using the Variance Covariance Model

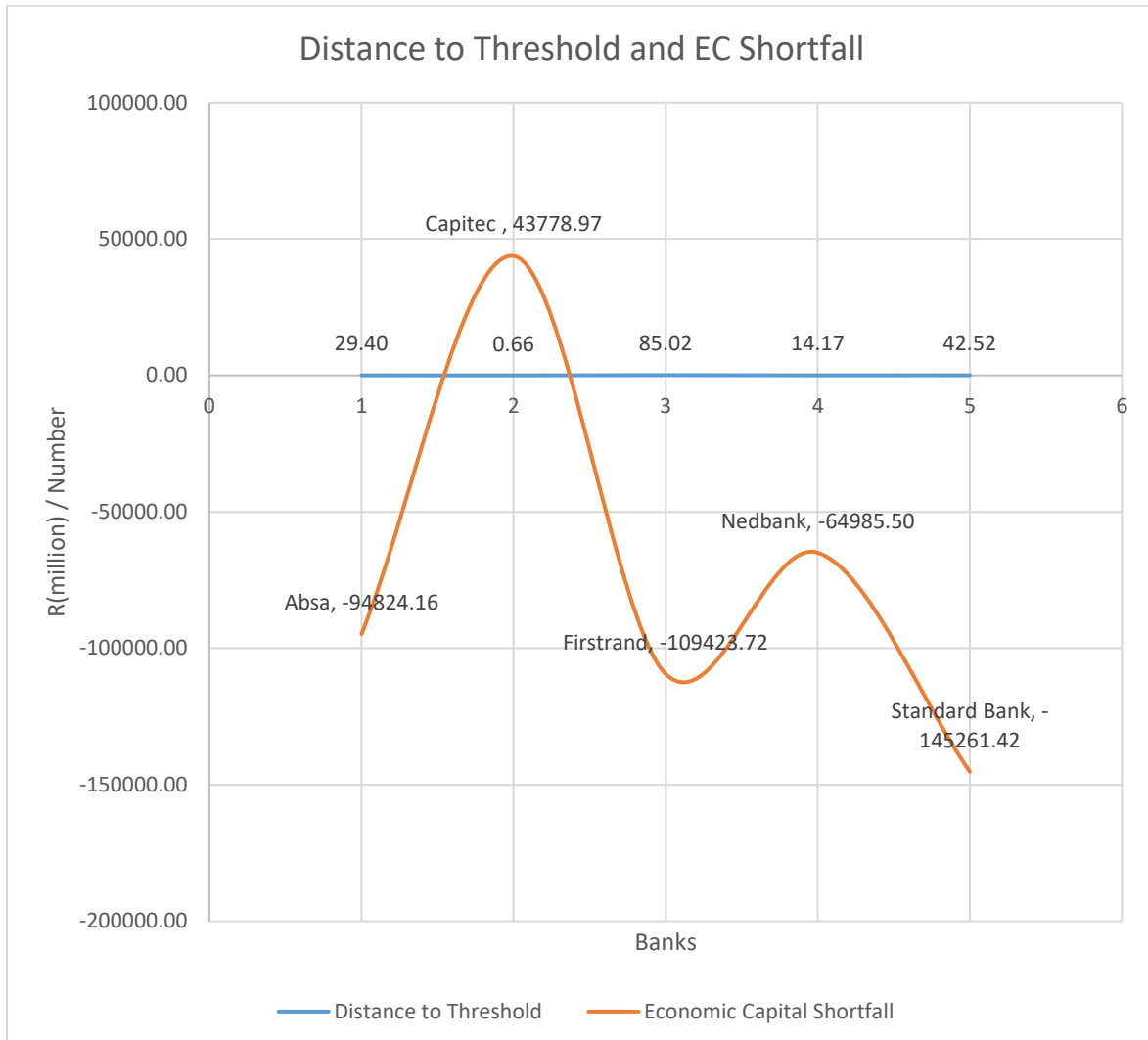
Banks	Absa	Capitec	FirstRand	Nedbank	Standard Bank
EC Shortfall	-94824	43779	-109424	-64985	-145261

Source: Author

Table 5.5 shows that Standard Bank protects its ordinary shareholder the most. Even though FirstRand has a better distance to the intervention threshold, its economic shortfall is still less than Standard Banks and this is the reason why an investor needs to complete the calculation up to economic capital and/or economic capital shortfall to make a decision. As predicted by distance to intervention threshold, the probability of intervention and economic capital shortfall, Capitec does not protect its ordinary shareholder even though it is number one in terms of customer satisfaction. The confusion on Nedbank, where it had a low distance to the threshold and zero probability to intervention, has been brought to light by the economic capital shortfall. The economic capital shortfall of -64985 (Rands in Millions) supports the probability fact that they will be zero market or regulatory intervention for Nedbank and existing ordinary shareholders are offered some form of safety.

Figure 5.10 shows the distance to the threshold and the estimated values of economic capital shortfall for the five commercial banks as was stated by (Farid, 2015). Figure 5.10 shows that Standard Bank's economic capital shortfall line is the furthest from the distance to the threshold line, which according to Farid (2015) means that it protects its existing ordinary shareholders the most. FirstRand is the second most protective bank, then Absa is third and Nedbank is the last bank to protect its existing ordinary shareholders. It seems that after one sigma loss and at a 98% confidence interval, Capitec does not protect its existing ordinary shareholders as its economic capital shortfall line is not below the distance to threshold line but above it.

Figure 5.10: The Distance to Threshold and Economic Capital Shortfall for the Five Commercial Banks.



Source: Author

The confidence interval and the number of sigma movements can be increased as per the author’s preference. One of the Farid (2015) recommendations was to keep the number of sigma movements constant and increase the confidence intervals to be certain about the results. Table 5.6 shows the various confidence intervals with a one sigma loss using the variance-covariance model.

Table 5.6: Economic Capital Shortfall at Various Confidence Intervals

Economic Capital Shortfall for Various Confidence Intervals					
CI (Required Distance)	Absa	Capitec	FirstRand	Nedbank	Standard Bank
90% = 1.28	-97493	19452	-110439	-69114	-148025
95% = 1.645	-96228	30984	-109958	-67157	-146715
98% = 2.05	-94824	43779	-109424	-64985	-145261
99% = 2.61	-92883	61471	-108685	-61983	-143251
99.7% = 2.75	-92397	65894	-108501	-61232	-142749
99.9% = 3	-91531	73792	-108171	-59892	-141852

Source: Author

According to Farid (2015) the required distance is equivalent to the z-value of a normal distribution and from the z-value, a confidence interval can be obtained. The confidence intervals and corresponding z-values (required distance) are shown in the first column of table 5.6 (Enders, 2015; Farid, 2015). However, the order in terms of banks that protect their existing ordinary shareholders does not change at any confidence interval. At the highest level of confidence interval (99.9%) and lowest acceptable confidence interval (90%), Standard Bank still protects its ordinary shareholders the most, FirstRand is second, Absa third and Nedbank is last. Capitec does not protect its existing ordinary shareholder at both the highest and lowest acceptable confidence interval.

5.4 Financial Ratio Analysis

Larsson (2009); Farid (2015) and Kaylene (2016) stated that there was a trade-off between the value of economic capital and investment returns, in other words, protection and profitability. To investigate this claim, four financial ratios were taken into account; these were the price to book ratio, price to earnings, return on assets and return on equity. In terms of price ratios, the price to book ratio measures the business entity's market value to the book value (net assets). In contrast, price to earnings measures the investor's willingness for each share (Elton et al., 2014). In terms of return ratios, the return on assets shows the profitability of a business entity relative to its total assets while, return on equity shows the efficiency of that business entity (Mabwe and Webb, 2010; Ifeicho and Ngalawa, 2014). Table 5.7 shows the ratios mentioned above for the top five banks obtained from IRESS

Table 5.7: Financial Ratio for the Top Five Banks

Variable	Absa	Capitec	FirstRand	Nedbank	Standard Bank
Price to Book	1.18	5.21	2.81	1.55	1.71
Price to Earnings	9.18	21.93	12.83	9.45	9.97
ROA %	-1.75	-6.07	-1.10	-1.05	-0.89
ROE %	12.71	23.74	21.93	15.97	16.63

Source: IRESS (2019)

Table 5.7 shows that Capitec has the highest price to book value, price to earnings value and return on equity. The aforementioned means that Capitec has a high probability that the bank's stocks are overvalued, investors for Capitec are willing to pay more for a single unit of Capitec's earning and Capitec's profitability gives the business entity the potential to grow. Standard bank has the highest return on assets even though it is negative. High return on assets means that it has the bank has the highest ability to take deposits and make them profitable investments, which makes sense why it has the highest total assets and deposits in the sector. However, since its negative, we can conclude that it acquires the least loss. Absa has the lowest price to book, price to earnings and return on equity. The aforementioned means that Absa has the lowest probability that its stocks are overvalued, investors for Absa are willing to pay more for a single unit of Absa's earning but not as much as the other banks and Absa's profitability gives the business entity the potential to grow but also not as much as the other banks.

As for financial ratios that show return on investment, profitability, potential growth and overvalued stocks, Capitec is leading. Nonetheless, in terms of the value of economic capital and return on assets, Standard Bank is leading while Capitec is last. Economic theory as was stated by Larsson (2009); Farid (2015) and Kaylene (2016) is true that they is a trade-off between the value of economic capital and the returns on investment, thus a trade-off between profitability and protection.

5.5 Other Bank Cases.

The concept of economic capital can be used to prevent an ordinary shareholder from consistently suffering due to bank closure. Other measures have proved to have their shortcomings. We shall look at three banks that closed, deregistered or placed under curatorship, but in all events, the regulator's main concern was the stability of the sector and depositors. There were not worried about existing ordinary shareholders. According to Mabwe

and Webb (2010), Imperial Bank was part of the top banks in South Africa during the 2005 – 2009 period. However, due to poor management, profit motives and inadequate capital as stated by Tjiane (2015), the bank deregistered in 2010. Imperial Bank's main shareholder was Nedbank at that time and when they noticed that the other were existing shareholders were about a run to exit (market intervention) because regulators were not going to intervene, they bought the remaining shares (Tjiane, 2015). For a bank that was in the top five in 2009 to deregister in 2010 shows that “no bank is too big to fall” and that banks should take an internal measure (the concept of economic capital) to prevent such. There is a high probability that if Nedbank used the value of economic capital instead of financial ratios, Nedbank would have withdrawn its investment. The main question to be asked is, Could this be the case of Nedbank?

Another bank that closed is VBS Mutual Bank. The reason for the closure of the bank was lack good corporate governance, fraud, poor management and looting (Motau, 2018). A prospective ordinary shareholder who likely used CAMEL, especially the management “M” as a deciding factor, was likely subjective, especially after hearing that the bank had higher returns as compared to the other banks that are in its league because of its managerial team. According to Motau (2018) the bank was then placed under curatorship in the hopes of trying to revive the bank, protect depositors and other creditors, however, the compensation of existing ordinary shareholders was never raised as a matter of concern. A prospective and existing ordinary shareholder who would have used the value of economic capital and monitored it the bank's ability to withstand shocks or the trade-off between return and protection to red-flag the high returns and thereby making a better decision.

Another Bank that has been curated and received regulatory intervention from time to time is African Bank. According to Tjiane (2015) Africa Bank Investment Limited was placed under a curator in 1995 due to inadequate capital and poor management styles and techniques. The bank asked for regulatory intervention and the government agree through the SARB to recapitalise, only if the bank restructured and improved their capital conservation methods (Tjiane, 2015). The banks manage to overcome that huddle, and from 2003 – 2008, the Africa Bank double its annual profits (Giamporcaro, 2017). Bearing in mind the trade-off concept proved in chapter 5.6 between protection and profitability, the bank did not last a decade. In 2014, Africa Bank was placed under curatorship and this came as a shock as the bank returns were quite good, but yet the bank had not implemented internal supervision measures. African Bank had underestimated the banks' bad debts. The bank was on the verge of collapsing and shareholders had not received remuneration and then the SARB stepped in (Giamporcaro,

2017). Currently, the bank has gone back to its old way of higher returns and the trade-off relationship that has been brought to light in this study should be used as a red flag that the bank is likely to be more profit-orientated than protective.

These three banks under study, namely VBS Mutual Bank, Imperial Bank and Africa Bank had two common problems, which were poor management and inadequate capital. In terms of making an investment decision, choosing according to management is always subjective; however, choosing using profitable ratios while keeping in mind economic theory (the relationship between return and economic capital) can help make an investment decision. Maintaining adequate levels of capital levels requires internal supervisory measures and this where the concept of economic capital can come in. The concept of economic capital gives prospective and existing ordinary shareholders an extra indicator to look at in terms of investment decisions.

5.6 Conclusion

To conclude about which bank protects its existing ordinary shareholders the most, the results of both the historical simulation model and the variance-covariance model should be taken into account. A better decision is derived if the results of both models tally, point in the same direction and can be used in conjunction with other indicators. Table 5.8 shows the economic capital shortfall of the two models.

Table 5.8: Economic Capital Results of the two models.

Model Type	Absa	Capitec	FirstRand	Nedbank	Standard Bank
EC Shortfall Model A	-99377.19	9291.72	-111255.84	-72773.92	-150369.28
EC Shortfall Model B	-91530.82	73792.46	-108170.90	-59891.85	-141851.54

Source: Author

Even though they are slight deviations in the economic capital for banks that protect their existing shareholders, both models confirm that Standard Bank protects its existing ordinary shareholders the most, followed by FirstRand, then Absa and lastly, Nedbank. There is a massive deviation for the only bank that does not protect its existing ordinary shareholders, which in this case is Capitec. Prospective ordinary shareholders who value their protection are

likely to invest in the other four banks except Capitec based on their preference. However, existing ordinary shareholders invested in Capitec, who are likely to pull out their investment, should do it in an orderly manner. The pulling out should be in an orderly manner because if the run to exit is chaotic and disorderly, this might cause a financial shock, especially if the bank holds a significant market share of which Capitec does (Farid, 2015). Prospective ordinary shareholders are likely to be recommended by an investment advisor to invest in Standard Bank, FirstRand, Absa and Nedbank respectively, that if one of their objectives as an ordinary shareholder is protection.

Investors tend to have various objectives, to obtain maximum returns, a prospective ordinary shareholder should invest in Capitec as was shown by the return series financial ratios. In terms of social responsibility, then a prospective ordinary shareholder should invest in the top five commercial banks for they are best known in the industry for doing so. Lastly, in terms of investment protection, then prospective ordinary shareholders should invest in Standard Bank, FirstRand and Absa. The cases on the three banks (VBS, Africa Bank and Imperial), the financial ratio, return series and the value economic capital proved that there is a trade-off between investment returns and economic capital.

One of the reasons for undertaking the research was to add to Kaylene (2016) finding. However, not much can be said for Absa, Capitec and FirstRand as they didn't publicly disclose what they publicly disclose their business risk thus they was no way to calculate business risk economic capital first and then calculate total economic capital. It worth noting that at the time of Kaylene's study, these banks had not clearly defined what they term "business risk economic capital," however, the present day they have (Kaylene, 2016).

Looking at Kaylene (2016) and these research findings, Standard Bank and Nedbank seem to have significantly increased their total economic capital meaning that they have increased their internal supervisory measure, which leads to protecting their existing ordinary shareholders more. Standard Bank seems to have improved existing ordinary shareholder protection from R88 Million (\$8.1 Million) to R146 111 Million (\$13512.7 Million) (Absolute average total economic capital of the two models) from the time of Kaylene time of study to currently.

Nedbank improved from R41 Million (\$3.8 Million) to R66 333 Million (\$6134.6 Million). It is worth noting that a ten year average exchange rate of \$1:10.8 was used. These improvements in the value of economic capital provide good news for investors who are looking at the financial sector. For the sector as a whole, it means that financial institutions have learnt from

past financial shocks and have made the initiative to be internally prepared for future financial shocks. The reason for the increase in the value of economic capital can be attributed to what Gorton, Yale and NBER (2012) and Tjiane (2015) said that a crisis will always come back worse, different and with a greater magnitude than before.

Chapter 6: Conclusion and Recommendations

6.1 Introduction

This chapter of the research is structured in the following way; firstly, it concludes the research paper; articulating some of the main findings and reminding readers of the main points that might have been missed throughout the paper. The second segment of the chapter states and explains recommendations that can better futures studies about economic capital on a country and global basis. The last segment concludes the research.

6.2 Key Findings.

As was mentioned earlier in the introduction, there has been limited research on economic capital, especially in the context of South Africa. Economic capital is a new area of study which can be used by prospective and existing ordinary shareholders as a protective indicator. Not only can economic capital be used as a protective indicator but also a performance indicator because of the trade-off relationship between economic capital and returns. Financial institutions that tend to have high returns have low economic capital. According to Farid (2015) existing and prospective ordinary shareholders who value protection as an objective within a business entity should look into companies that have positive economic capital, which is equivalent to negative economic capital shortfall as this shows them the value of their protection. Negative economic capital or positive economic capital shortfall is an unfavourable result and existing ordinary shareholders wishing to pull out should do it in an orderly manner or they should wait for regulatory intervention. Market invention tends to be slow and can be chaotic if the run to exit is done in a disorderly manner (Farid, 2015). Nonetheless, in the case of South Africa, regulatory intervention is more likely because Mlambo and Ncube (2011) stated that South Africa's banking sector has a sound regulatory regime. The banking sector of South Africa is moderately concentrated with a Herfindahl Hirschman Index of 0.179 (SARB, 2019a).

This research adopts alternatives to the Copula Models to measure economic capital by a method known as the Return Series Method, as was stated by (Farid, 2015). The return series method has three sub-models, namely the Historical Simulation Model, the Variance-Covariance Model and the Leverage Ratio Model. However, the first two models were used to estimate the value of economic capital shortfall in this research. The reason that the Leverage Ratio Model was not used in the research is that unlike the United States of America, South Africa stipulates its minimum capital requirements as 10% of the financial institute risk-

weighted assets and not as a leverage ratio. The empirical results obtained from the historical simulation model and the variance-covariance model have a slight deviation for banks that protect their existing ordinary shareholders and drastic deviation for the only bank that does not protect its existing ordinary shareholders. Nonetheless, there is consistency with the results. The results were as what the authors of the adopted method had stated, that they would be a deviation in the value of economic capital and that, the two models cannot be expected to have the same answers (Farid, 2015).

The empirical results of both models showed that Standard Bank protected its existing ordinary shareholders the most, followed by FirstRand, then Absa and Nedbank was last. Both models, even though they was a huge deviation in the economic capital shortfall, showed that Capitec does not protect its existing ordinary shareholder. The results are consistent with what Larsson (2009) stated that there is a trade-off between economic capital and returns. According to Larsson (2009), the more economic capital a financial institute holds, the less diversification and the fewer returns. A good example is taking Standard Bank and Capitec, Capitec had the highest mean return of about 3.26% and the lowest economic capital. In contrast, Standard Bank had the highest economic capital and the second from last amongst the five banks with a mean return of about 0.90%. The average economic capital shortfall for the two models are as follows; Standard Bank protected its existing ordinary shareholders with -R146 110 million, followed by FirstRand with -R109 713 million, then Absa with -R95 454 million and last is Nedbank with -R66 333 million. Capitec was the only bank according to the two models that did not seem to protect its existing ordinary shareholder with an average economic capital shortfall of R41 542 million. To obtain economic capital from economic capital shortfall one can multiply the value by a negative sign. The aforementioned numbers are quite large; however, at the 98% confidence interval, it will take FirstRand 129 target turns (worst case loss), Standard Bank 68, Absa 40, Nedbank 24 and Capitec 0.7 to reach the level of intervention. Since there is a trade-off between economic capital and returns, banks, for example, Standard Bank, FirstRand and Absa should seek to strike a balance. Nedbank can be said to be striking a balance between protection and returns.

Since the top five commercial banks hold the majority of the market share of about 90.53%, there are a good representation of the banking sector. Furthermore, since four of the five banks actively protect their existing, a conclusion that can be reached is that 80% banking sector in South Africa protects their existing shareholders. The above percentage attracts prospective ordinary shareholders to come and invest in South African banks since the sector is protective.

This research has proved that the South African banking sector is protective of its existing ordinary shareholders as was said by researchers such as, Quiding (2006); Maredza, Kapingura and Mishi (2013) and Ifeicho and Ngalawa (2014). Moreover, the fact that the regulators intervened with Imperial Bank, African Bank and VBS Mutual Banks is evident that the South African sector is well regulated and will not only attract prospective ordinary shareholders from South Africa but globally.

The more prospective ordinary shareholders who are willing to invest in the South African banking sector, the more new banks we will see, for instance, Discovery Bank, Tyme Bank and Bank Zero (Smith, 2019). The challenge is now left on the South Africa authorities to ensure that the concept of economic capital, along with other internal measures, is integrated into policy. Moreover, ensure that the policy is well vested into bank structures in time for the next financial shock. As Gorton, Yale and NBER (2012) said that financial shock recurs in market economies, affect small banks and banks without a shared pool. Lastly, banks need to be ready for future financial shocks as they come worse, different and more extensive.

6.3 Recommendations.

The research explored using the potential value of economic capital as an indicator for shareholders in guiding their decision making around ownership within the banking sector in South Africa. The research findings using the two sub-models (historical simulation and variance-covariance) proved that surely the value of economic capital could be used to detect whether the financial institutions under research are protecting their existing ordinary shareholders. The research further reported on the relationship between return (profitability) and the value of economic capital but not in a comprehensive manner.

Possible areas for future research may include, firstly, to look at the relationship between economic capital and returns in-depth. The use of regression models, correlation and multivariate analysis, can aid in explaining the relationship between the two and to what extent one variable explains the other. Secondly, because of the nature of the financial sector, a better reflection on the sector as a whole would have been brought out by using more financial institutions and not to base the sector on the top five commercial banks. Future researches should include, if possible, all the banks that are in the sector, especially considering that they are not as many banks in South Africa as compared to those of other BRIC's countries. Thirdly, the concept of economic capital should not only be limited to financial institutions but should be a

concept that is used by any, either existing or potential shareholders, to make decisions of ownership for any business entity.

In terms of policy, the Prudential Authority (Twin Peaks) should encourage financial institutions to keep a certain level of economic capital as it not only protects the shareholders but protects the financial institution as a whole. Economic capital, as shown in the research, has a target turns component that shows how many financial shocks a financial institution can withstand. Authors such as Inman (2019) predict that financial shocks occur in a cycle and there are always of greater magnitude than one before. A policy that encourages an adequate value economic capital will enable the depletion of economic capital first before regulatory capital, thus an extra cushion in times of financial shocks.

To conclude the chapter, the South Africa banking sector holistically protects its existing ordinary shareholders and attract potential ordinary shareholder because four of the five biggest banks protect its existing ordinary shareholders. Standard Bank, FirstRand, Absa and Nedbank protect their existing ordinary shareholder in that order and possibly attract potential ordinary shareholders in that order respectively. Nedbank is the only bank that does not protect its ordinary shareholders after one financial shock; thus, no potential ordinary shareholders who is protection driven is attracted. Nedbank is only focused on profitability (returns) and it should learn from banks such as Imperial bank (which it took under its wing) and VBS Mutual. These banks were more return incline and not protective of their existing ordinary shareholders and in the end, ceased to exist. The relationship between return on investment and the value of economic capital is brought out well in the case of Nedbank, which has high returns and low value of economic capital. Financial institutions should strike a balance between return and internal protective measures.

Reference List

- ABSA GROUP (2019). Absa Group | Definitions. [Online] Available at: <https://www.absa.africa/absaafrica/definitions/> [Accessed: 11 June 2019].
- ACHTERBERG, E. AND HEINTZ, H. (2010). Basel III summary. [Online] Available at: https://www.riskquest.com/wp-content/uploads/2016/09/whitepaper_basel_iii.pdf [Accessed: 29 July 2019].
- ADMATI, A. R., DEMARZO, P. M., HELLWIG, M. and PFLEIDERER, P. (2013). Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is Not Socially Expensive – *Stanford Business* [Accessed: 3 May 2019].
- AL JANABI, M. A. M. (2011). A generalized theoretical modelling approach for the assessment of economic-capital under asset market liquidity risk constraints - *Service Industries Journal*, 31(13), pp. 2193–2221. [Accessed: 23 March 2019].
- AMADEO, K. (2019a). Too Big to Fail: Definition, Examples, Banks. [Online] Available at: <https://www.thebalance.com/too-big-to-fail-3305617> [Accessed: 2 August 2019].
- AMADEO, K. (2019b). US Economy Collapse: What Will Happen, How to Prepare. [Online] Available at: <https://www.thebalance.com/u-s-economy-collapse-what-will-happen-how-to-prepare-3305690> [Accessed: 11 August 2019].
- BAER, T., MEHTA, A. AND SAMANDARI, H. (2011). McKinsey Working Papers on Risk, Number 24 The use of economic capital in performance management for banks: A perspective. [Online] Available at: https://www.mckinsey.com/~media/mckinsey/dotcom/client_service/risk/working_papers/24_the_use_of_economic_capital.ashx [Accessed: 27 May 2019].
- BASEL COMMITTEE (2000). Principles for the Management of Credit Risk Basel Committee on Banking Supervision Basel September 2000 Risk Management Group of the Basel Committee on Banking Supervision Chairman: Commission Bancaire et Financière, Brussels Mr Jos Meuleman Office of the Superintendent of Financial Institutions, Ottawa Ms Aina Liepins Secretariat of the Basel Committee on Banking Supervision, Bank for International Settlements - *Bis*. [Pdf]. Available at: <https://www.bis.org/publ/bcbs75.pdf> [Accessed: 24 July 2019].

- BASEL COMMITTEE, B (2003). Trends in risk integration and aggregation, *Initiatives*, [Accessed: 15 August 2019].
- CARTWRIGHT, A. (2009). Economic capital A Preamble – *Institute of Actuaries of India*, pp. 1–40 [Accessed: 15 June 2019].
- CHERUBINI, U. and LUCIANO, E. (2005). Risk Magazine Coping with copulas Risk magazine Book review Copula Methods in Finance – *Researchgate*. [Pdf] Available at: https://public.econ.duke.edu/~ap172/book_review_RISK_June05_2.pdf [Accessed: 29 August 2019].
- DEUTSCHE BANK (2019). Deutsche Bank – *News*. [Online] Available at: <https://www.db.com/newsroom/index.htm?kid=newsroom.redirect-en.shortcut> [Accessed: 5 August 2019].
- DOFF, R. (2008). Defining and measuring business risk in an economic-capital framework. *University of Amsterdam* [Accessed: 23 February 2019].
- DONNELLY, L. (2019). The battle of the banks. [Online] Available at: <https://www.mg.co.za/article/2019-01-18-00-the-battle-of-the-banks#targetText=According to the bank's most,1-trillion in assets respectively> [Accessed: 29 September 2019].
- ELLIOTT, L. (2019). Deutsche's deal with Commerzbank a sign of sector's weakness / *Larry Elliott | Business | The Guardian*. [Online] Available at: <https://www.theguardian.com/business/2019/mar/18/deutsche-deal-commerzbank-sign-sector-weakness-european-banks-zombie-like-state> [Accessed: 22 July 2019].
- ELTON, E. J., GRUBER, J. M. and BROWN, J. S. (2014). Modern Portfolio Theory and Investment Analysis. 9th Edition, *The Journal of Finance*. JSTOR, Wiley 37(5), p. 1317.
- ENDERS, W. (2015). Applied Econometrics Time Series. 4th Edition. *New York: Wiley*.
- FARID, J. A. (2015) Economic Capital: An Alternate Copula-Free Approach. [Pdf] Available at: <https://www.soa.org/globalassets/assets/files/resources/essays-monographs/2015-erm-symposium/mono-2015-erm-farid.pdf> [Accessed: 27 May 2019].
- FIORDELISI, F. AND MOLYNEUX, P. (2010). The determinants of shareholder value in European banking, *Journal of Banking & Finance*. North-Holland, 34(6), pp. 1189–1200. [Accessed: 17 May 2019].

GIAMPORCARO, S. (2017). Lest we forget - lessons from African Bank / *Fin24*. [Online] Available at: <https://www.fin24.com/Opinion/lest-we-forget-lessons-from-african-bank-20170927> [Accessed: 27 November 2019].

GOKO, C. (2019). Foreigners Are Dumping South African Bonds as Junk Status Looms - *Bloomberg*, 2019. [Online] Available at: <https://www.bloomberg.com/news/articles/2019-08-14/foreigners-are-dumping-south-african-bonds-as-junk-status-looms> [Accessed: 25 August 2019].

GORTON, G., YALE AND NBER (2012). Some Reflections on the Recent Financial Crisis. [Pdf] Available at: <http://faculty.som.yale.edu/garygorton/documents/SomeThoughtsontheRecentFinancialCrisisAug29.pdf> (Accessed: 9 September 2019).

GREENLEE, J., KELLY, H., FOGARTY, M., DUTTA, M. and BARAYBAR, J. (2011). Basel III: Issues and implications, *KPMG Report*, p. 20 [Accessed: 27 March 2019].

GREENSPAN, A. (2007). Capital Impact of Basel II & Economic Capital Risk, *Capital and Shareholder Value Management*. [Pdf] Available at: https://www.nedbank.co.za/content/dam/nedbank/site-assets/AboutUs/InformationHub/CorporatePresentations/2007/Basel_II_Economic_Capital_and_Performance_Measurement_Update_-_September_2007.pdf [Accessed: 23 July 2019].

HENDRICK, D. (2014). 5 Things Goldman Sachs Looks for in a Company Before Investing / *Inc.com*, 2014. [Online] Available at: <https://www.inc.com/drew-hendricks/5-things-goldman-sachs-look-for-in-a-company-before-investing.html> [Accessed: 22 August 2019].

HU, Z., LEVY, A. AND ZHANG, J. (2013). Economic Capital Model Validation: A Comparative Study - *Moody* [Pdf] Available at: <https://www.moodysanalytics.com/-/media/whitepaper/2018/economic-capital-model-validation-a-comparative-study.pdf> [Accessed: 20 September 2019].

HUDSPETH, C. (2018). Investing for Beginners: 8 Keys to Picking a Good Stock. [Online] Available at: <https://investinganswers.com/articles/8-most-important-facts-know-about-company-you-invest> [Accessed: 22 August 2019].

IFEACHO, C. AND NGALAWA, H. (2014). Performance Of The South African Banking Sector Since 1994, *Journal of Applied Business Research (JABR)*, 30(4), p. 1183 [Accessed: 2 May 2019].

INMAN, P. (2019). Pessimists are predicting a global crash in 2020. You can see why | Business / *The Guardian*, 2019. [Online] Available at: <https://www.theguardian.com/business/2019/jan/05/global-economic-crash-2020-understand-why> [Accessed: 11 August 2019].

IRESS (2019). Markets / *IRESS*. [Online] Available at: <https://expert.inetbfa.com/> [Accessed: 6 December 2019].

JENSEN, K., MAUTNER, T. AND SILVERMAN, D. (2005). Lecture notes from internet Qualitative research 3 PARADIGMS WITHIN THE IS-FIELD : Positivist Research Interpretive Research Handbook 5 paradigms : Questions for group work : METHODOLOGIES , focus will primarily be on : Action Research', (*Silverman 2005*), pp. 2–5 [Accessed: 11 August 2019].

JOSHI, M. V. (2018). Economic Capital Modeling with SAS® Econometrics. [Pdf] Available at: <https://www.sas.com/content/dam/SAS/support/en/sas-global-forum-proceedings/2018/2114-2018.pdf> [Accessed: 23 July 2019].

JSE (2015). Ordinary Shares. *Johannesburg Stock Exchange*. [Pdf] Available at: [https://www.jse.co.za/content/JSEPresentationItems/Ordinary Shares.pdf](https://www.jse.co.za/content/JSEPresentationItems/Ordinary%20Shares.pdf) [Accessed: 25 August 2019].

JSE (2017). Ordinary Shares. *Johannesburg Stock Exchange*. [Pdf] Available at: [https://www.jse.co.za/content/JSEPresentationItems/Ordinary Shares.pdf](https://www.jse.co.za/content/JSEPresentationItems/Ordinary%20Shares.pdf) [Accessed: 16 September 2019].

JSE (2019). Ordinary Shares. *Johannesburg Stock Exchange*. [Pdf] Available at: <https://www.jse.co.za/trade/equity-market/equities/shares/ordinary-shares> [Accessed: 6 October 2019].

- KAYLENE A. J. (2016). Assessment of Business Risk Economic Capital for South African banks: A response to Pillar 2 of Basel II. *University of the Witwatersrand, Faculty of Commerce, Law and Management, Wits Business School*. [Pdf] Available at: [http://wiredspace.wits.ac.za/jspui/bitstream/10539/23989/1/MMFI Research Project Final Kaylene Alie.pdf](http://wiredspace.wits.ac.za/jspui/bitstream/10539/23989/1/MMFI_Research_Project_Final_Kaylene_Alie.pdf) [Accessed: 27 May 2019].
- KIVUNJA, C. AND KUYINI, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts, *International Journal of Higher Education*. Sciedu Press, 6(5), p. 26 [Accessed: 27 January 2019].
- LARSSON, H. (2009). Inter-Risk Correlation within Economic Capital, [Accessed: 2 March 2019].
- LI, J., WEI, L., ZHU, X., WU, D. and LEE, C. (2018). Financial statements based bank risk aggregation, *Review of Quantitative Finance and Accounting*. Springer US, 50(3), pp. 673–694 [Accessed: 2 March 2019].
- MABWE, K. AND WEBB, R. (2010). A financial ratio analysis of Commercial Bank performance in South Africa, *African Review of Economics and Finance*. Rhodes University. Available at: <https://0-www.ajol.info.wam.seals.ac.za/index.php/aref/article/view/86945/76725> [Accessed: 9 September 2019].
- MAJUMDER, M. T. H. AND LI, X. (2018). Bank risk and performance in an emerging market setting: the case of Bangladesh, *Journal of Economics, Finance and Administrative Science*, 23(46), pp. 199–229 [Accessed: 20 March 2019].
- MANSON, H. (2012). Capitec’s 6 P’s of marketing / *Marklives.com*. [Online] Available at: <https://www.marklives.com/2012/04/capitecs-6-ps-of-marketing/> [Accessed: 7 October 2019].
- MAREDZA, A., KAPINGURA, F. AND MISHI, S. (2013). Exploring the Nexus between Bank competition and productivity in the South African Banking Sector. [Pdf]. Available at: <https://econrsa.org/system/files/workshops/papers/2013/kapingura.pdf> [Accessed: 9 September 2019].

MLAMBO, K. AND NCUBE, M. (2011). Competition and Efficiency in the Banking Sector in South Africa, *African Development Review*. John Wiley & Sons, Ltd (10.1111), 23(1), pp. 4–15 [Accessed: 2 May 2019].

MOTAU, T. (2018). Vbs Mutual Bank. The Great bank Heist. Investigator’s Report to the Prudent Authority. [Pdf] Available at: <https://uncensoredopinion.co.za/wp-content/uploads/2018/10/VBS-Mutual-Bank-The-Great-Bank-Heist.pdf> [Accessed: 27 November 2019].

NACHANE, D. AND GHOSH, S. (2001). Risk-Based Standards , Portfolio Risk and Bank Capital An Econometric Study, 36(10), pp. 871–876 [Accessed: 18 November 2019].

NAIDOO, P., YOO, S. AND BLOOMBERG (2019). SA’s junk spiral may deepen as S&P likely to cut outlook | *Fin24*. [Online] Available at: <https://www.fin24.com/Economy/sas-junk-spiral-may-deepen-as-sp-likely-to-cut-outlook-20191118-2> [Accessed: 18 November 2019].

OKEAHALAM, C. (2006). ‘Production Efficiency in the South African Banking Sector: A stochastic analysis’. [Online] Available at: <https://0-www.tandfonline.com.wam.seals.ac.za/doi/pdf/10.1080/02692170500362819?needAccess=true> [Accessed: 9 September 2019].

OMARJEE, L. (2019) Court stops banking strike, Cosatu warns workers shouldn’t risk their jobs by staying away / *Fin24*. [Online] Available at: <https://m.fin24.com/Companies/Financial-Services/breaking-banking-strike-interdicted-labour-court-rules-20190926> [Accessed: 4 October 2019].

PEARSON (2013). Shareholders Equity Chapter 9, pp. 1–4. [Pdf] Available at: http://catalogue.pearsoned.ca/assets/hip/us/hip_us_pearsonhighered/samplechapter/01318792_94.pdf [Accessed: 18 January 2019].

PITJENG, R. (2019). SA warned to withdraw enough money ahead of banking strike / *Ewn*. [Online] Available at: <https://ewn.co.za/2019/09/24/sa-warned-to-withdraw-enough-money-ahead-of-banking-strike> [Accessed: 4 October 2019].

QUIDING, C. (2006). The cost-benefit of regulation in South Africa Banking. [Online] Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?Pdf> [Accessed: 9 September 2019].

RAMADAN, I. (2016). EVA and the Impact of the Macroeconomic Variables: Evidence from the Jordanian Manufacturing Companies. [Pdf] Available at:

<https://pdfs.semanticscholar.org/4acd/48ee349d45f1a663bcf72813138ff915ec8d.pdf>

[Accessed: 11 September 2019].

SAITA, F. (2007). Value at risk and bank capital management. *Elsevier Academic Press*

[Accessed: 4 May 2019].

SALIE, F. (2016). Barclays selling Absa to save costs / *Fin24*. [Online] Available at:

<https://www.fin24.com/Companies/Financial-Services/barclays-makes-firm-intention-to-sell-absa-20160301> [Accessed: 4 October 2019].

SARIN, N. AND SUMMERS, L. H. (2018). On Market-Based Approaches to the Valuation of Capital. *Harvard Education*. [Pdf] Available at:

https://scholar.harvard.edu/files/nsarin/files/sarin_summers_on_market_based_march_2018.pdf [Accessed: 28 May 2019].

SARB (2015). Financial Stability Review. *South African Reserve Bank*. [Online] Available at: <http://www.reservebank.co.za> [Accessed: 25 November 2019].

SARB (2019a). Financial Stability Review. *South African Reserve Bank*. [Pdf] Available at: <https://www.resbank.co.za/Lists/News and Publications/Attachments/9276/FSR First Edition 2019.pdf> [Accessed: 30 September 2019].

SARB (2019b). Legislation - *South African Reserve Bank*. [Online] Available at: <https://www.resbank.co.za/AboutUs/Legislation/Pages/default.aspx> [Accessed: 21 October 2019].

SARB (2019c). Selected South African Banking Sector Trends July 2019 - *South African Reserve Bank*. [Pdf] Available at: <https://www.resbank.co.za/Lists/News and Publications/Attachments/9136/07 July 2019.pdf> [Accessed: 29 September 2019].

SARB (2019d). South Africa's implementation of Basel II and Basel III - *South African Reserve Bank*. [Online] Available at:

<https://www.resbank.co.za/PrudentialAuthority/Deposit-takers/Banks/Supervision/Pages/South-Africa's-implementation-of-Basel-II-and-Basel-III.aspx> [Accessed: 26 August 2019].

SARB (2019e). Welcome to the Prudential Authority - *South African Reserve Bank*. [Online]. Available at: <https://www.resbank.co.za/PrudentialAuthority/Pages/default.aspx> [Accessed: 25 November 2019].

SEMENOV, M. AND SMAGULOV, D. (2017). Portfolio Risk Assessment using Copula Models. [Online]. Available at: <http://arxiv.org/abs/1707.03516> [Accessed: 14 March 2019].

SMITH, C. (2019). Capitec tops again for customer satisfaction - but it's game on for banks in 2019 – *Fin24*. Available at: <https://www.fin24.com/Companies/Financial-Services/capitec-tops-again-for-customer-satisfaction-but-its-game-on-for-banks-in-2019-20190327> [Accessed: 7 October 2019].

STATS SA (2019). Statistical Release P0277 – *Statistics South Africa*. [Pdf] Available at: <http://www.statssa.gov.za/publications/P0277/P0277June2019.pdf> [Accessed: 29 September 2019].

TJIANE, K. N. (2015). Curatorship of Banks as a Measure to Rescue Failing Banks – *University of Pretoria, Faculty of Law*. [Pdf] Available at: https://repository.up.ac.za/bitstream/handle/2263/53196/Tjiane_Curatorship_2016.pdf [Accessed: 24 October 2019].

VERHOEF, G. AND SINGLETON, J. (2010). Regulation, deregulation, and internationalisation in South African and New Zealand banking - *Seals*. [Pdf] Available at: <https://0-www.tandfonline.com.wam.seals.ac.za/needAccess=true> [Accessed: 9 September 2019].

VERMEULEN, F. (2018). How Capitec Became South Africa's Biggest Bank, *Administrative Science Quarterly*, 47(2), p. 325 [Accessed: 4 April 2019].

WALL STREET (2014). Bank Regulatory Capital : Why We Need It Bank Regulatory Capital : Why It Affects Our Models & Valuation Risk-Weighted Assets – *Wall Street*. [Accessed: 7 April 2019].