Measuring the impact of Covid-19 on banking sector returns, profitability, and liquidity in South Africa.

Submitted by

Dashami Naidoo

Student number: 215005758

A dissertation submitted in fulfilment of the requirements for the degree of

M Com Finance

In the

DISCIPLINE OF FINANCE

School of Accounting, Economics and Finance, College of Law, Management, University of KwaZulu-Natal, Durban, South Africa.

November, 2022

Supervised by

Dr. Faeezah Peerbhai

(Supervisor)

Mr. Damien Kunjal

(Co supervisor)

Declaration

I Dashami Naidoo declare that:

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

(ii) This thesis has not been submitted for any degree or examination at any other university.

(iii) This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

(iv) This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

a) their words have been re-written but the general information attributed to them has been referenced;
b) where their exact words have been used, their writing has been placed inside quotation marks, and referenced.

(v) Where I have reproduced a publication of which I am author, co-author or editor, I have indicated in detail which part of the publication was actually written by myself alone and have fully referenced such publications.

(vi) This thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the References sections.

Student's Signature: 

Date: 2022/09/30

Acknowledgements

This study is dedicated to my parents, without whose support and constant encouragement this study would have not seen light, thank you for providing me with the ability to reach new heights. The two of you are my greatest inspirations, and I can only hope that in time, I will mimic a fraction of you. I am profoundly grateful for all your love and encouragement throughout my life. Thank you for encouraging greatness in your children. To my brothers, thank you for all the banter and competition. I am so proud of who we have become, and I know that without you two, life would not be the same. Thank you for listening to all my rants and providing me with comfort and wisdom when I needed it the most.

My dearest grandparents, your presence in my life has been the greatest blessing. Growing up with you has definitely shaped the person I have become. All the love, nurturing and beautiful memories will forever be cherished. It has been four years since the loss of my grandmother, and I can say with certainty that no amount of time can ease the pain. Thank you for making me who I am today, I see your traits in myself every day, and I am so grateful to have lived a life with you by my side. I am because you were.

To my supervisors, Dr. Faeezah Peerbhai and Mr. Damien Kunjal, this would have never been possible without your guidance and constant motivation. Thank you for believing in me and guiding me to the finish line. Dr. Peerbhai, you might not remember this, but it was you who gave me a glimmer of hope in one of the darkest moments of my life. I know that I would not be where I am today without the kindness you showed me that day, thank you.

List of acronyms

CEIC	Census and Economic Information Center
EMH	Efficient Market Hypothesis
GDP	Gross Domestic Product
IRESS	Integrated Real-time Equity System
JSE	Johannesburg Stock Exchange
NPL	Non-Performing Loan
PA	Prudential Authority
ROA	Return on Assets
ROAA	Return on Average Assets
ROE	Return on Equity
RTGS	Real-Time Gross Settlement
SARB	South African Reserve Bank

SARS	Severe Acute Respiratory Syndrome
SIFI	Systemically Important Financial Institution
SME	Small and Medium-Sized Enterprise

Abstract

In recent years, Covid-19 has taken the world by storm. The impact faced by all industries have been compared to that of the global financial crisis of 2008. Similarly, the banking sector was not spared in this state of emergency. Banks are considered to be a systemically important financial institution (SIFI) and, as a SIFI they have the ability to pose a serious risk to the economy should they fail because their failure could result in a financial crisis. The novelty of this virus created uncertainty in investors, thus giving rise to the risk of failure. Therefore, the objective of this study is to investigate the impact of Covid-19 on the banking sector by reviewing the abnormal returns, financial performance, and liquidity of the JSE (Johannesburg Stock Exchange) listed banks.

Panel regression models are employed to examine the impact of the crisis on the abnormal returns, financial performance and the liquidity of the banks overall. The impact on the abnormal returns was found to be insignificant overall, while the impact on financial performance was found to be significant and negative with a 27% decline in performance over the period of crisis. The impact on liquidity was similar but less intense with a 12% decline in liquidity over the period of crisis. In terms of implications, considering the impact on abnormal returns was insignificant, this has diversification benefits whereby investors could invest in an effort to reduce their exposure in the event of similar crisis. With respect to the effect on financial performance and ultimately profitability, policies should be implemented in an effort to improve performance during these periods of crisis. Lastly, a greater liquidity buffer should be enforced in order to prevent the significant decline in liquidity that was experienced during this period of crisis.

Contents

List of Tables

List of Figures

Chapter 1: Introduction

1.1 Background and research problem

1.1.1 Background

Banks form an essential part of any financial system, with multiple roles to play in the economy. The banking sector makes up a section of the economy, which holds and invests financial assets as a way to generate more wealth (Beck, Dottling, Lamber, van Djik., 2020). The South African Reserve Bank (SARB) is responsible for generating an efficiently functioning economy by ensuring an efficient payment system which is then adopted by a complex network of banks (local, national and international) (Ngalande, 2003). Ngalande (2003) states that the core responsibility of a bank in an economy is to ensure that monetary stability is maintained, which in return ensures the stability and effectiveness of the financial system. The banking sector has an important role in the transmission of monetary policy, which is one of the most essential tools used by government in aiding economic growth and avoiding inflation. The national level of the money supply is controlled by the SARB while the flow of money in the markets that they operate in are controlled by commercial banks (Mboweni, 2000). The SARB can control the money supply in the sense that it can shrink or expand the money supply (Gobat, 2021). This can be done by altering the reserve requirements by buying and selling securities, these transactions occur on the open market with banks acting as the key counterparties.

According to Dhliwayo (2014), banks have a critical role in ensuring the success of Small and Medium-Sized Enterprises (SMEs) and listed companies, and in return, these companies assist in alleviating poverty. The growth experienced by these SMEs along with other South African businesses have been found to have a direct impact on Gross Domestic Product (GDP) growth, this is due to the increase in output and profits (Dhliwayo, 2014). Indirectly, SMEs impact GDP

through the increase in innovation and resilience in macro-economic terms of the overall economy (Norden, 2015).

Banks, however, have the ability to fail just like any other business but failure in the banking system has the potential to impact other banks, their customers and the market as a whole. This is regarded as systemic risk which arises due to banks being regarded as Systemically Important Financial Institutions or SIFIs, SIFIs refer to financial institutions that have the ability to cause a financial crisis if they fail (Tabak, Fazio and Cajueiro, 2013). The bank has vulnerabilities that result from three specific sources including a high proportion of short-term funding, a low ratio of capital to assets, and low cash to assets ratio (Gobat, 2021). Consumer uncertainty has the ability to render a bank insolvent, this can happen due to customers withdrawing their assets rapidly due to uncertainty and fear over the banks' ability to cope with external forces (Siegel, 2020). The volatility placed on the bank by uncertain investors could be detrimental, and the mass number of investors withdrawing their investments could result in a further strain on the banking sector, whereby a disruption in this system can affect trade and subsequently the economic growth (Gobat, 2021).

The discovery of the Coronavirus (henceforth, Covid-19) in December 2019 resulted in mass consumer uncertainty due to the novelty of this virus, as consumers did not know what to expect in terms of market conditions. Covid-19 has had a range of effects on the economic conditions in South Africa; and the discovery has seen businesses suffer, with workplace productivity decreasing and a negative supply shock arising, causing many small businesses to close temporarily (42% of small businesses closed temporarily), aiding in the rise in unemployment (Bartik, Bertrand, Cullen, Glaeser, Luca, 2020). According to Siegel (2020), the market movements of mid-March 2020 can be compared to that of the global financial crisis of 2007-2009, with a GDP contraction of 5% being seen as a good outcome globally. Any addition that results in uncertainty could result in a mass simultaneous withdrawal of funds, can trigger a run leading to the banks potential failure. It

was determined that banks with a minimum liquidity buffer experienced a larger strain than expected as they were unable to cater to excessive customer demand during periods of uncertainty as well as cushion macroeconomic shocks (Siegel, 2020).

1.1.2 Problem statement

Banks are an essential part of the economy as they are regarded as SIFIs. Donnelly (2019) makes note of the allocation of the country's most vital banks as SIFIs by the SARB. The banks that have been determined to be SIFIs in South Africa are as follows; ABSA, Standard Bank, First National Bank, Nedbank, Investec, and Capitec (Donnelly, 2019). These banks are referred to as SIFIs due to their vital impact on the South African financial system. Due to their impact on the overall well-being of the financial system, these banks have strict regulations in place to help prevent any financial failures that could result in any detrimental impacts on the financial system. The strict regulations that are referred to consist of strict oversight by SARB, high capital requirements, and stress tests that are conducted periodically (Liberto, 2019).

The 2008 global financial crisis has left no industry unharmed, including the banking sector, the banking system experienced significant difficulties with an impact on its performance and liquidity capabilities (Andrieș, Capraru, Iesan-Muntean, Ihnatov, 2016). Vodova (2011) noted that during the global financial crisis, banks battled to maintain sufficient liquidity levels in an effort to sustain the financial system. Liquidity may be defined as the capability of a financial institution to meet the demand for funds, a bank can use multiple sources to meet these liquidity requirements, such as new deposits, borrowed funds and using the borrowing from the central bank. Liquidity risk is made up of two types of risk, such as market liquidity risk and funding liquidity risk. When a bank is considered to have liquidity risk, it is usually funding liquidity risk whereby the bank is unable to meet both unexpected and expected current and future collateral needs efficiently without

altering the daily operations or the financial stability of the bank. Khwaja and Mian (2008) note that in the event of a liquidity shock, banks pass on the fluctuation to borrowing firms, which could result in detrimental effects to the economy if these firms are incapable of coping during liquidity shortages from their respective banks. The impact on the economy stems from two different channels simultaneously, the bank lending channel and the firm borrowing channel. The bank lending channel consists of the banks inability to protect borrowing firms from bank-specific liquidity shocks and the firms borrowing channel consists of the inability of firms to protect against lending channel effects by borrowing from alternative sources of financing. Khwaja and Mian (2008) note that based on previous literature, the source of the transmission of the liquidity shock to the economy is primarily through the firm borrowing channel.

The first case of Covid-19 was reported in China's Hubei province (Kunjal, 2021). Ma, Tang, Wang, Wang, Zhao and Xiang (2022) noted that the discovery of Covid-19 created uncertainty which resulted in losses to the capital market due to the violent fluctuations. It was noted that the stock markets bore most of this loss due to the pandemic. The pandemic has had two major implications on the market in the sense that it created a sense of pessimism amongst investors globally which contributed to the herding effect, subsequently, resulting in a successive stock market decline. Furthermore, governments around the world restricted cross-border travel and implemented quarantine policies which led to a decline in consumption and output, which has thus caused a decline in stock returns, and ultimately impacted the broader economy. Bradley and Stumpner (2021) note that the capital market could provide an indication of what can be expected due to the stock returns being a pooled estimation of investor beliefs, thus the capital market serves as a powerful indicator of what the future may hold. This uncertainty could also impact the return of the South African banking sector.

The first case of Covid-19 was detected in March 2020 in South Africa. In an attempt to curb the spread of the virus, the South African government implemented a nationwide lockdown, and cross-

border travel restrictions. As a result, businesses closed leading to the loss of jobs. This led to individuals withdrawing deposits in order to have cash on hand coupled with an increase in the demand for credit. This put a strain on the liquidity of banks. Beck (2020) noted that with businesses having to close, they did not have the opportunity to bring in revenue, similarly with individuals who lost their jobs during the crisis. This reduction in revenue will bring about losses throughout and if this were to continue, the repayment capacity of these businesses and individuals would be stunted, thus affecting the banks' capital and profits. The loss together with lower liquidity has the ability the affect the banks solvency and ultimately weaken the economy. Beck and Kiel (2022) note that equity buffers have improved from the time of the 2008 financial crisis, although the Covid-19 crisis has differed in the sense that it is a crisis induced by a public health shock and not due to macroeconomic and financial imbalances. The SARB has made note of their attempts to aid the issues arising due to the discovery of Covid-19 and the lockdown that was implemented. They lowered the repo rate to 3.75% from 6.5% in an effort to ease the strain on borrowers and enable them to meet their financial obligations. Additional liquidity was availed by increasing the size and duration of repo facilities and by purchasing government bonds, this was done in an effort to ensure the smooth functioning of the financial markets. However, the uncertainty that has arisen from this health shock has exacerbated the volatility of the returns generated by banks.

According to PWC South Africa (2021), the financial performance delivered by SA's major banks reflected the many challenges that they faced during the financial year of 2020. The health concerns that resulted from Covid-19 caused anxiety amongst consumer confidence, which resulted in a huge downfall in economic activity domestically. Given the scale of economic impact since the discovery of Covid-19, it is necessary to determine how the banking sector has fared during this crisis. It has been noted that this pandemic is not the only crisis to come, there is a possibility of a climate crisis on the horizon (Figueres and Rivett-Carnac, 2020) and this study will assist in understanding how the banking sector responded in the face of a crisis and how to develop a resilience in future.

1.1.3 Research problem

Based on the problem statement discussed, this study's main focus is to answer the following question:

What is the impact of Covid-19 on the South African banking sector?

1.2 Research objectives

The objectives of this study are as follows:

- To determine the impact of Covid-19 on the banking sectors stock returns in SA.
- To determine the impact of Covid-19 on the banking sectors performance based on profitability, determined by the change in Return on Average Assets of each bank (ROAA).
- To determine the impact of Covid-19 on the banking sectors liquidity in SA, determined by the change in the loan-to-deposit ratio.

The objectives of this study are achieved by answering the following questions:

- What impact does Covid-19 have on the stock returns experienced by firms in the banking sector?
- What impact does Covid-19 have on the banking sectors performance in terms of the change in ROAA?
- What is the impact of Covid-19 on the banking sectors liquidity, measured by the loan-to-deposit ratio?

1.3 Scope and method of this study

1.3.1 Scope of this study

The effect of the pandemic on the South African banking sector is an essential aspect based on the assumption that the Covid-19 pandemic is not the last pandemic or crisis that the country will face. Demirguc-Kunt, Pedraza, and Ruiz-Ortega (2020) analysed the impact of Covid-19 on the banking sector of 44 countries, however South Africa was not part of the study group. Taking this into consideration, it is necessary to determine the implications on the South African banking sector and ultimately the possible failure of the financial sector, to hedge the country in the likelihood of a future pandemic. Hence the focus of the impact of Covid-19 on the banking sector which has been compartmentalised into three sections, the abnormal returns, financial performance, and liquidity. The sample period of the abnormal returns analysis spans from January 2017 to December 2021 using monthly data. The chosen time period accounts for a period prior to the crisis period, which began in March of 2020. The sample period of the financial performance analysis spans from 2009 to 2021 using yearly data, the use of yearly data was due to unavailability of financial statements at a higher frequency. The sample period of the liquidity analysis spans from 2011 to 2021 using yearly data, this sample period was considered to be sufficient based on works by Li, Strahan and Zhang (2020).

1.3.2 Method of this study

This study follows a panel regression approach for the three analyses. The abnormal return analysis begins with the calculation of abnormal returns based on separate regressions to determine the $\propto$ and β of the individual banks which is then used to calculate $ARet_{b.t}$ based on *Equation 3*. A panel regression is then run to determine the relevance of the independent variables on $ARet_{b.t}$ and the impact of the crisis on the dependent variable. The financial performance and liquidity analyses

follow a similar panel regression which will be estimated to determine the impact of the crisis on financial performance and liquidity of the JSE listed banks. Prior to the estimation of the models, preliminary data analysis was conducted to ensure that the series was suitable, the preliminary analysis consisted of unit root tests, correlation tests and descriptive statistics.

1.4. Structure of this thesis

This thesis consists of five chapters which are structured as follows:

- Chapter 1: Introduction

The introduction chapter reviews the problem statement which substantiates the need for the current study. Furthermore, the objectives, scope and method of this study are introduced in Chapter 1.

- Chapter 2: Literature Review

Chapter 2 builds a framework of concepts relative to behavioural finance, with emphasis on investor behaviour, followed by a theoretical approach to financial performance and liquidity. Chapter 2 then extends to an empirical review which is broken down into five sections, firstly, this study will review literature relevant to the impact of Covid-19 on the financial markets followed by the review of the South African banking sector. The review will then move on to the global banking sector during other financial crises followed by the global banking sector during Covid-19. Finally, the review will look at the banking sector crises and their determinants.

- Chapter 3: Data and Methodology

Chapter 3 outlines the various aspects relating to the data used in this study, inclusive of the sample period, data type as well as how each variable will be calculated. The latter provides a detailed discussion of the regression analysis.

- Chapter 4: Empirical Results and Discussion

Chapter 4 presents the results from the panel data analyses and provides an in-depth discussion of the findings obtained from the estimated regression models.

- Chapter 5: Conclusion and Recommendations

Chapter 5 summarises the results obtained from the analysis with the objective of answering the research questions posed. Chapter 5 concludes by discussing the implications of this study's findings together with recommendations for future studies.

Chapter 2: Literature Review

The following chapter will consist of a theoretical review followed by the empirical review. The theoretical review consists of an analysis of theories that already exist, in an effort to justify the changes that occurred during Covid-19. The theoretical review is broken down into theories relating to investor behaviour, financial performance and finally liquidity. Theories relating to investor behaviour is further broken down into traditional behavioural theories and behavioural theories. The empirical review will consist of a review of studies relevant to this study, in order to generate a sufficient understanding of studies that have already been published.

2.1 Theoretical review

Traditional finance theories aim to explain investor behaviour based on an assumption that all investors are rational, thus capital markets are efficient. However, this is not necessarily the case considering that several anomalies exist in financial markets that cannot be explained by traditional finance theories. These anomalies have been explained successfully since the introduction of Prospect Theory by Kahneman and Tversky (1979). Behavioural theories attempt to elaborate investor behaviour based on the assumption that not all investors are rational considering that biases and heuristics influence investment decisions. On this basis, the subsequent sections review traditional finance theories followed by a review of behavioural finance theories that explain investor behaviour.

2.1.1 Theories relating to investor behaviour

Investor behaviour is a relevant factor in this study considering that the decisions of the investor play a fundamental role in the stocks and how they react to events. Thus, it is essential to break down the different approaches to investor behaviour to have an understanding of how they should respond based on traditional finance versus how they actually behave.

2.1.1.1 Traditional finance approach to investor behaviour

Traditional finance theories are based on two assumptions, market efficiency and rationality. The Efficient Market Hypothesis (EMH) assumes that in an efficient market, the prices at which securities trade, incorporates all relevant information, including current and predicted events (Fama, 1970). This is due to market participants continuously conducting research to identify securities that are mispriced which results in all new information reflecting instantaneously in the market securities prices. (Fama, 1970). This is due to the competition between market participants to identify mispricing. This concept of market efficiency suggests that movements in share prices are completely random, thus making forecasting movements in share prices highly unlikely.

Three forms of market efficiency exist, namely, weak, semi-strong and strong. The weak form of EMH suggests that current share prices always reflect all past financial information (Fama, 1991). This results in traders being unable to utilise technical analysis to generate abnormal returns (Guney and Komba, 2016). The semi-strong version of EMH suggests that share prices incorporate all public information, inclusive of historical information at all times (Fama, 1991). With regards to a semi-strong capital market, technical analysis and fundamental analysis will not be sufficient to create a portfolio that is more profitable than a random portfolio of assets (Alexakis, Patra and Poshakwale, 2010). However, it is possible to utilise insider trading to earn excess returns in the

case when the capital market is semi-strong form efficient. Lastly, the strong form of EMH advocates that at all times, a shares price reflects all available information i.e., historical, public and private information. Thus, it is not possible in a strong form efficient capital market to generate abnormal returns (Fama, 1970).

Traditional finance theories were once thought of as essential explanations of investor and market behaviour; however, researchers have determined that standard finance theories do not explain actual market conditions sufficiently (Joo and Durri, 2015). This is because standard finance theories are based on assumptions that are incomplete and built on a foundation of how market participants should behave and not of how they actually behave (Kapoor and Prosad, 2017). This has resulted in behavioural finance theories emerging in order to account for investor irrationalities and biases. Notably, the JSE has been found to exhibit a degree of inefficiency, evidence of this has been noted by the works of Sarpong, Sibanda and Holden (2016), Heymans and Santana (2018) and Chipunza, Muguto, Muguto and Muzindutsi (2020).

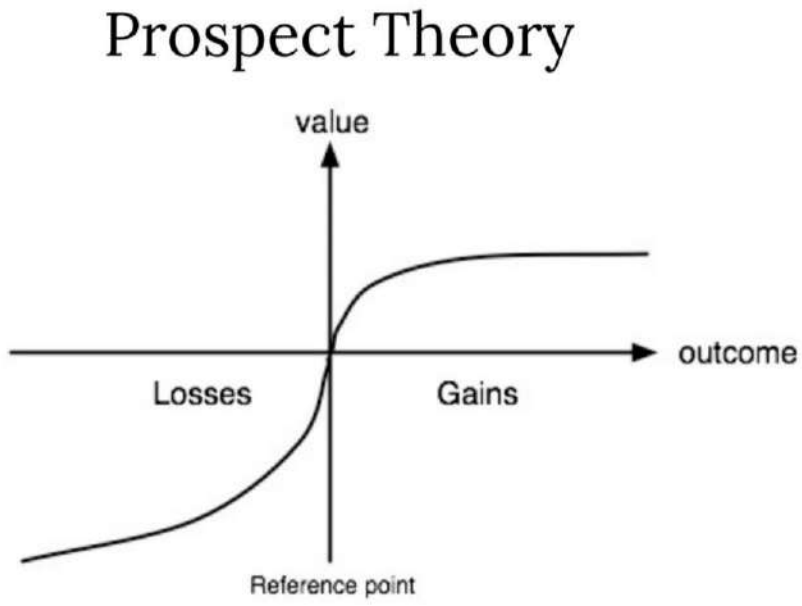
2.1.1.2 Behavioural finance approach to investor behaviour

Standard finance theories may be enough to make sound financial decisions, however, they may not be able to justify certain disturbances and anomalies in the market (Kapoor and Prosad, 2017). This is due to the reality that investors have been found to make decisions irrationally at times, whereby decisions regarding their investment are instead based on emotions, beliefs, and state of minds. Thus, behavioural finance theories become relevant as they may be able to explain such disruptions. Behavioural finance theories analyse how the psychology of the market participants have the ability to alter their investment decisions, and thus the market in which they trade (Dickason and Ferreira, 2018). Behavioural finance theories are relevant in this study due to the emotions that are involved when it comes to a global pandemic. In the case of Covid-19, although

the Swine flu pandemic existed in 2009-2010, Covid-19 brought about fear and uncertainty on a greater level whereby entire countries were put on lockdown, inhibiting movement to avoid the spread of this virus. Thus, the severity of the virus cannot be compared to anything experienced in this century. In particular, behavioural finance refers to the study of how different emotional and cognitive biases lead to irrational investment decisions that result in subpar investment choices or stock market anomalies (Raut, Das and Kumar, 2018).

One of the foundational behavioural finance theories is the Prospect Theory introduced by Kahneman and Tversky in 1979 and is based on the idea of loss aversion. Loss aversion refers to the idea whereby the pain of a loss is felt with more intensity than a gain of the same magnitude (Barberis and Huang, 2001), thus indicating that a loss is more powerful than an equivalent gain. The Prospect Theory proposes three key aspects; individuals don't have a uniform attitude towards risk, individuals use a point of reference to determine the value of each prospect, and individuals are risk adverse in a sense that individuals seek to avoid losses more than they seek gains. These three properties of Prospect Theory led to a value function that follows an asymmetric 'S' shape which is concave for gains and convex for losses and is steeper in the loss's domain. An illustration can be seen below which provides an approximate value that individuals assign to their gains and losses. The aversion of loss could possibly be the reason behind investors withdrawing investments at a rapid rate, as they feared the loss of capital due to the discovery of the virus.

Figure 1: Prospect Theory value function



Source: Bhasin (2021)

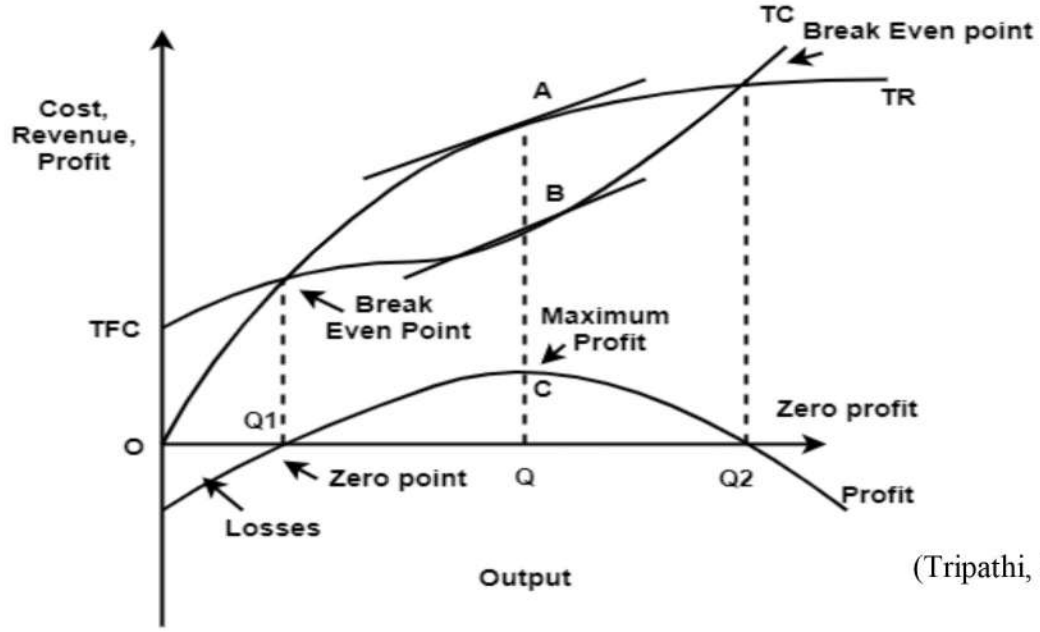
Behavioural finance theories may be able to explain the sudden fall in the stock market when Covid-19 was first discovered in South Africa. Investors were uncertain due to the novelty of this virus, thus they made decisions based on emotions, such as uncertainty and fear, and their current state of mind. This uncertainty could have led to the mass withdrawal of funds from banks thus affecting the banks liquidity.

2.1.2 Theoretical approach to financial performance

Profit maximisation theory in a traditional economic model assumes that a firm's main objective is to maximise its short-run profits. Profit is the difference between revenue and total cost. Firms

attempt to base their output and sales price based on the maximisation of economic profits, which is demonstrated in Figure 2 whereby total revenue (TR) represents the total revenue earned from selling various amounts of output of product. Total cost (TC) represents the total economic costs at different levels of output (Tripathi, 2019). At Q1 level of output, total economic cost is equal to total revenue allowing the firm to just break even. Therefore, the point where TR intersects TC is known as the break-even point. Beyond this point, the firm will be generating a profit based on its current level of output. Profits will continue to be generated till the Q level of output is reached. At the output level Q, the distance between TR and TC is at its maximum, as in the largest distance between the curves exists at this point. Thus, the difference between A and B is the maximum profits that can be earned based on the conditions of total cost and total revenue.

Figure 2: Profit maximisation illustration



(Tripathi, 2019)

In Figure 2, the lower curve TP represents the total profit generated. The total profit rises to its maximum point at C before it starts to descend. Therefore, to maximise profits, the firm should produce at the output level Q and will charge the maximum price that their customers are willing to pay based on the demand conditions. Keeping this in mind, a firm will make any decision based on the whether the change results in an increase in revenue that is greater than the costs involved in the action or if it reduces costs while maintaining revenue. However, the profit maximisation model consists of its own limitations, specifically, it does not take time into consideration, and it does not analyse the firm's behaviour under risk conditions and uncertainty (Tripathi, 2019). Considering that banks act as a financial intermediary, they still offer services as a business to their customers through the pandemic period, it is essential for them to redetermine their outlook due to this period of crisis and find their new optimal level of output based on what their consumers are willing to pay for their services, thus based on profit maximisation theory, they would have to alter their pricing as well as output to find their new profit maximisation point of output based on their new level of risk.

Risk management theory identifies the ability of man to identify patterns when it comes to uncertainty and develop heuristics to overcome it (Sipkin, 2013). Risk is a vague term with many perspectives, however, in the many definitions that have arisen over time, there are common characteristics. These common characteristics include: risk equals the expected loss (Willis, 2005), and risk is the probability of an adverse outcome (Graham and Weiner, 1995). Risk management consists of a comprehensive approach which is often referred to as the Enterprise Risk Management (ERM) approach. Whereby, under this approach, organisations proactively manage risk, monitoring the risks associated with their strategic objectives continuously. Organisations would also have to have an idea of the permanent risks involved within the organization with the objective of maintaining an overall risk profile. The management of risk is an integral part of the organisation and its processes in the sense that the organisation would need to understand the potential factors that could contribute to the possibility of failure or success. On this basis,

enterprise risk management would assist the organisation (banks in this case) in increasing the possibility of success and reducing the probability of failure during the Covid-19 pandemic.

2.1.3 Theoretical approach to liquidity

The precautionary demand for money is illustrated in Keynes' (1936) General Theory. Keynes (1936) suggests that liquidity preference consists of a precautionary motive to hold money. Keynes notes that uncertainty is the main reason why people want to hold money instead of alternatives that have the ability to yield interest, profit or utility. Keynes argues that most contingencies in future arise in the real world because they cannot be assigned a probability. In a capitalist economy, people would have to decide whether to accumulate their capital for the future or to borrow against expectations of future wealth with just a vague idea on how the future will look. Conventional judgements under uncertainty are based on an assumption that the existing state of affairs will continue indefinitely (Keynes, 1936). This allows for future events to be assumed based on distributions of the past or similar events observed in the past.

The consequences of liquidity preferences in finance are many. Firstly, a liquidity premium must be offered for parting with cash, and the size of the premium should be correlated with the levels of perceived risk (Carvalho, 2015). This would imply that the cost or price of illiquid assets increases as uncertainty increases and thus people desire to hoard cash instead of investing it. Secondly, liquidity premiums are a large source of unemployment in Keynesian economics, thus in an effort to keep liquidity premiums low the short-termism of secondary markets needs to be accepted along with the persistence of disequilibrium that it involves (Pacces, 2011). The issue that arises with the operation of secondary market is that the process and equity are likely to decrease when liquidity premiums rise and vice-versa, thus perpetuating the booms and slumps resulting from uncertainty and the disregard thereof. Thirdly, the existence of banks as a store of

wealth depends on financial intermediaries' commitment to swop their liabilities for wealth. This implication was lacking from the Keynesian framework and was developed by Hyman Minsky in 1975.

Minsky's work became widely cited post the global financial crisis due to his instability hypothesis being confirmed by the events. Minsky (1975) notes three models of asset finance, such as hedge finance whereby the expected future cash flow from the asset matches the repayment schedule of debt; speculative finance whereby expected cash flow is sufficient repay debt interests and not the principal which needs to be refinanced; Ponzi finance whereby the expected cash is insufficient to repay interests thus debt must increase. Under the Keynesian assumption, the current situation regarding capitalism will continue as is indefinitely through a period of uncertainty, which in turn validates the change from hedge to speculative to Ponzi finance till a debt crisis occurs. The crisis will be dependent on the difficulty to refinance existing debt; however, a crisis would give rise to uncertainty, raising interest rates thus making refinancing more difficult. Minsky's clarified the role of banks as being "merchants of debt" , whereby they gain profit from accepting private debt with different times to maturity and selling it as monetary liabilities (Pacces, 2011).

The precautionary demand for money theory is relevant to this study, considering that this theory affects the banks overall liquidity especially during the period of crisis when individuals become more sceptical of the bank's future especially during a period of uncertainty. The novelty of the virus did not ease the scenario and in fact intensified the feelings on uncertainty, thus it is relevant to have an idea of the possible response of individuals when it comes to holding on to funds.

2.2 Empirical review

This section will provide a review of existing literature attempting to provide a greater understanding of the global and South African banking sector, its performance and the impacts faced due Covid-19. Literature based on the impact of other financial crises will also be reviewed as, according to Siegel (2020), it is possible to use other financial crises as a comparison to the current occurrence due to the similarities of their impact on the financial system. The first sub-section will review the impact of Covid-19 on the financial markets, inclusive of the stock market which forms an important part of this study. The second sub-section will review the South African banking sector to provide a brief overview of the country's banking sector, its components, regulatory board and regulations. The third sub-section reviews the impact on the banking sector due to other financial crises, this will act as a source of comparison to the current situation since the effects of Covid-19 have been compared to that of previous financial crises. The fourth sub-section will review the impact of Covid-19 on the global banking sector to comprehend the impact that Covid-19 has had globally. The fifth sub-section of this chapter will review financial crises and their determinants in an effort to determine a possible pre-emptive approach to dealing with financial crises.

2.2.1 Review of the South African banking sector

This sub-section will provide an overview of the South African banking sector to provide further insight into the financial infrastructure of the country. The most recent SARB report published indicates that the banking sector in South Africa is dominated by the country's five biggest banks (BusinessTech, 2020). These five banks (Standard Bank, FirstRand, Nedbank, ABSA and Investec) hold 89.4% of the country's total banking sector assets. The rest of the banking sector is

made up of the likes of Capitec, African Bank, Discovery Bank and TymeBank (BusinessTech, 2020).

By the end of March 2020, the total banking assets in the country grew by 16.36%, to R6.6 trillion from the March 2019 figure of R5.7 trillion (BusinessTech, 2020). This drastic increase resulted from an increase in derivative financial instruments, gross loans and advances, and investments and trading securities. The securities were mostly made up of government securities and dated securities. Businesstech (2020) noted that although the banking sector remained profitable, the banks did experience a decline in the profitability ratios. The impact from the Covid-19 pandemic would have an impact on the profits for the 2020 and 2021 period. According to the governor and Prudential Authority (PA) chairman, Lesetja Kganyago, the pandemic has had a major impact on the financial systems and economies across the world (BusinessTech, 2020), thus making this study's topic relevant by determining the impact faced by the South African banking sector and what this could possibly mean for the banking sector's future.

South Africa has an established banking regulatory framework. Reuters (2022) determined that the Banks act together with its subordinate legislation and the exchange control regulation that was enforced by the national treasury resulted in South Africa being substantially shielded from the 2008 financial crises. The following acts have been allotted the responsibility of registering and supervising the banks, the South African Reserve Bank Act of 1989 (SARB Act), together with the Mutual Banks Act, 1993, the Banks Act and the Financial Sector Regulation (FSR) Act (Colegrave, 2022).

The SARB as the lead bank regulator has a primary objective to protect the value of the currency while ensuring sustainable economic growth. SARB, as the central bank, has a mandate to ensure financial stability by identifying and mitigating financial risks. The PA acts as a juristic person

operating within the administration of SARB, supervises the activities of all banks, foreign banks, and representative offices domestically. The PA also monitors the foreign activities of South African banks. The Financial Sector Regulation (FSR) requires the SARB and other organs of state to co-ordinate functions and their implementation of financial stability. The FSR attempts to establish a regulatory and supervisory framework that promotes the safety and soundness of financial institutions and ensure the fair treatment of their financial customers, financial inclusion and the integrity of the financial system amongst other principles (Coetzer and Naicker, 2021). The Banks Act states that no entity can act as a bank unless they are a public entity and are registered as a bank in terms of the banking act. The Banks Act defines the business of bank as the acceptance of deposits from the general public.

The Basel committee forms part of the regulatory framework in South Africa, it aims to strengthen the regulation, supervision and practices of banks worldwide with the purpose of enhancing global financial stability. This is done by generating supervisory standards and guidelines known as the Basel capital adequacy framework. South Africa's regulations were found to be compliant with all 14 components of the capital framework (Basel Committee on banking supervision, 2015). Prior to 2013, South Africa had Basel 2 in place, this framework consisted of 3 pillars. Pillar 1 related to the determination of the minimum capital required while taking into consideration the credit, operational and market risk. Pillar 2 relates to capital management, which is inclusive of the initial internal capital adequacy assessment process and the updating of the supervisory review and evaluation process (Resbank, 2022). Basel 3 consists of regulations relating to market discipline. South Africa's implementation of Basel 3 consisted of them raising the quality of capital, with focus on industry training.

In 2013, Basel 3 was implemented following the 2008 financial crisis in an effort to improve the banks' ability to handle shocks generated from financial stress. Basel 3 was designed to decrease the damage inflicted on the economy due to banks that take on too much of risk. It consisted of a

host of regulations that had the purpose of ensuring that banks were prepared in the event of financial and economic shock. These regulations intended to ensure that the banks were capable of absorbing these shocks, thus requiring them to maintain a large capital base, improve liquidity and increase transparency (Resbank, 2022). They were required to do the following: Increase the quality of capital (focusing on common equity and quantity of capital); generate a capital buffer, increase the standard of risk management and supervision; and finally, to generate a liquidity ratio which would help the banks' ability to provide long-term funding (South African Reserve Bank, 2020). Bearing this in mind, this provides an indication that the steps were implemented in an effort to hedge the banking sector from external factors by encouraging them to improve liquidity and generate a large capital base as it has been determined that South Africa complies with the Basel regulatory framework.

Ifeacho and Ngalawa (2014) investigated the performance of the South African banking sector from 1994 to 2011. According to Ifeacho and Ngalawa (2014), South Africa's banking system is developed in terms of its administration and information systems. Since 1994, the country has experienced growth in its financial system, focusing on extending banking products to newcomers and increasing total loans. Based on their research, in the year 2010, 37% of the country's adults did not have access to banks products and services. In an effort to analyse the performance of the banking sector using the country's four largest banks as their data sample, this is inclusive of ABSA, Standard Bank, First National Bank, and Nedbank. This study employed the CAMEL model, which consists of the following, capital adequacy, asset quality, management, earnings, and liquidity analysis. This study utilised two measures of bank performance, namely return on assets (ROA) and return on assets (ROE). A regression analysis was then carried out with the CAMEL model variables and the macroeconomic variables, such as GDP, interest rate, inflation, and unemployment. The study determined that asset quality, management quality and liquidity have a positive relationship with ROA and ROE. Capital adequacy however indicates a negative relationship with ROA. The study determined that bank performance is positively related to interest rates and negatively related to unemployment rates.

South Africa's response to the Covid-19 crisis was to apply various fiscal, regulatory and monetary measures in an attempt to support the country. Their response consisted of the following, a reduction of the interest rates, an increase of liquidity into the financial markets, regulatory relief for the banks and finally, tax and fiscal measures to support households and firms (McLaren and Schneidman, 2020). The South African banks have implemented relief measures such as a reduction in the minimum capital and liquidity requirements. The pandemic, together with the economic slowdown has resulted in the risk profiles of banks being reduced, thus reducing the bank's profitability and their ability to meet the necessary minimum capital requirements (BusinessTech, 2020). The liquidity and capital levels that the banks held from the start of the pandemic were above regulation levels, which aided the South African banks' ability to contain their risk levels by managing their exposure to abnormal operating conditions (PWC, 2021). Due to the increase in credit impairment charges, which resulted in a steep decline in headline earnings and returns, PWC determined that the current levels can be compared to that of the 2012 levels. It was determined that early in the pandemic, the banks shifted their focus to ensuring that their balance sheet was resilient and their operational stability from their usual focus on managing profitability and delivering stakeholder returns. Although the banks changed their operational methods, they experienced a decrease in the cost-to-income ratio due to their cost increasing at a greater pace than their income.

The literature reviewed provides a background into South Africa's banking sector and their regulatory framework that governs the South African banks domestic and foreign activities and the foreign banks activities within the country. Furthermore, the literature reviewed indicated how the South African banking sector reacted to the discovery of Covid-19. South Africa has a sound regulatory framework that provides some protection against uncertainties that could arise. According to PWC (2021), they determined that a liquidity and capital base existed prior to the introduction of Covid-19.

2.2.2 Review of the impact of Covid-19 on the financial markets

This sub-section will review literature based on the impact of Covid-19 on the financial markets. According to PWC (2020), the financial markets have experienced the highest level of volatility in the past 100 years. The introduction of SARS (Severe Acute Respiratory Syndrome) and the Ebola virus resulted in short bursts of volatility, but it does not compare to the volatility generated as a result of Covid-19. This sub-section is relevant to the study due to reliance on the stock returns to determine the impact of Covid-19 on the banking sector, the stock market forms a part of the financial markets.

Ahundjanov, Ahundjanov and Okhunjanov (2020) analysed the implications on the financial market due to individuals' uncertainty of the novel Covid-19 virus. To do this, the study explored the relationship existing between Google search queries regarding Covid-19 and the performance of the major financial indices. This study conducted a Structural Vector Autoregressive (SVAR) model using daily data obtained over a 6-month period, spanning from 22/01/2020 to 02/07/2020. The data was obtained from the following indices, S&P 500, NASDAQ, Dow Jones, DAX, FTSE 100, CAC 40, Nikkei 225, SZSE, and BSE SENSEX. The change in financial indices is due to the change in stock prices, thus, this study is determining the impact on the financial markets by analysing the stock market. The use of Google trends in this study was done due to the use of Google search queries in finance and financial economics amongst others. Google data has been known to be able to predict sales in the past, such as property and automotive, thus making it a suitable information source. This study determined that an increase in one unit of Google searches resulted in 0.038–0.069% of cumulative decline of financial indices over one day and 0.054–0.150% over a week, thus, indicating the negative impact of uncertainty on the financial markets.

Le Trangh Anh and Gan (2020) attempted to determine the impact of the Covid-19 lockdown on the stock market performance in Vietnam by analysing the daily stock returns. This study made use of a panel data analysis to determine the impact of the growing number of Covid-19 cases prior to and during the lockdown period. Their data sample consisted of the daily stock returns of 723 firms listed on Vietnam's stock market. Their analysis spanned from the 30th of January 2020 to the 30th of May 2020, resulting in 62901 observations in this study. This study determined that the stock returns experienced an adverse impact due to the daily increase in Covid-19 cases, however, the stock market movements prior to lockdown differed. This study determined that pre-lockdown had a negative effect on stock returns while during lockdown the stock returns increased. It was determined that the stock market was hit the hardest. Vietnam's fast-growing market has since recovered post lockdown.

Maroua and Slim (2020) analysed the impact of Covid-19 on the Saudi stock market using an Autoregressive Distributed Lag (ARDL) cointegration approach. They analysed the relationship between the natural log of daily Covid-19 cases and the natural log of trading volume of the Tadawul All Shares Index (TASI). The bounds test for cointegration was carried out from the 2nd of March 2020 (the first Covid-19 case in Saudi Arabia) to the 20th of May 2020. The study determined that a negative long-run relationship exists between the number of Covid-19 cases and the trading volume of TASI, as well as a unidirectional causality. Thus, Maroua and Slim (2020) have suggested that a national response is needed to prevent a stock market crash in the long run.

A study of the impact of Covid-19 on the stock markets and economic activities of 12 countries spanning across the world was conducted by Chowdury, Khan and Dhar (2021). The countries included in this study are South Africa, France, Italy, Germany, Singapore, India, United States, United Kingdom, Hong Kong, Japan, China and Spain. Chowdury et al. (2021) refers to this period of time in which the world faces the Coronavirus as a 'resting' period. During this resting period, the world is experiencing a financial crisis, surpassing the 2007-2008 recession. This period has

also been noted by the International Monetary Fund as the worst economic crisis since the Great Depression. This study utilised a panel vector autoregressive (PVAR) model using the event study method, using daily stock data based on the prime stock index of each country, collected over a period of 45 days. The data has been collected 14 days prior to the detection of the first Covid case in the country and 30 days post. This study determined that Covid-19 severely impacted all countries in the study, especially the European countries. The mean return and volatility of all countries increased except for the US and UK. Singapore, South Africa and France experienced the highest abnormal loss the day after the first patient was detected. Germany and Italy experienced the greatest abnormal loss on the day of the first detection.

Kunjal (2021) analysed the impact of Covid-19 on the liquidity of firms trading on the JSE. This study analysed 153 firms' stocks over the span of March 2020 to June 2020. A panel data analysis was employed to examine the liquidity of firms on the JSE, using the bid-ask spread percentage as the dependent variable in the analysis, an increase in this dependent variable is associated with a decline in liquidity. The independent variables in this study consist of price, volatility, implied volatility, market return and a Covid-19 variable which represents (i) the number of Covid-19 related deaths and (ii) the number of Covid-19 confirmed cases in South Africa. The findings of this study suggest that as the number of confirmed Covid-19 cases in South African increases, the liquidity of firms in the JSE All Share Index dries up. However, the increase in the number of deaths due to Covid-19 has led to an increase in liquidity of these firms.

The literature reviewed provides evidence that the stock market has been affected globally, this is partially due to investor uncertainty resulting from the novelty of the virus. Chowdury (2021) investigated the stock returns across 12 countries, where he noted that the greatest abnormal loss in stock returns was experienced either the day of the first detection or the day after in five of the twelve countries, South Africa was one of the five countries noted. A negative long-run relationship exists between the number of Covid cases and the trading volume by Maroua and Slim

(2020), thus, to reduce the probability of a stock crash in the long-run, a national response is necessary.

2.2.3 Review of global banking sector during other financial crises

This sub-section will review literature based on the impact that other financial crises had on the global banking sector, as it has been determined that the impact on the banking sector due to Covid-19 is similar to that caused by other financial crises (Siegel, 2020). The analysis of the banking sectors has relevance due to the comparison of the effects of the 2008 financial crisis to the current effects of Covid-19 in terms of the banks' performance on the equity and debt market (Aldasoro et al. 2020), thus, it would be beneficial to analyse the banking sector during the 2007-2008 financial crisis. The financial crisis of 2007-2008 severely impacted South Africa as a whole, with the economy falling into a recession, with almost a million jobs lost in the country in a single year (Brothwell, 2020). According to Gleeson (2019), during an economic downturn when the stock market falls, consumers and businesses lose confidence which results in a further economic downturn. This results in consumers and businesses borrowing less and fewer people qualifying for loans. In a similar sense, during a stock market fall, investment activity falls resulting in retail banks' brokerage function being negatively affected.

Kumbirai and Webb (2010) produced a ratio analysis of the commercial banks in South Africa over the period ranging from 2005 to 2009, during the subprime crisis. Ratios are utilised to measure the liquidity, credit quality and profitability of five of the South African commercial banks. Kumbirai et al. (2010) made note of the growing economy over the period ranging from 2004 to 2007 with an average GDP growth of 5% and a decline in unemployment of 5%, however, the global financial crisis of 2007 slowed this progress. This study made use of the following ratios in an effort to gauge profitability, liquidity and asset credit quality performance: ROA, ROE, cost-

to-income, liquid assets to deposit-borrowing ratio, net loans to total asset ratio, net loans to deposit and borrowing, and loan loss reserve to gross loans. This paper determined that the profitability performance deteriorated between 2006 and 2008, this has been put down to the increase in operating costs and a reduction in income during this period. There was no significant change in terms of liquidity and credit quality. According to Kumbirai et al. (2010), South Africa was able to weather the financial crisis due to them having limited ties to foreign currency debt.

Fadare (2011) analysed the banking sector liquidity during the financial crisis in Nigeria. This study analysed the determinants of banking sector liquidity and the extent to which the financial crisis affected the banking sector's liquidity. This study utilised a linear least square model with annual time series data over a period of 30 years from 1980 to 2009. A liquidity demand model was generated with the ratio of total loans to total banking sector deposits as the dependent variable. The study determined that three regressors were significant in predicting banking sector liquidity, which are: the liquidity ratio, the monetary policy rate, and the loan-to-deposit ratio (lagged one year). In terms of the impact of the financial crisis on liquidity, it was determined that economic and financial crises have the ability to render deposit money banks illiquid compared to the benchmark. This study also determined that significant liquidity monetary policies are essential to ensuring the banking sector survives.

Maredza (2013) analysed the impact of the subprime financial crisis on the efficiency and productivity of the banking system in South Africa. The failure of the United States financial system in 2007 was a cause of concern for other countries, as the financial system plays a vital role in the functioning of the entire economy. Maredza (2013) attempts to determine the changes experienced in terms of the efficiency and productivity of the South African banking sector due to the financial crisis. The study determined that ratio analysis alone was inadequate. Thus, it utilised a two-stage methodology framework instead, firstly it implemented the Hicks-Moorsteen total factor productivity (TFP) indices, which was deconstructed into a measure of technical and

efficiency change. The next stage involved a Tobit regression analysis which consisted of variables that are known to affect banking sector performance. The variables consisted of net profit, non-interest income, cost-to-income ratio, bank size, profitability, non-performing loans and a dummy variable to cater for a financial crisis. The analysis period consisted of 10 years of data from 2000 to 2010. Their sample was made up of the four largest banks in South Africa, such as First National Bank, Standard Bank, Nedbank and ABSA bank. The first stage determined that during the period of crisis there was a noticeable deviation of the efficiency measures and total factor productivity (TFP). The Tobit model indicated that the financial crisis was the main factor affecting the productivity and efficiency of the banking sector with these relative levels being 16.96% lower during the crisis period. South Africa was known to have weathered the disaster that was the 2008 financial crisis due to its sound regulatory framework and sturdy macroeconomic policies (Maredza, 2013).

An analysis of banks in India during the 2008 recession by Goel and Bajpai (2013) was carried out to determine the overall impact faced by Indian banks due to the 2008 recession. This is beneficial to this study, as the results can be utilised to understand the possible impact on the banks due to the effects of covid being similar to that of the 2008 recession. The data utilised in this study was secondary data obtained from 2008 to 2009 as the country was hit the hardest by the financial crisis during this period. The study found that the Indian banks follow a conservative approach in terms of the way they carry out their business, as they have a strict filter on their risk portfolio and sturdy monetary guidelines. The authors focused on the four financial indicators of banking performance, which were: profitability, management performance, liquidity, and capital adequacy. An analysis to determine the overall impact of the recession was conducted using the two-way ANOVA test to analyse whether an alternate group of banks differed in their performance. Goel and Bajpai (2013) has determined that although the world has experienced great losses due to the recession, Indian banks have shown high profits since the Indian banks operate in a way that is more conservative in terms of their approach. They were not as hard hit during the recession while banks in other

countries experienced a greater impact in the sense that a large number of them were out of business.

Akhtar, Pasha and Waleed (2016) analysed the impact of liquidity on the Pakistani banking sector, this study realised that the failure of liquidity levels in a bank has the ability to negatively affect the financial performance of the bank. This study determined that there is a close relationship between the liquidity ratios, current ratio (CR) and the liquidity ratio (LR), and the profitability ratios, ROA, ROE, net profit margin and Tobin's Q. The period of analysis ranged from 2010 to 2015 based on yearly reports. This study utilised OLS regression models with CR and LR as independent variables and the profitability ratios as the dependent variables. This study concluded that adequate liquidity has the ability to expand the bank's profitability and reduce the impact of a financial crisis and liquidity risk.

Caporale, Lodh and Nandy (2017) analysed the performance of banks located in the Middle East and North Africa (MENA) during the global financial crisis. They determine that globalisation has resulted in foreign banks entering the market, although this is a good thing in terms of generating competition, it allows enables the transmission of financial shocks. This study analyses the banks' performance in general as well as individually in terms of domestic banks and foreign banks. Their dataset was inclusive of domestic and foreign banks over a period ranging from 2000 to 2012. They utilised an OLS regression, with the log of ROAA (return of average assets) as the dependent variable. The following independent variables were essential in measuring the banks' performance; total assets, net loans, country-specific inflation rates, GDP, and two dummy variables that represent the ownership of the bank and the time period during a time of crisis. Three separate regressions are carried out, firstly, with all the banks in the MENA region, secondly, the domestic bank and lastly, the foreign bank was carried out to determine whether the impact of the financial crisis differs between domestic and foreign banks. It was determined that domestic banks outperformed foreign banks during the period of the financial crisis. This study focuses on the top

5 banks domestic activity in the country and not their foreign activities. Taking these findings into account, the banks in this study are domestic and should fare better as compared to their foreign counterparts.

The literature analysed in this section has determined that throughout the financial crises, the performance of the banking sector has always suffered. Assuming based on the statement from Seigel (2020), that the impact on the banking sector due to Covid-19 can be compared to that of the 2007-2008 financial crisis, it can be deduced that the productivity and efficiency of the banking sector will be substantially impacted by the Covid-19 crisis (Maredza, 2013); sufficient liquidity has the ability to reduce the impact of the financial crisis and expand the profitability of the bank (Akhtar et al., 2016); and significant liquidity monetary policies are essential to ensure the banking sector survives (Fadare, 2011). This sub-section has solidified the importance of sufficient liquidity, sound liquidity monetary policies and limiting foreign ties in order to reduce the effects of financial crises on domestic banks.

2.2.4 Review of the global banking sector during Covid-19

This sub-section will review literature based on the analysis of the global banking sector during the period of the Covid-19 pandemic and the impact that the banking sector faced. This sub-section aims to determine the impact faced by the banking sector of other countries in the world. This review of literature will be beneficial in understanding how other countries reacted to the exposure of Covid-19. KPMG (2020) has noted that the discovery of Covid-19 has resulted in significant instability and volatility in global capital markets.

Aldasoro, Fender, Hardy and Tarashev (2020) use their study to examine the effect of Covid-19 on the global banking sectors market performance. Their sample is inclusive of Asia, China,

Europe, Africa (exclusive of South Africa), and the US. They focus on stock prices, bond spreads, credit ratings and Credit Default Swaps (CDS) to determine the overall impact of Covid-19 on the banking sector. According to Aldasoro et al. (2020), the banking sector, in general, has been hard hit, with a fall in the banks' stocks together with the overall market following the rapid spread. It was determined that banks with a higher level of liquidity recovered quicker than banks with a lower level of liquidity. With respect to the market conditions, it was determined that the addition of policy measures by the central bank resulted in stabilisation and partial recovery after the initial shock that took place around the fifth of March 2020. They compared the size and scale of the impact of Covid to that of the 2007-2008 great recession, implying that no banks will be unaffected. OECD (2021) determined that the uncertainty caused by the novelty of this virus will result in the overall change in the banking sector, it could also result in lower profitability expectations. Deloitte (2021) suggests that banks are likely to experience an increase in their expected loan loss provision, this will result in an impact on the banks liquidity. The analysis of the impact of individual uncertainty on the stock market and ultimately the financial market, is relevant as its conclusion will add value to this current study. As this study analyses the impact on the banking sector by analysing the stock returns of the relevant banks.

The ability of banks to act as a first-resort lender during the Covid-19 period was analysed by Li, Strahan and Zhang (2020). They determined that in March of 2020 banks faced a drastic increase in demand for liquidity due to anticipation of financial disruptions and the deterioration of funding conditions due to Covid-19. Commercial and industrial banks experienced an increase of $482 billion in loans from 11/03/2020 to 01/04/2020, based on the analysis of large banks in the US over a period when the demand for liquidity spiked. Their study therefore analysed the demand for liquidity in response to the introduction of Covid-19. They also evaluated whether the financial conditions prior to the liquidity shock affected the banks' ability to cater to the demand. This paper analyses the characteristics of the banks and the markets they serve during this period of immense stress. A model was generated to estimate the level of change of commercial and industrial loans weekly. In an effort to remove bank-level heterogeneity and cluster standard errors throughout, the

model included a fixed effect variable. This paper determined this period to be the largest liquidity shock observed to date, where firms utilised pre-existing credit lines in anticipation of declines in future cash flows. When compared to the 2008 financial crisis, it was determined that banks were able to meet this liquidity demand due to liquidity buffers being far healthier now as compared to 2008 and the liquidity supply from the Federal Reserve and depositors assisted their liquidity standing.

Demirguc-Kunt, Pedraza and Ruiz-Ortega (2020) analysed the stock prices of 896 banks from 44 countries, excluding South Africa, intending to determine the effect that Covid-19 had on each country's banking sector. The study was based on data sets inclusive of the daily broad-based index prices, state ownership and quarterly financial statements over a time frame starting from May 2018 till May 2020. The emphasis of the study was on the way in which the addition of the financial sector policy measures affected the stock market. To determine the impact of the policy implications, the abnormal stock returns around the date of application were measured and analysed. A regression analysis was used to investigate the abnormal stock returns. With respect to the liquidity of the banks, the study measured the quarterly cash-to-total assets ratio of the banks. To measure the banks' size, Demirguc-Kunt et al. (2020) found the average of the tier 1 values (core capital of a bank, consists of disclosed reserves which are found on banks financial statements), over a single year based on quarterly figures. It was determined that the banks were expected to experience a greater loss as compared to alternative financial institutions, for example, brokerage firms and insurance companies.

The results of the study by Demirguc et al. (2020) showed that during the initial phases of the pandemic, liquidity shortages were aggravated by volatility in the foreign exchange markets and banks with lower liquidity buffers suffered more than expected, in terms of a greater price decrease. This study concluded that the impact that Covid-19 had on the banks in the sample was greater than experienced by the corporate sector and non-bank financial institutions. This indicates

that the banking sector was expected to absorb part of the shock that Covid-19 generated on the corporate sector. The study found that the public banks and larger banks experienced a greater reduction in stock returns, which indicated a greater role than they anticipated in dealing with the effects of the pandemic. Banks that had a lower liquidity level and exposure to the oil sector had a greater stock return reduction. This stock return reduction was consistent with the vulnerability to the shock of the pandemic.

A paper written by Ozsoy, Rasteh, Yonder and Yucel (2020) considers the impact of Covid-19 on bank stability in a liquidity backed environment. This study aimed to determine the short-term geographic-based impact of Covid-19 on the bank's performance and stability. The data utilised in this study is solely based on banks in the United States, as differentiated by states. They measured the banks' performance by looking at the Z-score, and the equity volatility and performance by measuring the ROA and NPL (Non-performing loan) respectively. It was found that the stability and performance of banks were distorted if banks expand the credit channels below median levels and vice versa. This study concluded that there is vast uncertainty in terms of the long-term economic impact of Covid-19.

Acharya, Engle and Steffen (2021) analyse the crash of the bank stock prices during Covid-19 in the United States, together with the causes and implications. This study determined that a measure of liquidity risk is necessary to determine the decline of bank stock prices during the initial stages of the pandemic. It was determined that banks with a higher liquidity risk prior to the pandemic underperformed with respect to their stock prices as compared to their counterparts with lower liquidity risk. This study determined that banks with a reduced capital buffer are more vulnerable to a stock price crash as compared to their counterparts.

This review of literature provided a greater understanding of the performance of banking sectors during the Covid-19 pandemic. Aldasoro et al. (2020) noted a decline in the stock prices and the overall market due to the exposure to Covid-19. Their study determined that the liquidity level of the banks prior to Covid-19 determined how quickly the banks recovered. Their study reiterated the similarity between the effects of Covid-19 and the 2007-2008 financial crisis on the banking sector. This sub-section determined that banks are at the forefront of this pandemic, taking a substantial hit by absorbing the shock experienced by the corporate sector (Demirguc-Kunt, 2020). Liquidity was once again determined to be an important factor in the recovery of the banks thus justifying the liquidity aspect of this study, in determining how the banks will respond in terms of their stock prices and overall performance.

2.2.5 Banking sector crises and their determinants

This sub-section will review literature based on banking sector crises and their determinants. The determinants highlighted in this sub-section will provide an overview of the possible causes of financial crises to enable the provision of a pre-emptive approach. Xuan (2022), notes that although a financial crisis cannot be eliminated, the understanding of financial crises and comprehensive prevention could assist in surviving the financial crisis.

Demiguc-Kunt and Detragiache (1998) analysed the components relative to the emergence of systemic banking crises in developed and developing countries in 1981-1994 utilising a multivariate logit econometric model. In the 1980's and 1990's economies in transition in both developed and developing countries experienced harsh banking crises, this generated widespread concern as a banking crisis results in an investment and consumption reduction, thus possibly pushing promising firms into bankruptcy. Banking crises play a role in undermining confidence in financial institutions, decreasing domestic savings and capital outflow. A systemic crisis may also

result in sound banks closing. In an attempt to intervene, policymakers usually consider pursuing a loose monetary policy or a bailout of insolvent financial institutions. These methods of intervention are however costly and sanction inefficient financial institutions to continue the business. A bailout provides the expectation of future bailouts, thus reducing the need for banks to apply efficient risk management tools. The study consisted of 20 countries over a period ranging from 1980 to 1995, including South Africa. This study determined that a weak macroeconomic environment together with high inflation and low growth generates an environment that encourages a possible financial crisis.

Moore (2009) analysed the impact of financial crises on commercial banks in Latin America and the Caribbean. From 1990 to 2002, this region has faced 16 financial crises, and a factor influencing the severity of these crises was the liquidity of the banks. Banks that are adequately prepared to face the bank runs that accompany a financial crisis tend to survive the crises better as compared to their counterparts. In most countries, the loan-to-deposit ratios increased in the months after the crisis, however, there were scenarios where this was not the case. In these examples, the following occurred: the government recapitalised the banks that wouldn't have made it through the crisis; countries with high foreign participation, the foreign parent companies were requested to provide liquidity support.

Moore (2009) attempts to assess the main determinants of banks liquidity and the impact of the crises on the banks' liquidity. This study makes note of indicators preceding a financial crisis, it was determined that preceding a financial crisis the country is likely to face an appreciation of the real exchange rates, interest rates, money multiplier and equity prices. Although these indicators were only able to predict a crisis 20% of the time, however, the use of all the above variables in one index was able to predict the occurrence of a banking crisis 70% of the time. These pipelines are an option; however, they do come at a cost, thus it is essential for adequate liquidity management methods to be established. This study determined that opportunity cost impacts

demand for liquidity, an increase in interest rate ceteris paribus, should decrease the demand for liquidity.

Xuan (2022) attempted to understand the determinants of financial crisis. Although the financial crisis occurred 13 years ago, Xuan (2022) stated that the suspension of enterprises and interruptions of transnational cooperation attributed to Covid-19 has affected the production of many countries which has resulted in the panic due to the belief of the return of the financial crisis has been noted among markets. The economic factors that have been noted to cause a financial crisis consists of the growth of the housing bubble and the impact of central banks. The existence of a housing bubbles consists of a scenario whereby the prices of houses will gradually increase followed by significant drop. The most significant impact on the real economy is due to the credit-fueled housing bubbles. When the housing bubble bursts, enterprises will be trapped in a shortage of funds, resulting in a credit crisis, severe reduction in demand and a soaring unemployment rate will occur which could gradually form a vicious cycle. Central banks have the responsibility of taking charge of the monetary policy and rate of inflation. However, when creating monetary policies, they are created without attempting to avoid the creation of asset price bubbles, to minimise the impact to the economy, banks usually react and remedy the situation post the bubble bursting instead of acting to prevent the bubble from forming. A political factor of financial crises consists of the decreased regulation of financial institutions, whereby regulations are eased due to the false belief that conditions are stable.

This review of literature determined that a weak economic environment together with high inflation and low growth rates have the ability to foster an environment which encourages a financial slump, and the use of the following indicators in a single index has the ability to predict a financial crisis with a 70% success rate, the indicators consist of an appreciation of the real exchange rates, interest rates, money multiplier and equity prices.

2.3 Summary of Empirical Review

Ahundjanov et al. (2020), noted that investor uncertainty resulted in a noticeable decline in the financial indices and confirmed that uncertainty of Covid-19 had a negative significant impact on the financial markets. Whilst Le Trangh and Gan (2020) noted that the stock returns were not negatively impacted during Lockdown. The study conducted by Ahundjanov, et al. (2020) was conducted from January to July 2020, which is consistent with the Lockdown period across the world, thus it can be noted that these two studies have conflicting results. While Chowdury et al., (2021) agrees with Ahundjanov et al. (2020), by noting that a significant impact was experienced by the stock market and economic activities across the world with the highest abnormal loss experienced the day after the first patient was detected.

Kumbirai and Webb (2010) determined that the decline in profitability and performance was due to the increase in operating costs and a reduction in income, there was no noticeable change in terms of liquidity and credit quality. They also determined that due to South Africa having limited ties to foreign currency, they were able to weather the financial crisis due to them having limited ties to foreign currency debt. While Maredza (2013) argues that South Africa weathered the financial crisis due to its' sound regulatory framework and sturdy macroeconomic policies. Goel and Bajpai (2013) noted that Indian banks showed high profits during the recession die to their conservative approach. Akhtar et al. (2016), noted by analysing the Pakistani banking sector that sufficient liquidity has the ability to increase profitability and reduce the impact of a financial crisis. Based on the literature analysed, it can be understood that countries with limited ties to financial debt and sound financial policies and regulations that understand the importance of liquidity buffers were able to withstand the financial crisis better as compared to those countries who did not have an established sector.

Aldasoro et al. (2020), has a similar outlook to that of Maredza (2013) by noting that that the addition of policy measures was able to stabilise the initial shock that occurred around the fifth of March. Li et al. (2020), determined that the discovery of Covid-19 led to a drastic increase in demand for liquidity due to the anticipation of financial disruptions and deterioration of funding conditions. This shares some similarity with the findings of Akhtar et al. (2016) with regards to the focus and importance of liquidity. Li et al (2020) did note that the liquidity buffers were more prepared this time around. Demirguc et al. (2020) agreed with the findings of Akhtar et al. (2016) and Li et al. (2020) whereby he determined that banks with a lower liquidity level had experienced a greater stock return reduction.

The empirical literature reviewed has a consensus when it comes to the factors that have the ability to drastically affect whether or not a country is able to withstand a financial crisis. The main factors are sound framework and macroeconomic policies. Liquidity has an essential role to play, it was a point of note during the 2008 financial crisis as well as during Covid-19. Thus, it is essential to analyse liquidity during this analysis.

Table 1: Summary of studies reviewed in this chapter.

Finding	**Author(s)**
Uncertainty has a negative impact on the financial markets.	Ahundjanov, Ahundjanov and Okhunjanov (2020).
Pre-lockdown had a negative impact on stock returns, however stock returns increased during lockdown.	Le Trangh Anh and Gan (2020).
A negative long-run relationship exists between the number of Covid-19 cases and the trading volume of TASI,	Maroua and Slim (2020).

Covid-19 severely impacted all the stock markets analysed.	Chowdury, Khan and Dhar (2021).
The increase of positive Covid-19 cases results in the liquidity of firms in the JSE All Share Index drying up.	Kunjal (2021).
Bank performance is positively related to interest rates and negatively related to unemployment rates.	Ifeacho and Ngalawa (2014).
The impact on the banking sector due to Covid-19 is similar to that caused by other financial crises	Siegel (2020)
South Africa was able to weather the financial crisis due to them having limited ties to foreign currency debt.	Kumbirai and Webb (2010).
Economic and financial crises have the ability to render deposit money banks illiquid compared to the benchmark.	Fadare (2011).
The financial crisis was the main factor affecting the productivity and efficiency of the banking sector with these relative levels being 16.96% lower during the crisis period.	Maredza (2013).
A conservative approach towards banking has the ability to preserve.	Goel and Bajpai (2013)
Banks were able to meet this liquidity demand this time around due to liquidity buffers being far healthier now as compared to 2008 and the liquidity supply from the Federal Reserve and depositors assisted their liquidity standing.	Li, Strahan and Zhang (2020).
A weak macroeconomic environment together with high inflation and low growth generates an environment that encourages a possible financial crisis.	Demirguc-Kunt, Pedraza and Ruiz-Ortega (2020)

The stability and performance of banks were distorted if banks expand the credit channels below median levels and vice versa.	Ozsoy, Rasteh, Yonder and Yucel (2020)
Banks with a reduced capital buffer are more vulnerable to a stock price crash as compared to their counterparts.	Acharya, Engle and Steffen (2021)
This study determined that a weak macroeconomic environment together with high inflation and low growth generates an environment that encourages a possible financial crisis.	Demiguc-Kunt and Detragiache (1998)
Opportunity cost impacts demand for liquidity, an increase in interest rate ceteris paribus, should decrease the demand for liquidity.	Moore (2009)
A political factor of financial crises consists of the decreased regulation of financial institutions, whereby regulations are eased due to the false belief that conditions are stable.	Xuan (2022)

Chapter 3: Data and Methodology

The following chapter provides a breakdown of the data utilized, their relevant time frames and a justification for their use in the analyses. This is followed by a discussion of the methodologies used in this study.

3.1 Data

3.1.1 Stock return analysis

3.1.1.1 Sample period

The period of analysis ranges from January of 2017 to December of 2021, with the crisis period spanning from March of 2020 to December 2021. This period of crises is based on the initial discovery of Covid-19 in South Africa on the 1st of March 2020 (National Institute of Communicable Diseases, 2020), and considering that South Africa was still in a state of emergency till April 2022 (Ramaphosa, 2022), it will be beneficial to include 2021 as a period of crisis. This study has made use of monthly data in an effort to ensure accurate results.

3.1.1.2 Dataset

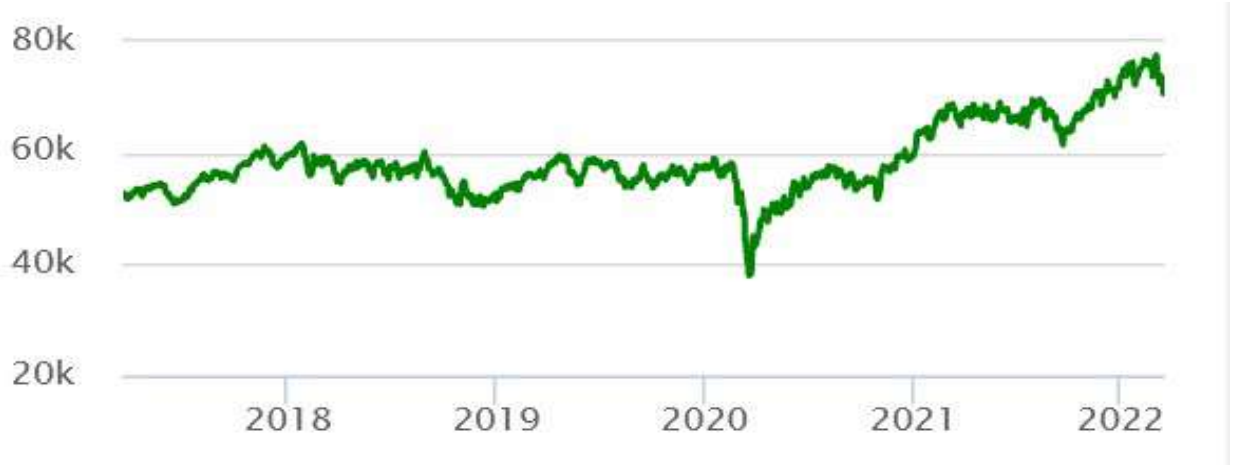
The stock return analysis comprises of bank specific data sourced from the IRESS database for the period spanning from January of 2017 to December of 2021 of all JSE listed South African banks. The data sample consists of all JSE listed banks, namely, Nedbank, Standard Bank, FirstRand, ABSA, Capitec and Investec. The criteria for the choice of banks in the sample were that they had to be registered on the JSE as a separate entity and not registered as part of a portfolio company.

At the time of analysis, there were 6 banks registered on the JSE, all of which have been included in this study to give a wider perspective. The bank specific data which is utilized in this analysis consists of cash and cash equivalents, total assets, realized stock returns.

The monthly stock returns were obtained for all the banks; however, tier 1 assets, total assets, and cash and cash equivalents are annual data, these control variables were obtained from IRESS. In order to find a mutual consensus between the data frequencies for this study, the annual data will be converted through the Eviews software to generate a monthly frequency in an effort to maximise the frequency in the data sample.

According to the Hardouvelis (1987), an index is a guide or benchmark to access how the market is performing at a certain period. The Financial Times Stock exchange (FTSE)/JSE All-share index represents 99% of the market capital value of all ordinary securities listed on the main board of the JSE. According to SAShares (2022), FTSE's products are utilized to benchmark investment performance, thus the FTSE/JSE All Share index will act as the market return, to benchmark the performance of the banks' stock return to that of the market. The JSE All Share Index is illustrated below for the period 2017 to 2022, as it can be seen that the movements remained constant until the beginning of 2020 where it plummeted followed by a gradual increase since then. This index will be used as a benchmark against the actual returns of the bank specific returns.

Figure 3: FTSE/JSE All share index



Source: SAShares.com (2022)

Tier 1 capital is made up the disclosed reserves of the bank, it is their core capital and exists as their primary source of funds. The capital the banks hold ensures that there are enough funds to fulfil the needs of their customers in terms of the lending aspect of the business which comes with sufficient risk. Tier 1 capital is made up of preferred stock, common stock, and retained earnings.

The total assets of a company are the sum of the book values of all assets owned by the organization. The value is determined after accounting for the depreciation associated with the relevant assets. Cash and cash equivalents comprise of cash on hand, cash pool assets, deposits held and other short-term highly liquid investments. The short-term investments are those with maturities of three months or less that are available on demand (Grand Vision, 2022).

3.1.2 Bank financial performance analysis

3.1.2.1 Sample period

The study of FirstRand, Standard Bank, Nedbank, ABSA, Capitec and Investec spanned from 2009 to 2021. The use of 2009's financial statement was to cater to the total assets lagged by 1 year, hence the actual analysis ran from 2010 to 2021. Yearly data was sourced due to the availability of financial statements. The intended data sample was meant to have 40 observations (quarterly data over a period of 10 years), however the availability of financial statements resulted in a data sample of 11 yearly observations. The data is then converted to quarterly data through Eviews to maintain the data sample. The period of crisis remains the same as mentioned previously, whereby the crisis period will extend from March 2020 to December 2021.

3.1.2.2 Dataset

The performance aspect of this study comprises of bank specific data sourced from IRESS whilst the inflation data was obtained from Statista. The bank specific data consists of the following: total assets, total loans, cash and cash equivalents, interest received, and interest expense.

The inflation rate in South Africa has been stable over the past 10 years, staying between the range of 3.27% and 6.34%. According to the works of Neill (2022), it is expected to stabilize around 4.5% in future. South Africa has a mixed economy, combining both private and state enterprises. A mixed economy allows for competition to occur between producers, consumers also have a choice in this situation. However, the active presence of the government allows for stability.

GDP per capita is measured as the sum of gross value added by all producers in the economy, and the product taxes divided by the population measured mid-year (The World Bank, 2022). The purpose of the log of a variable will change the case from a unit change to a percentage change. GDP per capita growth will be used; therefore, it is already in percentage form, thus removing the need to find the logarithmic form.

The total assets of a company are the sum of the book values of all assets owned by the organization. The value is determined after accounting for the depreciation associated with the relevant assets. Total loans are the sum of long-term and short-term debt. Total net loans are the total loans minus liquid assets, cash or an asset that can be liquidated for cash (indeed.com, 2021). Net interest revenue is a measure used by businesses to determine how much money is being lost or gained on interest payments (Newth, 2022). An entity's interest revenue can be considered as revenue earned from investments or any debt that it owns (Bragg, 2021). An interest expense can be defined as a non-operating expense that represents the interest payable on borrowings. Cash and cash equivalents comprise of cash on hand, cash pool assets, deposits held and other short-term highly liquid investments.

3.1.3 Liquidity analysis

3.1.3.1 Sample period

The period of analysis runs from 2011 to 2021 using yearly data, this results in a dataset of 66 samples during this period. This sample is sufficient as noted by the works of Li, Strahan and Zhang (2020). The intention of this dataset is to cater to a time period prior to the discovery of Covid-19, and when it was discovered.

3.1.3.2 Dataset

The liquidity aspect of the study contains data sourced from CEIC (Census and Economic Information Center), SARB and IRESS (Integrated Real-time Equity System). The period of analysis runs from 2011 to 2021 for Nedbank, Standard Bank, FirstRand, Capitec, ABSA and Investec. The monetary policy rate, total deposits in South Africa and the total currency in circulation in South Africa data is relevant to all the banks in this study. The bank specific data consists of total deposits and total currency in circulation.

The monetary policy rate is an interest rate set by the monetary authority in an effort to influence the evolution of the economy's main monetary variables, consumer prices, credit expansion or the exchange rate amongst others (SARB, 2022). According to the Reserve bank, monetary policy is implemented by setting a short-term policy rate, the repo rate, and it impacts the economy by affecting the borrowing cost of the financial sector (SARB, 2022).

The total deposits in South Africa were sourced from CEIC (2021), total deposits refer to the total amount of currency deposited across all banks in South Africa. The total currency in circulation in South Africa was sourced from SARB (2022). Nasdaq (2022) refers to currency in circulation as the sum of paper money, coins and demand deposits that circulate in the economy.

3.2 Research Methodology

This sub-section outlines the methodologies used to answer the research questions posed by analysing the stock returns, performance and liquidity of the South African banks. Preliminary testing will include testing the stationarity of the data as well as correlation between the variables. The bank specific analysis will then consist of the following: analysis of the banking sector returns, banking sector financial performance and finally the liquidity analysis. This study will consist of a panel data analysis which consists of all the banks in this study in an effort to provide a robust analysis across the banks over the predetermined time period. This method of analysis is used to form linear combinations of different predictor variables to improve the prediction accuracy. By performing a stacked regression, the study intends to reduce the variation and bias.

Panel data is a dataset that allows for the behaviour of separate entities to be analysed over a period of time in a single regression. These entities can include companies, countries or individuals (Torres-Reyna, 2007). The use of panel data regressions in this study is motivated by their ability to mitigate problems related to multicollinearity and heteroscedasticity (Al-Awashi, et al., 2020). Accordingly, this study will incorporate the South African banks into a single panel regression in an effort to ensure the robustness of the study.

3.2.1 Pre-requisite testing

The following section will elaborate on the pre-requisite testing requirements prior to conducting the relative regression analysis. The pre-requisite tests to be conducted consist of a test for stationarity by Levin, Lin and Chu (2002); followed by a correlation test and finally a model of best fit test to determine the preferred model for the regression.

3.2.1.1 Stationarity test

The data will first need to be tested for stationarity. If non-stationary data is used, this will result in a spurious regression which will lead to biased estimates (Phillips and Moon, 2000). A stationary series will ensure that the model predicts effectively and precisely. For a data series to be stationary, the statistical properties should not change over time (Kumar, 2021). These statistical properties consist of the mean, variance and covariance. The overall behaviour of the data should remain constant. If the data is found to be non-stationary, the data will need to be transformed in order to flatten the increasing variance (Kumar, 2021).

There are many tests that can be utilized to test for a unit root in panel data, some of these tests are developed by Levin, Lin, and Chu (2002), Im, Pesaran and Shin (2003), Hadri (2000) and Breitung (2001). The tests noted above all have a null hypothesis whereby a unit root is present in the data, however they differ through their methodological approach to the approximation of the test statistic (Peerbhai, 2020). The tests also allow for the inclusion of fixed effects and time-trends in the model. The Levin et al. (2002) test will be used since it has been noted that this test has superior small sample properties.

The Levin, Lin and Chu (2002) test for panel data stationarity may be viewed as a pooled ADF test, it enables the user to run a pooled test rather than running each test individually (Liow and Li, 2006). The Levin et al. (2002) test follows a t-distribution with the following hypotheses:

$$H_0 = Panels\ contain\ unit\ roots$$

$$H_1 = Panels\ are\ stationary$$

If the t-value is less than the critical value, this study will fail to reject the null hypothesis, indicating that the series is not stationary. Non-stationary data will have to be transformed if the proceeding tests were to be run. If the t-value is greater than the critical value, this study can reject the null hypothesis and assume that the series is stationary, indicating that the behaviour of the data remains constant over time and the study can continue with proceeding tests.

3.2.1.2 Descriptive Data

Sekaran (2006) uses descriptive data analysis to summarize and describe information that is presented by the data. In this study, descriptive analysis is used to calculate and explain the mean, minimum and maximum values. This section will analyse the skewness of each variable, a value between 0 and 0.5 or -0.5 is considered to be fairly skewed. A value between 0.5 and 1 or -0.5 and -1 is considered to be moderately skewed. A value above 1 or below -1 is considered to be highly skewed. The kurtosis value measures the sharpness of the peak of a frequency-distribution curve (Ruppert, 1987). A value less than 3 mirrors a normal skewness and is considered to platykurtic. A value above 3 is considered to be leptokurtic. The Jarque-Bera test is a test for normality with a null hypothesis of the data being normally distributed, a p-value less than 0.05 results in the rejection of the null hypothesis and indicates that the data does not come from normal distribution. However, non-normality is common in financial data and will not affect the results of this study (Esch, 2010).

3.2.1.3 Correlation test

Correlation can be defined as the way in which two variables move in coordination with each other. If two variables move in the same direction, this can be described as a positive correlation.

The movement in the opposite direction can be described as a negative correlation Rodgers and Nicewander (1988).

Correlation is measured on a scale that ranges from –1 to 1. A complete correlation can be expressed as –1 or 1. No correlation can be denoted as 0. The closer the correlation value is to 0, the lower the correlation between the variables. The closer the correlation value is to 1 or -1, the higher the correlation between the variables. Multicollinearity is also a relevant issue in this study, multicollinearity refers to the linear relation between two or more variables. The presence of multicollinearity could result in serious difficulties arising with the reliability of the model parameter estimates (Alin, 2010). A correlation table will utilized in this study. This is a two-way tabulation of relations between correlates. Correlation can be calculated with the following formula:

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Equation (1)

3.2.1.4 Model of best fit tests

The following section will utilise the Breusch-Pagan Lagrange Multiplier test and the Hausman test to determine the model of best fit for each of the regressions. The Breusch-Pagan Lagrange Multiplier test will assist in determining whether a pooled OLS model is preferred or if random or fixed effects are present. If it is determined that random or fixed effects are present, this study will then proceed to run the Hausman test. This test will assist in the deciding between the fixed effects model or the random effects model.

3.2.1.4.1 Breusch-Pagan Lagrange Multiplier test

The Breusch-Pagan Lagrange Multiplier test has provided a standard means of testing parametric restrictions for a wide range of models (McKenzie, 2014). The Breusch-Pagan's LM test for random effects is a linear model based on a two-step procedure or maximum likelihood. It is performed to test for the presence of existing random effects, performed for both cross-sectional random effects and time varying random effects. The test statistic for the Breusch-Pagan Lagrange multiplier test is as follows:

$$LM = N \times R^2$$

$$Equation\ (2)$$

whereby N represents the sample size (with k degrees of freedom) and R^2 denotes the coefficient of determination of the regression of squared residuals. The LM statistic follows a chi-square distribution with the following hypotheses:

$$H_0: Variances\ across\ entities\ are\ equal\ to\ zero$$

$$H_1: Variances\ across\ entities\ are\ not\ equal\ to\ zero$$

If the null hypothesis is accepted, this would indicate that the pooled OLS model is preferred. However, if it is rejected, this indicated that a random effects or fixed effects is preferred (Brooks, 2019). If the null hypothesis is rejected, the Hausman test can be carried out to determine which model is preferred between the random effects model or the fixed effects model.

3.2.1.4.2 The Hausman test

The Hausman test is utilized to determine which model is preferred between the random effects model or the fixed effects model. The Hausman test is able to determine whether a fixed effects or random effects model is the preferred option by identifying the presence of endogeneity in the explanatory variables (Hausman, 1978). Fixed effects models analyse the relationships between the independent variables and the dependent variable assuming that the banks have their own characteristics that influence these correlations. On the contrary, the random effects models imply a random variation across banks, uncorrelated to the explanatory variable (Sorana, 2015).

The Hausman test follows the following hypothesis:

$$H_0 = No\ independent\ variable\ is\ correlated\ with\ individual\ effects\ (Exogeneity)$$

$$H_1 = At\ least\ one\ independent\ variable\ is\ correlated\ with\ individual\ effects\ (Endogeneity)$$

A p-value that is less than the respective level of significance will result in the null hypothesis being rejected, which infers that the fixed effect model is better suited. However, a p-value greater than the respective level of significance will result in failure to reject the null hypothesis which indicates that no independent variable is correlated with individual effects, thus indicating that the random effects model is preferred (Park, 2011). In the case whereby the null hypothesis is accepted, the random effects model would be consistent and efficient whilst the fixed effects model would be consistent and inefficient and vice versa.

3.2.2 Regression analysis

3.2.2.1 Banking sector returns regression analysis

The first chosen method of analysis is the abnormal return regression model, the regression analysis is an estimation of relationships between one or more independent variables and the dependent variable (Olive, 2005). This model will be used to determine and examine abnormal returns in the stock market. This model was utilized by Demirguc-Kunt et al. (2020) to determine the effect of Covid-19 on the banking sector and to test for a banking sector premium. By abnormal returns this refers to the difference between the expected returns and the realized returns generated by the market over a period of time.

Firstly, separate bank specific regressions will be conducted between the returns of the bank and the returns of the market in an effort to obtain the $\alpha_{b,t}$ and $\beta_{b,t}$ values which will be used in *Equation 3* to obtain the respective abnormal return values, $ARet_{b.t}$, which will then be used in the abnormal return panel regression model, *Equation 4*.

Table 2: Variables to be used to obtain respective bank specific $\alpha_{b.t}$ and $\beta_{b,t}$ values.

Variable	**Definition**
Dependent variable	
$R_{b,t}$	$\left(\frac{P_{b,t+1}}{P_{b,t}}\right) - 1$
Independent variables	
RM_t	$\left(\frac{P_{t+1}}{P_t}\right) - 1$

The following equation will then be utilized to determine the bank specific $ARet_{b.t}$values:

$$ARet_{b,t} = R_{b,t} - \alpha_{b,t} - \beta_{b,t} RM_t$$

$$Equation\ (3)$$

In *Equation 3*, $ARet_{b,t}$ is the abnormal returns of stocks for bank b at time t. $R_{b,t}$ can be determined as the actual or realized stock return of the bank b at time t. RM_t can be determined as the market returns in excess of the risk-free rate as proxied by the 3-month t-bill. $\alpha_{b,t}$ represents the intercept value and $\beta_{b,t}$ represents the slope coefficient of bank b at time t. This regression will be used to calculate the abnormal returns ($ARet_{b.t}$), the dependent variable of *Equation 4.*

This study will then move on to attempting to determine the performance of banks' stock. This study will then examine the effect of Covid-19 on abnormal returns using a panel data regression. This will be carried out by utilized a cross-sectional regression that will link the monthly cumulative abnormal returns of banks to the bank characteristics (Demirguc-Kunt et al., 2020). The following model (*Equation 4*) will be incorporated to examine the effect of Covid-19 on banking sector returns:

$$ARet_{b,t} = \alpha_0 + \alpha_1 Iliq_{b,t} + \alpha_2 Crisis_t + \varepsilon_{b,t}$$

Equation (4)

Liquidity risk is referred to by the $Iliq_{b,t}$ term, this is calculated by dividing the average cash holdings of the bank by the total assets of the bank to generate a proportion. The $Crisis_t$ variable refers to a dummy variable which takes the value of 1 during the Covid-19 period and 0 otherwise. $\varepsilon_{b,t}$ is the error term. This equation should provide an indication of the performance of the banks returns throughout this period. The $Crisis_t$ variable will serve as an indication to determine whether the Covid-19 pandemic played a part in generating greater abnormal returns than would have been expected, the larger the coefficient, the greater the impact faced due to the pandemic. A positive significant coefficient would indicate that the Covid-19 crisis resulted in a significant increase in the abnormal returns of the stocks and a negative significant coefficient would suggest that the Covid-19 crisis actually decreased the abnormal returns experienced by the banks. Table 2 summarizes the computation of each variable whilst Table 3 provides a summary of the expected coefficient of the independent variables.

Table 3: Variables to be used in abnormal return regression.

Variable	**Definition**
Dependent variable	
$ARet_{b.t}$	$R_{b,t} - \alpha_{b,t} - \beta_{b,t} RM_t$
Independent variables	
$Iliq_{b,t}$	$\frac{Average\ cash\ holdings}{Total\ assets}$
$Crisis_t$	$Dummy\ variable$: $1\ if\ during\ pandemic,\ 0\ otherwise.$

Table 4: Expected coefficients of variables in Abnormal return analysis, Equation 4.

Dependent variable	Independent variables	
	Liquidity	Crisis
Abnormal returns	*Negative coefficient* Reason: Stocks with more volatile liquidity can expect lower returns and greater abnormal returns due to liquidity acting as a source of stability (Gartvall and Landahl, 2020)	*Positive coefficient* Reason: Covid-19 has resulted in significant exchange rate fluctuations which in turn has impacted the stock returns by creating volatility, which would suggest the increase of abnormal returns due to the Covid-19 crisis (Tan et al., 2022).

3.2.2.2 Financial performance regression analysis

The following methodology has been adapted from the works of Caporale, Lodh and Nandy (2017) to measure the financial performance of the South African banks in the sample during the Covid-19 period using ROAA as the dependent variable. ROAA has been found to be an efficient measure of performance based on the works of Caporale, Lodh and Nandy (2017) and Said and Tumin (2011) where it was used investigate the impact of bank-specific factors on performance, such as liquidity, capital, size and operating expenses. The determinants of bank performance consists of the bank's internal characteristics, such as liquidity, total assets and net interest revenue. The total assets portion can be used to determine the relationship that exists between bank size and

profitability. The loans to total assets ratio serve as the liquidity aspect of this regression. Net interest revenue is the revenue generated from the bank's assets after accounting for their liabilities. The second category consists of macroeconomic variables such as the annual inflation rate and the annual GDP per capital growth. Lastly, the final category consists of the crisis variable which accounts for the Covid-19 period.

Equation 5 depicts the panel regression model which will be incorporated to examine banking performance in line with the study's objective and Table 4 consists of a summary of the variables used in the panel regression and how they were computed.

$$Log(ROAA)_{b,t} = \alpha_t + \beta_1 Crisis_{b,t} + \beta_2 \log(Total\ Assets)_{b,t-1} + \beta_3 \log(Net\ loans)_{b,t} + \beta_4 \log(Net\ Interest\ Revenue)_{b,t} + \beta_5 \log(Inflation)_{b,t} + \varepsilon_{b,t}$$

$$Equation\ (5)$$

Table 4 provides a summary of the variables used in *Equation 5* and their respective calculations. Whereby, $\varepsilon_{b,t}$ is the normally distributed error term with a mean of 0. The chosen model will be determined using the necessary pre-requisite tests, such as the Breusch Pagan Larage-Multiplier test followed by the Hausman test. In this analysis, all the variables are essential in the sense that they all have a vital role to play in determining the banks performance. The significance of the variables will be analysed, based on a t-test at a 5% level of significance. The $Crisis_{b,t}$variable will serve as an indication of the impact that Covid-19 has had on the banks' profits throughout this period of crisis. A negative relationship between the dummy variable and the dependent variable, ROAA, will indicate a decline in profitability. A positive relationship between the Crisis variable would indicate that an increase in profitability during the Crisis period, thus indicating that the Covid-19 crisis did not result in a decline of financial performance. The Coefficient of the Crisis variable will be able to indicate the extent of the decline in profitability. The independent

variables and their coefficients, inclusive of the crisis variable will provide an indication of their effect on the dependent variable. Table 5 consists of the expected coefficients and their possible interpretations.

Table 5: Variables to be used in financial performance panel regression model, Equation 5.

Variable	**Definition**
Dependent variable	
$Log(ROAA)_{b,t}$	$Log\left(\frac{profit\ after\ interest\ and\ tax}{Total\ assets}\right)$
Independent variables	
$\log(Total\ Assets)_{b,t-1}$	$Log\ of\ (Total\ assets)_{t-1}$
$\log(Net\ loans)_{b,t}$	$Log\left(\frac{Total\ net\ loans}{Total\ assets}\right)$
$\log(Net\ Interest\ Revenue)$	$Log(Interest\ revenue - Interest\ expense)$
External variables	
$\log(Inflation)_{b,t}$	$Log\ of\ annual\ country\ inflation\ rate\%, measured\ by\ CPI$
$Crisis_t$	$Dummy\ variable\colon\ 1\ if\ during\ pandemic,\ 0\ otherwise.$

Table 6: Expected coefficients of variables in Financial performance analysis, Equation 5.

Dependent Variable	Independent Variable	
	Total assets	Inflation
ROAA	*Positive coefficient* Reason: A larger size results in a greater economy of scale which allows the bank to enter markets that would not be possible by smaller banks (Corporale et al. 2017)	*Negative coefficient* Reason: Inflation has had a positive effect on the returns of real assets (USBank, 2022); however inflation has an eroding component in terms of its effect on returns.
	Net interest rev	Loans
	Positive coefficient Reason: Interest revenue has found to be a significant positive factor in profitability based on the works of Anokye, Gatpetor and Musah (2018) and Caporale (2017).	*Negative coefficient* Reason: A trade-off exists between liquidity together with the risk that comes with it and the returns of an asset, as liquidity increases, risk decreases resulting in a lower return (Henriques and Neves, 2021).
	Crisis	
	Negative coefficient Reason: Based on findings by Gazi, Nahidduzzaman, Harymawan, Masud and Dhar (2022), Covid-19 resulted in a decline in profitability during the period of crisis	

3.2.2.3 Liquidity regression analysis

The method for assessing liquidity is derived from the study of Fedare (2011) and Vodava (2011). According to Fedare (2011), the liquidity ratio and the monetary policy rate are key determinants of the banking sector liquidity. The following model will attempt to establish the determinants of the banking sector liquidity in South Africa and the impact faced on the liquidity due to the Covid-19 crisis. The dependent variable of this regression is the ratio of loans to deposits and short-term financing (*L4*), this ratio relates illiquid assets with liquid liabilities (Vodava, 2011). The independent variables of the regression consist of the liquid assets to total assets ratio and the monetary policy rate. The liquid assets to total assets ratio *($L1_{b,t}$)* provides an indication of the banks' shock absorption capacity, their ability to absorb shock during a period of crisis. The monetary policy rate or the repo rate affects the costs of borrowing of the financial sector and thus the greater economy (Resbank, 2022) *Equation 6* depicts the liquidity panel regression model and Table 6 consists of a summary of variables used in *Equation* 6 and how they were computed. The liquidity panel regression model is as follows:

$$\mathrm{L4} = a_1 \mathrm{L1}_{b,t} + a_2 r + Crisis_t + \varepsilon_{b,t}$$

$$Equation\ (6)$$

Table 7: Variables to be used in liquidity panel regression, Equation 6.

Variable	**Definition**
Dependent variable	
$L4$	$\frac{Total\ loan}{Total\ deposits}$
Independent variables	
$\mathrm{L1}_{b,t}$	$\frac{Liquid\ assets}{Total\ assets}$
External variables	
r	$Monetary\ policy\ rate$
$Crisis_t$	$Dummy\ variable\colon\ 1\ if\ during\ pandemic,\ 0\ otherwise.$

Table 6 consists of the variables to be used in the regression and their respective calculations. An increase in the L4 variable would indicate that the bank is becoming less liquid over time as the level of loans is increasing at a larger proportion as compared to the level of deposits. This variable indicates what percentage of the banks' assets are tied up in illiquid loans (Vodava, 201). The Crisis variable will provide an indication of the pandemic on the liquidity of the banks in a sense that a positive coefficient would indicate that a negative relationship exists, suggesting that the crisis period resulted in an increase of the loan to deposit ratio, indicating that the loans of the bank increased as compared to their level of deposits, thus the bank became more illiquid. A negative coefficient of the crisis variable would indicate that during the crisis period, the banks become more liquid since the loan to deposit ratio decreased. As noted previously, the increase of the ratio indicates that the bank is less liquid. Table 7 provides a summary of all the independent variables and their expected coefficients in the liquidity panel regression.

Table 8: Expected coefficients of variables in Liquidity analysis, Equation 6.

Dependent Variable	Independent Variable		
	L1	R	Crisis
L4	*Negative coefficient* Reason: L1 is a measure of the banks shock absorption capacity, the greater the banks' ability to absorb a financial shock, the greater the liquidity (Vodova, 2011)	*Positive coefficient* Reason: The monetary policy rate reduces liquidity in an effort to prevent inflation (Amadeo, 2022).	*Positive coefficient* Reason: Covid-19 as a financial crisis has had the opportunity to cripple the liquidity of firms that were not adequately prepared (Rahman, Zaman and Begum, 2020).

3.3 Summary

The current chapter provided a discussion of the empirical methodologies used to study the impact of Covid-19 on the South African banking sector based on an analysis of the stock returns, financial performance and liquidity. The stock return analysis will employ abnormal returns as the dependent variable with liquidity and a dummy variable as the independent variables in an effort to determine how the periods in which Covid-19 was relevant, impacted abnormal stock returns. A positive significant coefficient would suggest that Covid-19 did result in the increase of abnormal returns, which is to be expected. The inclusion of the liquidity variable was to determine another possible cause of a change in abnormal returns. Financial performance will be analysed using the log of ROAA as the dependent variable and net interest revenue, loans, inflation and total assets as the independent variables. Log of ROAA was previously utilized by Caporale, Lodh and Nandy (2017) and Said and Tumin (2011) where it was used investigate the impact of bank-specific factors on performance, such as liquidity, capital, size and operating expenses.

Prior to the estimation of empirical regressions, preliminary data analysis is conducted to ensure that the appropriate time series is conducted, preliminary tests consist of unit root tests, descriptive statistics, and correlations. The next chapter provides a discussion of the results obtained.

Table 9: Summary of Empirical methods

Research Question	Model Employed	Regression
What impact does Covid-19 have on the stock returns experienced by firms in the banking sector?	Panel Regression model	$ARet_{b,t} = \alpha_0 + \alpha_1 Iliq_{b,t} + \alpha_2 Crisis_t + \varepsilon_{b,t}$
What impact does Covid-19 have on the banking sectors performance in terms of the change in ROAA?	Panel Regression model	$Log(ROAA)_{b,t} = \alpha_t + \beta_1 Crisis_{b,t} + \beta_2 \log(Total\ Assets)_{b,t-1} + \beta_3 \log(Net\ loans)_{b,t} + \beta_4 \log(Net\ Interest\ Revenue)_{b,t} + \beta_5 \log(Inflation)_{b,t} + \varepsilon_{b,t}$
What is the impact of Covid-19 on the banking sectors liquidity, measured by the loan-to-deposit ratio?	Panel Regression model	$L4 = a_1 L1_{b,t} + a_2 r + Crisis_t + \varepsilon_{b,t}$

Chapter 4: Empirical Results and Discussion

The following chapter consists of the empirical results of the tests mentioned in Chapter 3. The chapter consists of three main sub-sections. Firstly, the abnormal returns analysis followed by the financial performance analysis and finally the liquidity analysis. Each sub-section consists of the preliminary test results followed by the panel regression analysis and the discussion of the results.

4.1 Results of the abnormal return analysis

4.1.1 Preliminary test results

The following sub-section consists of all pre-requisite tests for the abnormal return analysis, inclusive of the stationarity tests, descriptive data analysis, correlation tests and model of best fit tests.

4.1.1.1 Stationarity

The following sub-section consists of the stationarity test results for all variables in the regression analysis.

Table 10: Stationarity of variables Abnormal return analysis, Equation 4.

Stationarity	
Variables	Levin, Lin & Chu t-statistic
$ARet_{b.t}$	-1.8005**
$Iliq_{b,t}$	-3.8249***
$Crisis_t$	-3.4734***

Notes:

1. ARet denotes abnormal returns, Iliq denotes liquidity and Crisis denotes the dummy variable.
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively.

Table 8 depicts the Levin, Lin and Chu test for the Abnormal returns regression *(Equation 4)*. Based on the Levin, Lin and Chu statistics, and the significance of the variables, the study can reject the null hypothesis and thus determine that all variables in this analysis are stationary. All of the variables in the analysis were found to be stationary at levels.

4.1.1.2 Descriptive data.

Table 11: Descriptive data of variables in abnormal return analysis, Equation 4.

	$ARet_{b.t}$	$Iliq_{b,t}$
Mean	-0.000023	0.090995
Median	-0.001630	0.065403
Maximum	0.195135	0.315119
Minimum	-0.225798	0.012125
Std. Dev.	0.068113	0.090423
Skewness	0.002855	1.635726
Kurtosis	3.193973	4.124052
Jarque-Bera	0.564874	179.4884
Probability	0.753944	0.000000

Notes:

1. $ARet_{b.t}$ denotes abnormal returns, $Iliq$ denotes liquidity, $Crisis$ denotes the dummy variable.
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively.

The $ARet_{b.t}$ variable has a mean value of -0.000023 and a median value of -0.001630. This implies that the banks' abnormal returns relative to the market index (as measured by the JSE All Share Index) was negative, on average, during the sample period. The $ARet_{b.t}$ variable exhibits a skewness value of 1.4856 which indicates that the variable is highly positively skewed. The kurtosis value of 8.9811 is greater than 3, thus it can be determined that the variable exhibits a positive skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. While the Liquidity variable consists of a mean value of 0.090995 and a median value of 0.065403, liquidity exhibits a skewness value of 1.6357 which indicates that the variable is highly positively

skewed. The kurtosis value of 4.1240 is greater than 3, thus it can be determined that the variable exhibits a positive skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. Taking into consideration that the Jacque-Bera p-value is less than the critical value in the case of both variables, thus this study can reject the null hypothesis and this study can assume that the $ARet_{b.t}$ and $Iliq$ variable are not normally distributed.

4.1.1.3 Correlation

Table 12: Correlation of variables in Abnormal returns regression, Equation 4.

Correlation			
	$ARet_{b.t}$	$Iliq_{b,t}$	$Crisis_t$
$ARet_{b.t}$	1.0000		
$Iliq_{b,t}$	0.0749	1.0000	
$Crisis_t$	-0.0678	-0.0523	1.0000

Notes:

1. AR denotes abnormal returns, $Iliq$ denotes liquidity and Crisis denotes the dummy variable.
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively.

According to Table 10, liquidity is positively correlated to abnormal returns; liquidity is negatively correlated to the crisis variable, these correlations are however insignificant at a 10% level of significance. The crisis variable is negatively correlated to abnormal returns, and liquidity however this correlation is insignificant at a 10% level of significance.

Langley and Ellis (2004) denote a high correlation statistic to be one whereby r is greater than 0.8 or less than -0.8. Thus, an analysis of the correlation between the dependent and independent variables indicates that multicollinearity is not an issue in this dataset as all correlation statistics fall within the restrictions.

4.1.1.4 Model of best fit

Table 13: The Breusch Pagan Lagrange-Multiplier test, abnormal returns, Equation 4.

The Breusch Pagan Lagrange-Multiplier test			
	Test Hypothesis		
	Cross-Section	Time	Both
Abnormal returns (Equation 2)	2.9972 (0.0834)	345.6266 (0.0000)	348.6238 (0.0000)

The Breusch-Pagan test for random effects indicates that at a 5% level of significance, the null hypothesis can be rejected for the time-varying hypothesis and both analyses. Since the time-varying aspect is significant, this study will continue with a time-varying analysis. The test indicates that variances across entities are not zero and time-varying random effects or fixed effects are present. The Breusch Pagan Lagrange-Multiplier test thus indicates that the preferred abnormal returns model is either a random effects model or a fixed model with a time varying aspect. This study can then proceed to test for which of the two models would be preferred using the Hausman test.

Table 14: The Hausman test, abnormal returns, Equation 4.

Hausman test			
	Test Hypothesis		
	Chi-sq Statistic	Degrees of freedom	Probability
Period random	6.2791	1	(0.0122)

.

The Hausman test, with a p-value less than the level of significance of 5% indicates that the null hypothesis should be rejected and that at least one independent variable is correlated with individual effects and that the fixed effect model would be preferred. The chosen model will thus be a time-varying fixed effects model to estimate the regression.

4.1.2 Abnormal return panel regression results

The following sub-section will analyse the regression of the abnormal returns. This first step in this process will involve the calculation of the AR variable for regression analysis of *Equation 4,* whereby AR serves as the independent variable.

The regression between the bank specific returns and the return of the market was run to generate the α_b and β_t values which were used in the calculation of $ARet_{b.t}$ whereby $ARet_{b,t} = R_{b,t} - \alpha_b - \beta_t RM_t$. The calculation of $ARet_{b.t}$ is then utilized in the stock return regression analysis based on *Equation 4.* Table 13 is a compilation of the bank specific $\alpha_b$and β_t values which were used in *Equation 3.*

Table 15:Compilation of bank specific α_(b,t) and β_(b,t) values.

Bank	$\alpha_{b,t}$	$\beta_{b,t}$
ABSA	-0.0058	0.5353
Standard Bank	-0.0062	0.5001
First Rand	-0.0020	0.4669
Nedbank	-0.0103	0.7011
Investec	-0.0080	0.8504
Capitec	0.0162	0.3393

This study will then move on to regressing *Equation 4* based on the calculation of the dependent variable, AR, from the table above. *Equation 4* is estimated, and the results are presented in Table 14. The regression will analyse the relationship between each independent variable and the dependent variable based on the coefficient as well the impact of the crisis period on the abnormal returns.

Table 16: Results of the abnormal return regression, Equation 4.

Dependent Variable: $ARet_{b.t}$	
Model:	Time varying fixed effect
C	-0.0027
	(0.0093)
$Iliq_{b,t}$	-0.0094**
	(0.0245)
$Crisis_t$	-0.0109
	(0.0014)
$R-squared$	0.0181
$F-Statistic$	3.2597
$Prob(F-statistic)$	0.0206

Notes:

1. AR denotes abnormal returns, *Iliq* denotes liquidity and Crisis denotes the dummy variable.
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively.
3. Values in parenthesis '( )' represent standard errors

Equation (4) is estimated to generate Table 14 depicting the results of the time-varying fixed effects model, inclusive of the coefficients, standard error and significance of the variables. The crisis variable should provide an indication of the impact faced by the stock returns during the crisis period. The crisis variable is insignificant at a 10% level of significance and is negatively related to the abnormal returns of the banks. This would suggest that the Covid-19 crisis did not have a significant impact on the abnormal returns of the banks. Based on the above table, it can be determined that there is a negative relationship between liquidity and abnormal returns which is

significant at a 5% level of significance. This negative relationship would indicate that the increase of the proportion of average cash holdings to total assets results in a decrease in abnormal returns. The F-statistic of 3.27 is greater than the critical value of 2.6 and a p-value of 0.0206 is less than the level of significance of 5%, thus this study can assume that at least one of the coefficients related to the independent variables are not zero. This study can thus determine that the model is significant.

4.1.3 Discussion of the findings of the abnormal returns analysis

The analysis determined that the impact of the crisis was not as great as expected considering that the crisis coefficient was insignificant and relatively low. The analysis found that the impact of Covid-19 resulted in an insignificant decrease in abnormal returns during the period of crisis. This study can also determine based on the above results, the impact of Covid-19 on the abnormal returns and ultimately the stock returns of the banks is minimal, although investor uncertainty could be to blame over the initial sudden downfall of stock prices. The findings of this analysis are in line with the findings of Farooq, Bilal, Nasir and Quddoos, (2021) whereby the impact of Covid-19 on the stock returns were negative overall across firms in German, India, Australia, USA, UK and Indonesia. The abnormal return regression analysis proves that liquidity of the banks plays an important role on the returns of the banking sector, as a negative significant relationship was found to exist, thus indicating that an increase in the liquidity results in lower abnormal returns. Liquidity in banks is both the ability to meet financial obligations internally and towards the customers. It can thus be assumed that the greater the liquidity of the banks, the greater the ability of the bank to survive the period of crisis. Gartvall and Landall (2017) noted that liquidity is a source of stability for banks and without a sufficient reserve, the bank will have a difficult time staying afloat

4.2 Results of the financial performance analysis

4.2.1 Preliminary test results

The following sub-section consists of all pre-requisite tests for the financial performance analysis, inclusive of the stationarity tests, descriptive data analysis, correlation tests and model of best fit tests.

4.2.1.1 Stationarity

Table 17: Stationarity of variables in financial performance analysis, Equation 5.

Stationarity	
Variables	Levin, Lin & Chu t-statistic
$\log(Inflation)_{b,t}$	-2.7132***
$\log(Net\ loans)_{b,t}$	-2.6437***
$\log(Net\ Interest\ Revenue)_{b,t}$	-5.6165***
$Log(ROAA)$	-1.8124***
$\log(Total\ Assets)_{b,t-1}$	-8.8057***
$Crises_t$	-6.2165***

Notes:

1. ROAA denotes Log(ROAA), Total Assets denotes Log(Total assets), Net int rev denotes Log(Net int rev), Loans denotes Log(Loans), Inflation denotes Log(Inflation).
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively

Table 15 depicts the Levin, Lin and Chu test for the financial performance regression (*Equation 5*). Based on the Levin, Lin and Chu statistics, and the significance of the variables, the study can reject the null hypothesis and thus determine that all variables in this analysis are stationary. The variables, inclusive of Inflation, Loans, Net int rev, GDP, Total Assets and ROAA were found to be stationary at levels.

4.2.1.2 Descriptive data

Table 18: Stationarity of variables in financial performance analysis, Equation 5.

Descriptive Data					
	ROAA	*Inflation*	*Loans*	*Net int rev*	*Total Assets*
Mean	-1.551793	-1.298805	-0.096405	-5.472605	8.568161
Median	-1.888932	-1.278189	-0.064896	-7.407766	8.952918
Maximum	0.020120	-1.197911	-0.042829	0.000000	9.435497
Minimum	-2.440497	-1.485452	-0.316683	-7.977477	5.855198
Std. Dev.	0.758535	0.080406	0.079307	3.386911	0.775799
Skewness	1.317501	-0.937177	-1.853114	1.001548	-1.045893
Kurtosis	3.307313	3.236551	4.739500	2.029517	3.512959
Jarque-Bera	19.35361	9.815195	46.09545	13.62413	12.75640
Probability	0.000063	0.007390	0.000000	0.001100	0.001698

Notes:

1. ROAA denotes Log(ROAA), Total Assets denotes Log(Total assets), Net int rev denotes Log(Net int rev), Loans denotes Log(Loans), Inflation denotes Log(Inflation).
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively

The ROAA variable has a mean of -1.551793 and a median of -1.888932, ROAA exhibits a skewness value of 1.3175 which indicates that the variable is highly postively skewed. The kurtosis value of 3.3073 is greater than 3, thus it can be determined that the variable exhibits a positive skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. The Inflation variable has a mean of -1.298805 and a median of -1.278189 and exhibits a skewness value of -0.9371 which indicates that the variable is moderately negatively skewed. The kurtosis value of 3.3947 is greater than 3, thus it can be determined that the variable exhibits a positive skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. The Net interest revenue variable has a mean of -5.472605 and a median of -7.407766, the variable exhibits a skewness value of 1.001 which indicates that the variable is moderately positively skewed. The kurtosis value of 2.0295 is less than 3, thus it can be determined that the variable exhibits a normal skewness and is platykurtic. The Jacque-Bera p-value is less than the critical value of 0.05. The Loans variable has a mean of -0.096405 and a median of -0.064896, the variable exhibits a skewness value of -1.8531 which indicates that the variable is highly negatively skewed. The kurtosis value of 4.7395 is greater than 3, thus it can be determined that the variable exhibits a positive skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. The Net interest revenue variable has a mean of 8.568161and a median of 8.952918, the variable exhibits a skewness value of -1.045893 which indicates that the variable is moderately negatively skewed. The kurtosis value of 3.512959 is greater than 3, thus it can be determined that the variable exhibits a positive skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. Taking into consideration that the Jacque-Bera p-value is less than the critical value in the case of all variables, thus this study can reject the null hypothesis and this study can assume that the Loans, Inflation and Net interest revenue variables are not normally distributed.

4.2.1.3 Correlation

Table 19: Correlation of variables in financial performance regression, Equation 5.

	ROAA	*Total Assets*	*Net int rev*	*Loans*	*Inflation*	*Crisis*
ROAA	1.0000					
Total Assets	0.1665	1.0000				
Net int rev	-0.2276*	-0.7075***	1.0000			
Loans	-0.1750	0.5190***	-0.4844***	1.0000		
Inflation	0.0563	-0.0715	-0.0504	0.0406	1.0000	
Crisis	-0.0904	0.0815	0.0331	0.0331	-0.7396	1.0000

Notes:

1. ROAA denotes Log(ROAA), Total Assets denotes Log(Total assets), Net int rev denotes Log(Net int rev), Loans denotes Log(Loans), Inflation denotes Log(Inflation).
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively

There is a significant correlation between the log of net interest revenue and the log of ROAA at a 10% level of significance, the negative correlation implies that the log of net interest revenue has a direct negative impact on ROAA. This would imply that a decrease in the net interest revenue would result in a significant increase in the ROAA. The impact of the log of total assets, log of loans, log of inflation has an insignificant positive impact on the log of ROAA. The log of net interest revenue also has a direct negative impact on the log of total assets at a 1% level of significance which indicates that the increase of the banks total assets results in the decrease of the net interest revenue, this may either indicate that the interest expense has increased, or the interest revenue has decreased. Although the correlation is relatively high between total assets and net interest revenue, according to Langley and Ellis (2004), a high correlation that could lead to an

issue of multicollinearity would have to be greater than 0.8, thus the relationship between net interest revenue and total assets is not a problem here. The log of loans has a direct positive impact on the log of total assets at 1% level of significance. The log of loans has a positive correlation on the log of net interest revenue at a 1% level of significance. Inflation is insignificantly positively correlated to ROAA. The log of inflation has a positive insignificant impact on the log of loans and a negative insignificant impact on the log of total assets and the log of net interest revenue. The Crisis variable is negatively correlated to ROAA, the dependent variable, and the Inflation variable. This correlation is however insignificant at a 10% level of significance. The Crisis variable has an insignificant positive correlation to the total assets, net interest revenue and loan variable.

4.2.1.4 Model of best fit

The following section aims to determine the best fit model for the financial performance analysis. The first test conducted will be the Breusch Pagan Lagrange-Multiplier test followed by the Hausman test.

Table 20: Breusch Pagan Lagrange-Multiplier test, financial performance, Equation 5.

The Breusch Pagan Lagrange-Multiplier test			
	Cross-Section	Time	Both
Financial Performance	305.9348 (0.0000)	5.9745 (0.0145)	311.9094 (0.0000)

The Breusch-Pagan test for random effects indicates that at a 5% level of significance, the null hypothesis can be rejected for the cross-section, time-varying hypothesis and both analyses. Considering that the cross-sectional aspect is significant at a 1% level of significance, this study will continue with a cross-sectional analysis. The test indicates that variances across entities are not zero and random effects or fixed effects are present. The Breusch Pagan Lagrange-Multiplier test thus indicates that the preferred financial performance model is either a cross-sectional random effects model or a cross-sectional fixed effects model. This study can then proceed to test for which of the two models would be preferred using the Hausman test.

Table 21:The Hausman test, financial performance, Equation 5.

Hausman test			
	Chi-sq Statistic	Degrees of freedom	Probability
Cross-section random	3.2319	1	(0.0722)

The Hausman test suggests that no independent variable is correlated with individual effects and thus, the preferred model would be a cross-sectional random-effects model. The statistic is statistically insignificant based on the p-value and fails to reject the null hypothesis based on a 5% level of significance. The cross-sectional random effects model will be utilized to estimate the regression.

4.2.2 Financial performance panel regression results

Equation 5 is then estimated, and the results are presented in Table 20. The regression will analyse the impact of Covid-19 on the bank's profitability based on their returns of average assets.

Table 22: Results of the financial performance regression, Equation 5.

Dependent Variable: $Log(ROAA)$	
Model:	Cross section random effects
C	-1.8031** (0.5897)
$Log(Total\ assets)_{t-1}$	-0.0247 (0.0291)
$Log(Loans)$	-2.4706** (1.1704)
$Log(Net\ interest\ revenue)$	-0.0126 (0.0119)
Inflation	-0.1390 (0.2109)
Crisis	-0.2721*** (0.0578)
$R-squared$	0.430022
$F-Statistic$	11.6514

$Prob(F-statistic)$	0.0000

Notes:

1. ROAA denotes Log(ROAA), Total Assets denotes Log(Total assets), Net int rev denotes Log(Net int rev), Loans denotes Log(Loans), Inflation denotes Log(Inflation).
2. ***, **,* represent significance at 1%, 5%, and 10% level of significance, respectively.
3. Values in parenthesis '( )' represent standard errors

Equation 5 is estimated to generate the above table depicting the results of the cross-sectional random effects model, inclusive of the coefficients, standard error, and significance of the variables. The Crisis variable is significant at a 1% level of significance and is negatively related to the log of ROAA. The estimated coefficient on the Crisis variable confirms the effect of the crisis on the banks' profits (ROAA) with a decrease of 27.21% in profitability over the period of crisis extended over 2020 and 2021. The results depict a negative relationship between the log of loans and the log of ROAA which is significant at a 5% level of significance, this can be explained due to the reliance of the loan variable on the return of average assets considering that the loan variable is the total loans reduced by the banks' liquid assets. The inflation variable indicates a negative relationship, that is insignificant at a 10% level of significance, between the banks' profitability and the inflation experienced, this is justified since Alfani and Rustander (2013) experienced a similar outcome whereby the impact of inflation on the Indonesian banking sectors ROAA was insignificant. The Net interest revenue has a negative relationship with ROAA, however this relationship is insignificant. Based on the F-statistic, since 11.6514 is greater than the critical value of 2.37 and with a p-value of 0, this study can assume that at least one of the coefficients related to the independent variables are not zero and the model is significant.

4.2.3 Discussion of the findings of financial performance

The profitability regression analysis proved the impact of the period of crisis on the banks' profitability with a 27.21% decrease in the banks' profitability over the period of crisis as measured by the return on average assets. The profitability of the banks can be seen as the most impacted dependent variable in this study. The decline in profitability could be linked to slower growth prospects of banks through a reduction in lending activity and a possible increase in credit impairments, this links to the liquidity aspect of the study. The uncertainty surrounding the pandemic could be another cause of the decline in performance. Based on the significant decline of financial performance experience, this study can thus determine that the impact of Covid-19 on the banks' profitability has been immense. The findings of the financial performance analysis are in line with the findings of Dang Ngoc, Vu Thi Thuy and Le Van, (2021) whereby a decline in profitability was noted over the period of crisis of listed firms in Vietnam. The liquidity aspect of this regression is significant, thus proving the reliance on liquidity for the overall profitability of the banks. Jathurika and Madushanka (2018) made note of the reliance of liquidity on firm profitability. Koutsomanoli-Flippack, Mamatzakis and Staikourous (2008), noted that loans are positively linked to profitability, however if loans were to be issued on a level that is considered to be overly generous, it will have a negative impact on the profitability of the bank. Based on the negative coefficient of the loan component, the liquidity aspect of the regression, it can be noted that the increase of the proportion of net loans to assets in this case results in a decrease of profitability, which could insinuate the state of the banks' lending capacity. In other words, this variable could determine the banks position in a lending capacity.

4.3 Results of the liquidity analysis

4.3.1 Preliminary test results

4.3.1.1 Stationarity

Table 23: Stationarity of variables in Liquidity regression, Equation 6.

Stationarity	
Variables	Levin, Lin & Chu t-statistic
$L4$	-8.7208***
$\mathrm{L1}_{b,t}$	-7.4071***
r	-16.5024***
$Crisis_t$	-7.2573***

Notes:

1. $L4$ denotes the loan to deposit ratio, r denotes the monetary policy rate, $L1$ denotes the liquid assets to total assets ratio and $Crisis$ denotes the dummy variable.
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respective.

Table 21 depicts the Levin, Lin and Chu test for the Liquidity regression *(Equation 6)*. Based on the Levin, Lin and Chu statistics, and the significance of the variables, the study can reject the null hypothesis and thus determine that all variables in this analysis are stationary. All of the variables in the analysis were found to be stationary at levels.

4.3.1.2 Descriptive data

Table 24: Descriptive data of variables in Liquidity analysis, Equation 6.

Descriptive Data			
	$L4$	$\mathrm{L1}_{b,t}$	r
Mean	0.705261	0.077579	0.057773
Median	0.762182	0.047628	0.057500
Maximum	1.020090	0.315119	0.070000
Minimum	0.002439	0.012125	0.042500
Std. Dev.	0.186479	0.079624	0.008543
Skewness	-1.097765	1.864461	-0.204950
Kurtosis	5.040284	5.210575	1.806060
Jarque-Bera	24.70355	51.67661	4.382151
Probability	0.000004	0.000000	0.111796

Notes:

1. $L4$ denotes the loan to deposit ratio, R denotes the monetary policy rate, and $L1$ denotes the liquid assets to total assets ratio..
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively.

The L4 variable has a mean of 0.705261 and a median of 0.762182, L4 exhibits a skewness value of -1.097765 which indicates that the variable is highly negatively skewed. The kurtosis value of 3.3073 is greater than 3, thus it can be determined that the variable exhibits a negative skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. The L1 variable has a mean of 0.077579 and a median of 0.047628, the variable exhibits a skewness value of 1.8644 which indicates that the variable is highly positively skewed. The kurtosis value of 5.2105

is greater than 3, thus it can be determined that the variable exhibits a positive skewness and is leptokurtic. The Jacque-Bera p-value is less than the critical value of 0.05. The r variable has a mean of 0.057773 and a median of 0.057500, the variable exhibits a skewness value of -0.204950 which indicates that the variable is slightly negatively skewed. The kurtosis value of 1.806060 is less than 3, thus it can be determined that the variable exhibits a negative skewness and is platykurtic. The Jacque-Bera p-value is greater than the critical value of 0.05. Taking into consideration that the Jacque-Bera p-value is less than the critical value in the case of *L4 and L1*, thus this study can reject the null hypothesis and this study can assume that the $L4$ and $L1$ are not normally distributed. In the case of the R variable, this study cannot reject the null hypothesis and it would have to be assumed that the variable is normally distributed.

4.3.1.3 Correlation

Table 25: Correlation of variables in the liquidity analysis, Equation 6.

Correlation				
	$L4$	r	$\mathrm{L1}_{b,t}$	$Crisis_t$
$L4$	1.0000			
r	0.2546**	1.0000		
$\mathrm{L1}_{b,t}$	-0.3925***	0.0444	1.0000	
$Crisis_t$	0.1020	-0.2932	0.0870	1.0000

Notes:

1. $L4$ denotes the loan to deposit ratio, r denotes the monetary policy rate, $L1$ denotes the liquid assets to total assets ratio and $Crisis$ denotes the dummy variable.
2. ***, **, * represents significance at a 1%, 5%, and 10% level of significance, respectively.

According to Table 23, the monetary policy rate is significantly positively correlated to the loan to deposit ratio at a 1% level of significance. This would suggest that a rise in the monetary policy rate (r) results in an increase of the loan to deposit ratio, indicating that the bank becomes more illiquid considering the proportion of loans is increasing at a greater rate as compared to the deposits. The shock absorption capacity $(L1)$ is significantly negatively related to the loan to deposit ratio at a 1% level of significance, this suggests that the shock absorption capability declines as the bank becomes more illiquid. $L1$ is positively correlated to the monetary policy rate, this correlation is however insignificant at a 10% level of significance.

4.3.1.4 Model of best fit in the liquidity analysis

Table 26: Breusch Pagan Lagrange-Multiplier test for the liquidity analysis, Equation 6.

The Breusch Pagan Lagrange-Multiplier test			
	Cross-Section	Time	Both
Abnormal returns	4.9938 (0.0254)	0.0216 (0.8832)	5.0153 (0.0251)

The Breusch-Pagan test for random effects indicates that at a 5% level of significance, the null hypothesis can be rejected for the cross-sectional hypothesis and both analyses. Thus, indicating that variances across entities are not zero and either cross-sectional random effects or fixed effects are present. The Breusch Pagan Lagrange-Multiplier test thus indicates that the preferred abnormal returns model is either a cross-sectional random effects model or a fixed model. Considering that the cross-sectional test hypothesis is significant, the study will utilize a cross-sectional analysis

instead of a time varying analysis. This study can then proceed to test for which of the two models would be preferred using the Hausman test.

Table 27: The Hausman test for liquidity analysis, Equation 6.

Hausman test			
	Chi-sq Statistic	Degrees of freedom	Probability
Period random	2.3103	3	(0.5105)

The Hausman test suggests that no independent variable is correlated with individual effects and thus, the preferred model would be a cross-sectional random effects model. The statistic is statistically insignificant based on the p-value and fails to reject the null hypothesis. The cross-sectional random effects model will be utilised to estimate the regression.

4.3.1 Liquidity panel regression results

This study will then move on to regressing *Equation (6)*, the liquidity regression. The following regression will analyse the impact of Covid-19 on the banks level of liquidity. The following regression will analyse the significance of the dependent variables as well as the relationship between each independent variable and the dependent variable based on the coefficient.

Table 28: Results of the liquidity regression, Equation 6.

Dependent Variable: L4	
Model:	Cross-sectional random effects
c	0.3351***
	(0.1376)
$\mathrm{L1}_{b,t}$	-1.2167***
	(0.2407)
r	7.6636***
	(2.2607)
$Crisis_t$	0.1200***
	(0.0501)
$R-squared$	0.2296
$F-Statistic$	6.1614
$Prob(F-statistic)$	0.0000

Notes:

1. L4 denotes the loan to deposit ratio,L1 denotes the liquid assets to total assets ratio, r denotes the monetary policy rate, *and Crisis is a dummy variable.*
2. ****, **,* represent significance at 1%, 5%, and 10% level of significance, respectively.*
3. *Values in parenthesis '( )' represent standard errors.*

Equation 6 is estimated to generate the above table depicting the results of the cross-sectional random effects model, inclusive of the coefficients, standard error and significance of the variables. The estimated coefficient on the Crisis variable indicates the effect of the crisis on the banks' liquidity with an increase of 12% in the loan to deposit ratio over the period of crisis extended over 2020 and 2021, thus indicating that the banks experienced a significant increase in the loans or a decrease in deposits. This therefore confirms that banks experienced a significant decline in liquidity over the period of crisis. The results depict a negative significant relationship between the shock absorption capacity $(L1)$ with the loan to deposit ratio $(L4)$, which indicates that the increase of the shock absorption capacity of the bank results in a bank that is more liquid. The monetary policy rate has a positive significant relationship with loan to deposit ratio $(L4)$, thus indicating that the increase of the monetary policy rate (R) results in an increase of the banks liquidity. The F-statistic of 6.1614 is greater than the critical value of 3 and with a p-value of 0, this study can assume that at least one of the coefficients related to the independent variables are not zero. This study can thus determine that the model is significant.

4.3.2 Discussion of liquidity findings

The dependent variable in this analysis is the loan to deposit ratio which serves as an indication of the liquidity levels of the banks in the sense that an increase in this ratio provides the indication that the liquidity levels are decreasing. The liquidity regression analysis indicated that the Covid-19 crisis resulted in liquidity decreasing by 12% during the crisis period, this change in the loan to deposit ratio was quite drastic, this study can determine that liquidity was impacted overall. Table 29 is a summary of the change in deposit-loan ratio, this table indicates the liquidity changes

experienced over the years. A decrease in this ratio would indicate the bank faced a decline in liquidity an increase would suggest that the bank became more liquid as the ratio of deposits to loans increased. An increase in the ratio would suggest that deposits increased relative to loans thus making the bank more liquid. This table supplements the findings of the liquidity regression analysis as it can be seen that liquidity was significantly affected, this can be seen in Standard Bank's 2019 values, whereby the deposit to loan ratio decreased by 332%, for ABSA and Standard Bank, they managed to increase their liquidity in 2020. However, for the rest of the banks in this data sample, the ratio remained consistent over the period of crisis, this could suggest that these banks were possibly more prepared for the crisis.

Table 29: Summary of deposits to loan ratio.

	ABSA	**Standard Bank**	**First Rand**	**Capitec**	**Investec**	**Nedbank**
2012	-18%	-280%	-91%	20%	-30%	5%
2013	70%	57%	14%	0%	-56%	10%
2014	-4%	13%	-11%	48%	-36%	6%
2015	-27%	-111%	-139%	29%	-12%	10%
2016	-30%	-72%	-25%	23%	15%	5%
2017	-1%	-34%	18%	23%	11%	1%
2018	18%	-71%	26%	23%	3%	1%
2019	-18%	-332%	16%	22%	9%	6%
2020	26%	180%	29%	22%	3%	6%
2021	-18%	58%	12%	33%	-14%	0%

The findings of this study are in line with the findings of Omaliko, Amnim, Okeke and Obioro, (2021) during their analysis of the impact of Covid-19 on the profitability and liquidty of the Nigerian firms. This study can then assume that in terms of a liquidity barrier, the banks faced a large shock to their liquidity levels since the loan ratio increased to such an extent. If this study were to assume that some sort of crisis prevention existed in terms of liquidity due to the occurrence of the 2008 financial crisis, it can be said that the novelty of the virus was enough to surpass any prevention that was put in place. The negative significant coefficient of the L1 variable (shock absorption capacity) which proves that the increase of the shock absorption capacity of the bank results in the decrease of the L4 ratio, thus indicating that the increase of the shock absorption capacity improves the liquidity levels of the banks. The Monetary policy proves to be significant in the liquidity analysis as the increase in the Monetary policy rate results in the decline of the banks liquidity.

4.4 Summary

Chapter 4 presents and discusses the results obtained from the estimations of different empirical methodologies. The results for each result question are summarized in Table 30. In summary, this study reports three key empirical findings. Firstly, the result of the abnormal analysis indicates that abnormal returns was not significantly impacted by the Covid-19 pandemic. Secondly, the financial performance of banks during Covid-19 was significantly affected, with performance facing a decline of 27.1% over this period of analysis. Lastly, the liquidity aspect of this study indicated *that* the liquidity of the South African banks experienced a 12% decline over the period of crisis.

Table 30: Summary of results.

Research Question	Finding(s)
What impact does Covid-19 have on the stock returns experienced by firms in the banking sector?	The abnormal returns of banks during Covid-19 were insignificantly impacted overall.
What impact does Covid-19 have on the banking sectors performance in terms of the change in ROAA?	The financial performance had a significant decline of 27.1%, thus indicating that the crisis had a significant impact on the profitability of the South African banks.
What is the impact of Covid-19 on the banking sectors liquidity, measured by the loan-to-deposit ratio?	The liquidity of the banks was impacted significantly, with an increase of the loan to deposit ratio of 12%, thus indicating that the liquidity decreased by 12%.

Chapter 5: Conclusion

5.1 Review of objectives

Covid-19 has had a vast impact on the world as a whole, the South African economy is familiar to crises having dealt with the global financial crisis of 2008. During the global financial crisis, the banking system experienced a significant impact on the performance aspect. The discovery of the Coronavirus in December 2019 resulted in mass consumer uncertainty due to the novelty of this virus, as consumers didn't know what to expect in terms of market conditions. Covid-19 has had a range of effects on the economic conditions in South Africa, the discovery has seen businesses suffer, with workplace productivity decreasing and a negative supply shock arising, this saw many small businesses closing, aiding in the rise in unemployment. Market movements have been compared to the movements during the global financial crisis. The impact on the South African economy is a point of concern and to the authors knowledge, the impact of the Covid-19 pandemic on the South African banking sector has not been clearly determined in terms of abnormal returns, financial performance, and liquidity.

Based on this background, the objectives of this study are as follows:

- To determine the impact of Covid-19 on the banking sectors stock returns in SA.
- To determine the impact of Covid-19 on the banking sectors performance based on profitability, determined by the change in Return on Average Assets of each bank (ROAA).

- To determine the impact of Covid-19 on the banking sectors liquidity in SA, determined by the change in the loan-to-deposit ratio.

In an effort to achieve the abovementioned objectives, this study employs three different empirical analyses - the results of which are discussed in the preceding chapter. The proceeding section provides a summary of the main findings in an attempt to address the research questions of this study.

5.2 Summary of findings

5.2.1 Research question 1 - What impact does Covid-19 have on the stock returns experienced by firms in the banking sector?

The results from the estimated panel regression model indicated that the effect of the crisis on the abnormal returns was insignificant. Therefore, this finding indicates that Covid-19 did not impact the abnormal returns of the JSE listed banks and thus the firms in the banking sector.

5.2.2 Research question 2 - What impact does Covid-19 have on the banking sectors performance in terms of the change in ROAA?

The results from the estimated panel regression model indicated that the effect of the crisis on the log of ROAA is significant at a 1% level of significance. The log of ROAA experienced a 27.21% decrease during the period of crisis. It can thus be determined that Covid-19 resulted in the

financial performance of the South African banks being impacted significantly as can be determined by the significant decline in the ROAA over 2020 to 2021. This study can thus determine that the banks possible uncertainty experienced due to the pandemic together with an increase in credit impairments have resulted in the decline of performance.

5.2.3 Research question 3 - What is the impact of Covid-19 on the banking sectors liquidity, measured by the loan-to-deposit ratio?

The results from the estimated panel regression model indicated that the effect of the crisis on the loan-to-deposit ratio is significant at a 1% level of significance. The loan-to-deposit ratio increased by 12% over the period of crisis from 2020 to 2021. This study can thus determine that the banking sectors liquidity as measured by the loan-to-deposit ratio has been negatively impacted due to Covid-19 considering the ratio of loans to deposits increased significantly. Based on this finding, this study can assume that the novelty of this virus created enough uncertainty that resulted in the consumers withdrawing their deposits possibly fearing the failure of the banks or more individuals and businesses took out loans to ensure their sustainability during the period of uncertainty.

5.3 Implications of findings

Although the country faced a financial crisis in the late 2000's, the effect of the current crisis on the banking sector has been evident. This study has determined that the returns of the banking sector are not impacted by the crisis. This finding has diversification benefits for investors in the sense that they can invest in the banking sector to reduce their exposure to similar crises.

This study has determined that Covid-19 has resulted in a significant decline in financial performance of the South African banks over the period of crisis. Which would insinuate that

banks need to implement policies to improve their performance during these crises. The importance of liquidity has been identified in a period of crisis, considering that liquidity has been found to be a significant factor, it can be determined that in order for the banking sector to safely navigate any future crises that may arise, it would be beneficial to ensure a sufficient source of funds at all times, thus a liquidity buffer would be suggested in order to maintain liquidity levels that would allow them to keep up with their daily operations. From a depositor's point of view, the negative impact on the banks' liquidity could imply that they as customers may find it difficult to liquidate their deposits immediately. With regards to the monetary policy rate, should the monetary policy rate be increased in an effort to maintain inflation, this would result in the banks liquidity declining considering that monetary policy was found to be a significant factor when it comes to liquidity.

The findings of this study suggest that liquidity is an essential factor when it comes to the overall success of the banking sector. In order to ensure that the banks remain unharmed, it would be necessary to maintain the liquidity levels, this should be done by ensuring the shock absorption capacity is sufficient to protect from any sudden fluctuations in the supply and demand of funds.

5.4 Recommendations for future studies

This study had a few limitations. Firstly, due to the 2022 financial data being unavailable at the time of compilation, the study could only take into account two years of crisis, being 2020 and 2021. Moreover, given that some of the well-known South African banks are listed as part of a portfolio company, this made it difficult to obtain financials for the banks on their own. Based on these limitations, the following research opportunities have been identified to contribute to existing knowledge.

- Firstly, the study comprises of the JSE listed banks, however, it excludes the likes of Bidvest Bank and Discovery Bank which form part of a portfolio company. These banks together with those included in the study form the South African banking sector. Thus, a future study could incorporate all banks to determine the impact of Covid-19 on the financial performance, liquidity and abnormal returns.

- Secondly, the time frame of the analysis consists of 2 years of crisis. Thus, a future study could incorporate a greater time frame to grasp a better idea of how the banking sector stabilized over time.

- Thirdly,, there could be other determinants at play besides the variables included in this study. Future studies could include determinants such as size, capital, operational expenses into their models to analyse if they were relevant in affecting the financial performance, liquidity and abnormal returns of the banking sector.

- Lastly, a future study could utilise MAAR to measure the impact of Covid-19 on market efficiency.

5.5 Conclusion

The analysis of the impact of Covid-19 on the South African banking sector over the period of crisis, spanning from March of 2020 to December of 2021 has determined that the abnormal returns of the JSE listed banks have not been significantly impacted over this period. The analysis of the financial performance which acted as a measurement of profitability indicated that Covid-19 has had a negative impact on profitability with ROAA declining by 27% over this period. Lastly, this study attempted to determine the impact on the banks' liquidity, it was determined that Covid-19

had a negative impact on the liquidity considering that the loan to deposit ratio increased 12% was noted over the period of crisis.

References

Andrieș, A., Căpraru, B., Ieșan-Muntean, F. and Ihnatov, I. (2016). The Impact of International Financial Crisis on Bank Performance in Eastern and Central European Countries. *EuroEconomica*, 35(1), pp.1582–8859.

Athanasoglou, P.P., Brissimis, S.N. and Delis, M.D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), pp.121–136. doi:10.1016/j.intfin.2006.07.001.

Acharya, V.V., Engle, R.F. and Steffen, S. (2021). Why Did Bank Stocks Crash during COVID-19? *SSRN Electronic Journal*.

Ahundjanov, B.B., Akhundjanov, S.B. and Okhunjanov, B.B. (2020). Information Search and Financial Markets under COVID-19. *Entropy*, [online] 22(7), p.791. Available at: https://pdfs.semanticscholar.org/acb1/56100c757af75cb87ffcd6997760ab303ef2.pdf?_ga=2.167269054.1897429657.1633024684-799655672.1631806263 [Accessed 30 Sep. 2021].

Akoi, S. and Andrea, S. (2020). The determinants of the performance of the banking sector: Evidence from an emerging market. [online] Available at: https://www.researchgate.net/publication/350153714_THE_DETERMINANTS_OF_THE_PER

FORMANCE_OF_THE_BANKING_SECTOR_EVIDENCE_FROM_AN_EMERGING_MARKET [Accessed 20 Jan. 2022].

Aldasoro, I., Fender, N., Hardy, B and Tarashev, B. (2020). *Effects of Covid-19 on the banking sector: the market's assessment.* [online] Available at: https://www.bis.org/publ/bisbull12.pdf [Accessed 22 Mar. 2021].

Alexakis, C., Patra, T., and Poshakwale, S. (2010) Predictability of stock returns using financial statement information: evidence on semi-strong efficiency of emerging Greek stock market. Applied Financial Economics, 20(16), pp.1321-1326.

Amadeo, K. (2022). *What is Monetary Policy? [online] Available at: https://www.thebalance.com/what-is-monetary-policy-objectives-types-and-tools-3305867*

Anh, D.L.T. and Gan, C. (2020). The impact of the COVID-19 lockdown on stock market performance: evidence from Vietnam. *Journal of Economic Studies*, ahead-of-print. doi:10.1108/jes-06-2020-0312.

Anis, J. and Hajer, C. (2016). Analysis of the Impact of Governance on Bank Performance: Case of Commercial Tunisian Banks. *Journal of the Knowledge Economy*, 9(3), pp.871–895. doi:10.1007/s13132-016-0376-6.

Antwi, F. (2019). Capital Adequacy, Cost Income Ratio and Performance of Banks in Ghana. *International Journal Academic Research in Business and Social Sciences*, *9*(10), 168–184.

Alin, A. (2010). Multicollinearity. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2(3), pp.370–374. doi:10.1002/wics.84. [Accessed on 5 May 2022].

Athanasoglou, P.P., Brissimis, S.N. and Delis, M.D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), pp.121–136. doi:10.1016/j.intfin.2006.07.001.

Beck, T., Döttling, R., Lambert, T. and Dijk, M. van (2020). *How banks affect investment and growth: New evidence*. [online] VoxEU.org. Available at: https://voxeu.org/article/how-banks-affect-investment-and-growth [Accessed 5 Jan. 2022].

Beck, T. (2020). *How is coronavirus affecting the banking sector?* [online] Economics Observatory. Available at: https://www.economicsobservatory.com/how-coronavirus-affecting-banking-sector [Accessed 29 Sep. 2022].

Beck, T. and Keil, J. (2022). Have banks caught corona? Effects of COVID on lending in the U.S. *Journal of Corporate Finance*, pp.102-160. doi:10.1016/j.jcorpfin.2022.102160.

Bradley, C. and Stumpner, P. (2021). The impact of COVID-19 on capital markets, one year in. *McKinsey & Company*. [online] 10 Mar. Available at: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-impact-of-covid-19-on-capital-markets-one-year-in [Accessed on 1 May 2022]

Bragg, S. (2021). *Interest revenue definition*. [online] AccountingTools. Available at: https://www.accountingtools.com/articles/what-is-interest-revenue.html [Accessed 24 Feb. 2022].

Brothwell, R. (2020). *South Africa lost 1 million jobs because of the 2008 recession – here's why this one could be even worse*. [online] Businesstech. Available at: https://businesstech.co.za/news/technology/379079/south-africa-lost-1-million-jobs-because-of-the-2008-recession-heres-why-this-one-could-be-even-worse/ [Accessed 1 Mar. 2022].

Brown, JS., Hagel, J. and Lui, M. (2021). *Success or struggle: ROA as a true measure of business performance | Deloitte Insights*. [online] www.deloitte.com. Available at: https://www2.deloitte.com/us/en/insights/topics/operations/success-or-struggle-roa-as-a-true-measure-of-business-performance.html [Accessed 4 Dec. 2021].

Businesstech (2020). *South Africa's banking sector is dominated by 5 names – who control almost 90% of all assets.* [online]

Available at: https://businesstech.co.za/news/banking/416057/south-africas-banking-sector-is-dominated-by-5-names-who-control-almost-90-of-all-assets/#:~:text=According%20to%20the%20SARB%2C%20South,(March%202019%3A%2090.5%25).&text=Total%20banking%20sector%20assets%20grew,2020%20(March%202019%3A%20R5. [Accessed 17 Mar. 2021].

Capitec (2020). are you in need of credit relief or assistance? [online]. Available at: https://www.capitecbank.co.za/bank-better-live-better/articles/good-for-credit/are-you-in-need-of-credit-relief-or-assistance/

CFA Institute. (2022). *Expected return, realised return summary*. [online] Available at: https://www.cfainstitute.org/en/research/cfa-digest/2000/02/expected-return-realized-return-and-asset-pricing-tests-digest-summary%20Elton%20EJ%202000 [Accessed 23 Feb. 2022].

Chaouachi, M. and Slim, C. (2020). Current COVID-19 Impact on Saudi Stock Market: Evidence from An ARDL Model. *SSRN Electronic Journal*. doi:10.2139/ssrn.3636333.

Chowdhury, E.K., Khan, I.I. and Dhar, B.K. (2021). Catastrophic impact of Covid-19 on the global stock markets and economic activities. *Business and Society Review*. [online] Available at: https://onlinelibrary.wiley.com/doi/10.1111/basr.12219 [Accessed 16 Sep. 2021].

Coetzer, J. and Naicker, M. (2021). *In brief: banking regulatory framework in South Africa | Financial Regulation Journal*. [online] Financial regulation journal. Available at: https://financialregulationjournal.co.za/2021/05/26/in-brief-banking-regulatory-framework-in-south-africa/ [Accessed 27 Feb. 2022].

Colegrave, A. (2022). *Banking Regulation in South Africa: Overview*. [online] Thompson Reuters Practical Law. Available at: https://uk.practicallaw.thomsonreuters.com/w-007-6934?transitionType=Default&contextData=(sc.Default)&firstPage=true#co_anchor_a828871 [Accessed 18 Mar. 2022].

Corporale, GM., Lodh, S. and Nandy, M. (2017). *The performance of banks in the MENA region during the global financial crisis.* Research in International Business and Finance 42, pp.583–590.

Corporate Finance Institute (2021). *Capital adequacy ratio (CAR).* [online] Available at: https://corporatefinanceinstitute.com/resources/knowledge/finance/capital-adequacy-ratio-car/ [Accessed 18 Apr. 2021].

Corporate finance institute. (2022). Expected return. [online] Available at: https://www.cfainstitute.org/en/research/cfa-digest/2000/02/expected-return-realized-return-and-asset-pricing-tests-digest-summary%20Elton%20EJ%202000 [Accessed 23 Feb. 2022].

Corporate Finance Institute (2021). *Regression analysis.* [online] Available at: https://corporatefinanceinstitute.com/resources/knowledge/finance/regression-analysis/#:~:text=Regression%20analysis%20is%20a%20set,a%20dependent%20variable%20(the%20outcome

Dang Ngoc, H., Vu Thi Thuy, V. and Le Van, C. (2021). Covid 19 pandemic and Abnormal Stock Returns of listed companies in Vietnam. *Cogent Business & Management*, 8(1), p.1941587. doi:10.1080/23311975.2021.1941587.

data.worldbank.org. (2022). *GDP per capita growth (annual %) - South Africa | Data*. [online] Available at: https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=ZA [Accessed 23 Feb. 2022].

Demirguc-Kunt, A. and Detragiache, E. (1998). The Determinants of Banking Crises in Developing and Developed Countries. *Staff Papers - International Monetary Fund*, 45(1), p.81. doi:10.2307/3867330.

Demirgüç-Kunt, A., Morales, A. and Ruiz Ortega, C. (2020). Banking Sector Performance During the COVID-19 Crisis. *SSRN Electronic Journal*. doi:10.2139/ssrn.3689789.

Dickason, Z. and Ferreira, S. (2018) Establishing a link between risk tolerance, investor personality and behavioural finance in South Africa. Cogent Economics and Finance, 6(1).

Donnelly, L. (2019). *Reserve Bank labels six SA banks as systemically important.* [online] Available at: https://www.businesslive.co.za/bd/economy/2019-11-28-reserve-bank-labels-six-sa-banks-as-systemically-important/ [Accessed 18 Apr. 2021].

Driscoll, J.C. (2004). Does bank lending affect output? Evidence from the U.S. states. *Journal of Monetary Economics*, 51(3), pp.451–471. doi:10.1016/j.jmoneco.2004.01.001.

Esch, D. (2010) *Non-Normality Facts and Fallacies*, [online], available: https://www.newfrontieradvisors.com/media/1160/non-normality.pdf. [Accessed on 2 May 2022].

Fama, E.F. (1970) Efficient capital markets: a review of theory and empirical work. The Journal of Finance, 25(2), pp.383-417.

Fama, E.F. (1991) Efficient capital markets: II. The Journal of Finance, 46(5), pp.1575-1617.

Fadare, S.O. (2011). Banking Sector Liquidity and Financial Crisis in Nigeria. *International Journal of Economics and Finance*, 3(5). doi:10.5539/ijef.v3n5p3.

Farooq, U., Nasir, A., Bilal and Quddoos, M.U. (2021). The impact of COVID-19 pandemic on abnormal returns of insurance firms: a cross-country evidence. *Applied Economics*, 53(31), pp.3658–3678. doi:10.1080/00036846.2021.1884839.

Federal Reserve Bank of San Francisco. (2001). *What is the economic function of a bank?* [online] Available at: https://www.frbsf.org/education/publications/doctor-econ/2001/july/bank-economic-function/ [Accessed 18 Mar. 2021].

Figueres, C. and Rivett-Carnac, T. (2020). What the World Will Look Like in 2050 If We Don't Cut Carbon Emissions in Half. *Time*. [online] Available at: https://time.com/5824295/climate-change-future-possibilities/ [Accessed 15 Apr. 2022].

First National Bank. (2020). Covid relief solutions. [online]. Available at: https://www.fnb.co.za/realhelp/for-my-business/cash-flow-relief.html

Focus Economics (2013). *Policy interest rate*. [online] FocusEconomics | Economic Forecasts from the World's Leading Economists. Available at: https://www.focus-economics.com/online-store [Accessed 21 Feb. 2022].

Gazi, M., Nahiduzzaman, M., Harymawan, I., Masud, A. and Dhar, B. (2022). Impact of COVID-19 on Financial Performance and Profitability of Banking Sector in Special Reference to Private Commercial Banks: Empirical Evidence. [online] Available at: https://www.researchgate.net/publication/360756812_Impact_of_COVID-19_on_Financial_Performance_and_Profitability_of_Banking_Sector_in_Special_Reference_to_Private_Commercial_Banks_Empirical_Evidence_from_Bangladesh [Accessed 18 Jun. 2022].

Gill, V. (2020). *Coronavirus: This is not the last pandemic.* [online] Available at: https://www.bbc.com/news/science-environment-52775386 [Accessed 17 Mar. 2021].

Gobat, J. (2021). *Banks: At the Heart of the Matter.* [online] Finance & Development | F&D Available at: https://www.imf.org/external/pubs/ft/fandd/basics/bank.htm [Accessed 18 Apr. 2021].

Gobat, J. (2012). *Finance & Development*. [online] Finance & Development | F&D. Available at: https://www.imf.org/external/pubs/ft/fandd/basics/bank.htm.

Grant, S.W., Hickey, G.L. and Head, S.J. (2018). Statistical primer: multivariable regression considerations and pitfalls†. *European Journal of Cardio-Thoracic Surgery*, 55(2), pp.179–185.

Guney, Y. and Komba, G. (2016) Testing for the weak-form market efficiency of the Dar es Salaam stock exchange. Handbook of Frontier Markets, 1.

Hausman, J. A. (1978) 'Specification tests in econometrics', *Journal of the Econometric Society*, 46(6), pp.1251–1271.

Hardouvelis, G.A. (1987). Macroeconomic information and stock prices. *Journal of Economics and Business*, 39(2), pp.131–140. doi:10.1016/0148-6195(87)90012-9.

Henriques, C. and Neves, E. (2021). Exploring the trade-off between liquidity, risk and return under sectoral diversification across distinct economic settings. *The Journal of Risk Finance*. doi:10.1108/jrf-05-2020-0101.

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. doi:10.19030/jabr.v30i4.8663.

Indeed Career Guide. (2021). *How to Calculate Total Debt (With Example)*. [online] Available at: https://www.indeed.com/career-advice/career-development/how-to-calculate-total-debt [Accessed 21 Feb. 2022].

International Monetary Fund (2020). *Policy tracker.* [online] Available at: Policy-Responses-to-COVID-19 [Accessed 1 Mar. 2021].

Joo, B.A. and Durri, K. (2015) Comprehensive review of literature on behavioural finance. Indian Journal of Commerce and Management Studies, 6(2), pp.11-19.

Kapoor, S. and Prosad, J.M. (2017) Behavioural finance: a review. Procedia Computer Science, 122, pp.50- 54.

Khwaja, A.I. and Mian, A. (2008). Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. *American Economic Review*, 98(4), pp.1413–1442. doi:10.1257/aer.98.4.1413.

Koutsomanoli-Filippak, A., Mamatzakis, E., Staikouras, C., 2008. Cost efficiency of the banking industry in the South Eastern European region. J. Int. Financ. Mark. Inst. Money 18 (5), 483–497.

Kumar, V. (2021). *Statistical tests to check stationarity in Time Series*. [online] Analytics Vidhya. Available at: https://www.analyticsvidhya.com/blog/2021/06/statistical-tests-to-check-stationarity-in-time-series-part-1/ [Accessed 7 Apr. 2022].

Kunjal, D., 2021. The impact of COVID-19 on stock market liquidity: Evidence from the Johannesburg Stock Exchange. *African Review of Economics and Finance*, *13*(2), pp.104-123.

Kunjal, D. and Peerbhai, F. (2021). Investor overconfidence in the South African exchange traded fund market. *Cogent Economics & Finance*, 9(1). doi:10.1080/23322039.2021.1978190.

Kosmidou, K., Pasiouras, F. and Tzanetoulakos, A. 2007. Domestic and multinational determinants of foreign bank profits: The case of Greek banks operating abroad. Journal of Multinational Financial Management, 17 (1), pp. 1-15.

Koutsomanoli-Filippak, A., Mamatzakis, E., Staikouras, C., 2008. Cost efficiency of the banking industry in the South Eastern European region. J. Int. Financ. Mark. Inst. Money 18 (5), pp.483–497.

KPMG (2020). *COVID-19: Impact on the banking sector - KPMG Global*. [online] KPMG. Available at: https://home.kpmg/xx/en/home/insights/2020/07/covid-19-impact-on-banking-m-and-a-2020.html [Accessed 20 Mar. 2022].

Kuepper, J. (2020). *The Asian financial crisis* [online] Available at: https://www.thebalance.com/what-was-the-asian-financial-crisis-1978997 [Accessed 6 Apr. 2021].

Kumbirai, M. and Webb, R. (2010) *A financial Ratio Analysis of Commercial Bank Performance in South Africa.* African Review of Economics and Finance, 2(1), pp. 30-53

Khwaja, A.I. and Mian, A. (2008). Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. *American Economic Review*, 98(4), pp.1413–1442. doi:10.1257/aer.98.4.1413..

Kumar, V. (2021). *Statistical tests to check stationarity in Time Series*. [online] Analytics Vidhya. Available at: https://www.analyticsvidhya.com/blog/2021/06/statistical-tests-to-check-stationarity-in-time-series-part-1/ [Accessed 7 Apr. 2022].

Kupukile, M. and Ncube, M. (2011). *Competition and Efficiency in the Banking Sector in South Africa.* [online] Available at: http://web.b.ebscohost.com.ukzn.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=2&sid=4117ff72-8d2e-46b0-9574-3b95c7f074a7%40sessionmgr101 [Accessed 8 Mar. 2021]

Li, L., Strahan, P.E. and Zhang, S. (2020). Banks as Lenders of First Resort: Evidence from the COVID-19 Crisis. *SSRN Electronic Journal*. doi:10.2139/ssrn.3606279

Madushanka, K. H. I. and Jathurika, M., "The Impact of Liquidity Ratios on Profitability (With special reference to Listed Manufacturing

Companies in Sri Lanka)," International Research Journal of Advanced Engineering and Science, Volume 3, Issue 4, pp. 157-161, 2018

Maredza, A. (2013) *Measuring the Impact of the Global Financial Crisis on Efficiency and Productivity of the Banking System in South Africa*. Mediterranean Journal of Social Sciences, *4(6),* pp. 553-569. [Accessed on 9 June 2021].

Mboweni, T. (2000). *The role of the South African Reserve Bank in the economy*. [online] Available at: https://www.bis.org/review/r000321a.pdf [Accessed 13 May 2022].

Meyer, D. (2017). An analysis of the short and long-run effects of economic growth on employment in south africa. *International journal of economics and finance studies*, 9(1), pp.1309–8055.

Mlambo, K. and Ncube, M. (2011). Competition and Efficiency in the Banking Sector in South Africa. *African Development Review*, 23(1), pp.4–15. doi:10.1111/j.1467-8268.2010.00268.x.

Nasdaq. (2022.). *Currency in circulation*. [online] Available at: https://www.nasdaq.com/glossary/c/currency-in-circulation [Accessed 24 Mar. 2022].

National Institute for Communicable Diseases (2020). *FIRST CASE OF COVID-19 CORONAVIRUS REPORTED IN SA*. [online] NICD. Available at: https://www.nicd.ac.za/first-case-of-covid-19-coronavirus-reported-in-sa/#:~:text=This%20morning%2C%20Thursday%20March%205.

Neill, A. (2022). *Inflation rate in South Africa 2027*. [online] Statista. Available at: https://www.statista.com/statistics/370515/inflation-rate-in-south-africa/ [Accessed 14 Apr. 2022].

Newth, A. (2022). *What Is Net Interest Revenue?* [online] Smart Capital Mind. Available at: https://www.smartcapitalmind.com/what-is-net-interest-revenue.htm. [Accessed on 26 April 2022]

Ngalande, EE. (2003). *The importance of financial system modernisation in Africa.* [online] Available at: https://www.bis.org/review/r030620e.pdf [Accessed 16 Apr. 2021].

Norden, L. (2015). *The Role of Banks in SME Finance*. [online] *repub.eur.nl*. Available at: https://repub.eur.nl/pub/77636/ [Accessed 15 June 2022].

Olive, D.J. (2005). Introduction to Regression Analysis. *Technometrics*, 47(2), pp.233–233. doi:10.1198/tech.2005.s257.

Ozsoy, S.M., Rasteh, M., Yönder, E. and Yucel, M. (2020). COVID-19 Impacts on Bank Stability in a Liquidity-Backed Environment. *SSRN Electronic Journal*. doi:10.2139/ssrn.3713526.

Pacces, A. (2011). Liquidity, Uncertainty, and Financial Crisis. *SSRN Electronic journal*. doi:DOI: 10.2139/ssrn.1966964.

Phillips, P. C., & Moon, H. R. (2000). Nonstationary panel data analysis: An overview of some recent developments. Econometric reviews, 19(3), pp.263-286.

PWC (2021). *SA Major Banks Analysis.* [online] Available at: https://www.pwc.co.za/en/press-room/major-banks-analysis-dec-2020.html [Accessed 12 Apr. 2021].

Rahman, M.M., Zaman, R. and Begum, M. (2020). Bank Liquidity during COVID-19 Pandemic: Evidence from Bangladesh. *SSRN Electronic Journal*. doi:10.2139/ssrn.3778056.

Ramaphosa, C. (2022). *PRESIDENTIAL ADDRESS: SA's National State of Disaster terminated with effect from midnight*. [online] Daily Maverick. Available at: https:/www.dailymaverick.co.za/article/2022-04-04-sas-national-state-of-disaster-terminated-with-effect-from-midnight/ [Accessed 29 Apr. 2022].

Reuters.com (2021). *South Africa's unemployment rate jumps to new record high. [online]* Available at: https://www.reuters.com/article/us-safrica-economy-unemployment-idUSKBN2AN0S1 [Accessed on 21 Dec. 2022]

Resbank (2020). *Our response to COVID-19*. [online] Available at: https://www.resbank.co.za/en/home/publications/publication-detail-pages/media-releases/Our-response-to-COVID-19.

Resbank (2021). South Africa's implementation of Basel II and Basel III. [online] Available at: https://www.resbank.co.za/en/home/what-we-do/Prudentialregulation/Sector_data/south-africa-s-implementation-of-basel-ii-and-basel-iii.

Rodgers, J.L and Nicewander, W.A. (1988) Thirteen ways to look at the correlation coefficient. The American Statistician, 42(1): 59-66.

Ruppert, D. (1987) What is kurtosis? An influence function approach. The American Statistician, 41(1): 1- 5

SA Shares. (2022). *JSE All Share Index (ALSI) - Live Price, Historical Data**. [online] Available at: https://sashares.co.za/jse-all-share-index/ [Accessed 8 Mar. 2022].

Siegel, L. (2020). *The Novelty of the Coronavirus: What It Means for Markets.* [online] Available at: https://blogs.cfainstitute.org/investor/2020/03/18/the-novelty-of-the-coronavirus-what-it-means-for-markets/ [Accessed 12 Apr. 2021].

Spikin, IC. (2013). Risk Management theory: the integrated perspective and its application in the public sector. *Revista Estado, Gobierno y Gestión Pública*, [online] 0(21). doi:10.5354/0717-6759.2013.29402.

South African Reserve Bank (2021). *Monetary Policy*. [online] www.resbank.co.za. Available at: https://www.resbank.co.za/en/home/what-we-do/monetary-policy [Accessed 22 Feb. 2022].

South African Reserve Bank (2020). *South Africa's implementation of Basel ||and Basel |||*. [online] Available at: https://www.resbank.co.za/en/home/what-we-do/Prudentialregulation/Sector_data/south-africa-s-implementation-of-basel-ii-and-basel-iii

South African Reserve Bank (2021). Reserve Bank on how the third Covid-19 wave will impact the economy. [online] Available at: https://businesstech.co.za/news/banking/498617/reserve-bank-on-how-the-third-covid-19-wave-will-impact-the-economy/

Sorana, V. (2015). Determinants of Return on Assets in Romania: A Principal Component Analysis. *Timisoara Journal of Economics and Business*, 8(s1), pp.32–47. doi:10.1515/tjeb-2015-0003.

Standard Bank (2020). Financial relief for you. [online] Available at: https://www.standardbank.co.za/southafrica/personal/covid-19

stats.oecd.org. (2022). *OECD Glossary of Statistical Terms - Trend component of a time series Definition*. [online] Available at: https://stats.oecd.org/glossary/detail.asp?ID=6692 [Accessed 22 Feb. 2022].

Stewart, R. and Chowdhury, M. (2021). Banking sector distress and economic growth resilience: Asymmetric effects. *The Journal of Economic Asymmetries*, 24, pp.218.

Study.com. (2022). *Tier 1 capital*. [online] Available at: https://study.com/academy/lesson/what-is-tier-1-capital-definition-ratio-core-capital.html [Accessed 22 Feb. 2022].

Tabak, B.M., Fazio, D.M. and Cajueiro, D.O. (2013). Systemically important banks and financial stability: The case of Latin America. *Journal of Banking & Finance*, 37(10), pp.3855–3866. doi:10.1016/j.jbankfin.2013.06.003.

Takyi, P.O. and Bentum-Ennin, I. (2020). The impact of COVID-19 on stock markets performance in Africa: A Bayesian Structural Time Series Approach. *Journal of Economics and Business*, p.105968. doi:10.1016/j.jeconbus.2020.105968.

Tan, X., Ma, S., Wang, X., Zhao, Y., Wang, Z. and Xiang, L. (2022). The Dynamic Impact of COVID-19 Pandemic on Stock Returns: A TVP-VAR-SV Estimation for G7 Countries. *Frontiers in Public Health*, 10. doi:10.3389/fpubh.2022.859647.

Tripathi, A. (2019). Profit Maximization Theory and Value Maximization Theory. *International Journal of Scientific Development and Research*, 4(6), pp.2455–2631.

Tyson, J. (2020). *The impact of Covid-19 on Africa's banking system.* [online] Available at: https://odi.org/en/insights/the-impact-of-covid-19-on-africas-banking-system/ [Accessed 3 May 2021].

Torres-Reyna, O. (2011). *Panel Data Analysiixed and Random Effects using Stata (v. 4.2)*. [online] Available at: https://www.princeton.edu/~otorres/Panel101.pdf.

Waleed, A. (2016). Exploring the Impact of Liquidity on Profitability: Evidence from Banking Sector of Pakistan. *SSRN Electronic Journal*. doi:10.2139/ssrn.2899817.

Way, J., (2018). *The Advantages of Using Debt as Capital Structure.* [online] Available at: https://smallbusiness.chron.com/advantages-using-debt-capital-structure-22011.html [Accessed 11 Mar. 2021].

Wasserman, H. (2020). *The rand's massive comeback: It's as if lockdown and 'junk' never happened.* [online] Available at: https://www.businessinsider.co.za/rand-comeback-in-2020-2020-12

Western & Southern Financial Group (2020). The Impact of Inflation on Your Savings & Investments [online] Available at: https://www.westernsouthern.com/learn/financial-education/the-impact-of-inflation-on-your-savings-and-investments

Resbank (2021). South Africa's implementation of Basel II and Basel III. [online] Available at: https://www.resbank.co.za/en/home/what-we-do/Prudentialregulation/Sector_data/south-africa-s-implementation-of-basel-ii-and-basel-iii.

www.usbank.com. (2021). *Effects of inflation on investments*. [online] Available at: https://www.usbank.com/financialiq/invest-your-money/investment-strategies/effects-of-inflation-on-investments.html [Accessed 10 Jun. 2022].

Xuan, S. (2022). The Determinants of Financial Crisis. *4th International Conference on Global Economy, Finance and Humanities Research*. [online] doi:DOI:10.23977/GEFHR2021.033

Appendix A

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

22 April 2022

Miss Dashami Naidoo (215005758)
School Of Acc Economics&Fin
Westville

Dear Miss Dashami Naidoo,

Original application number: 00014551
Project title: Measuring the impact of Covid-19 on banking sector returns, profitability and liquidity in South Africa.

Exemption from Ethics Review

In response to your application received on 15 Feb 2022 , your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

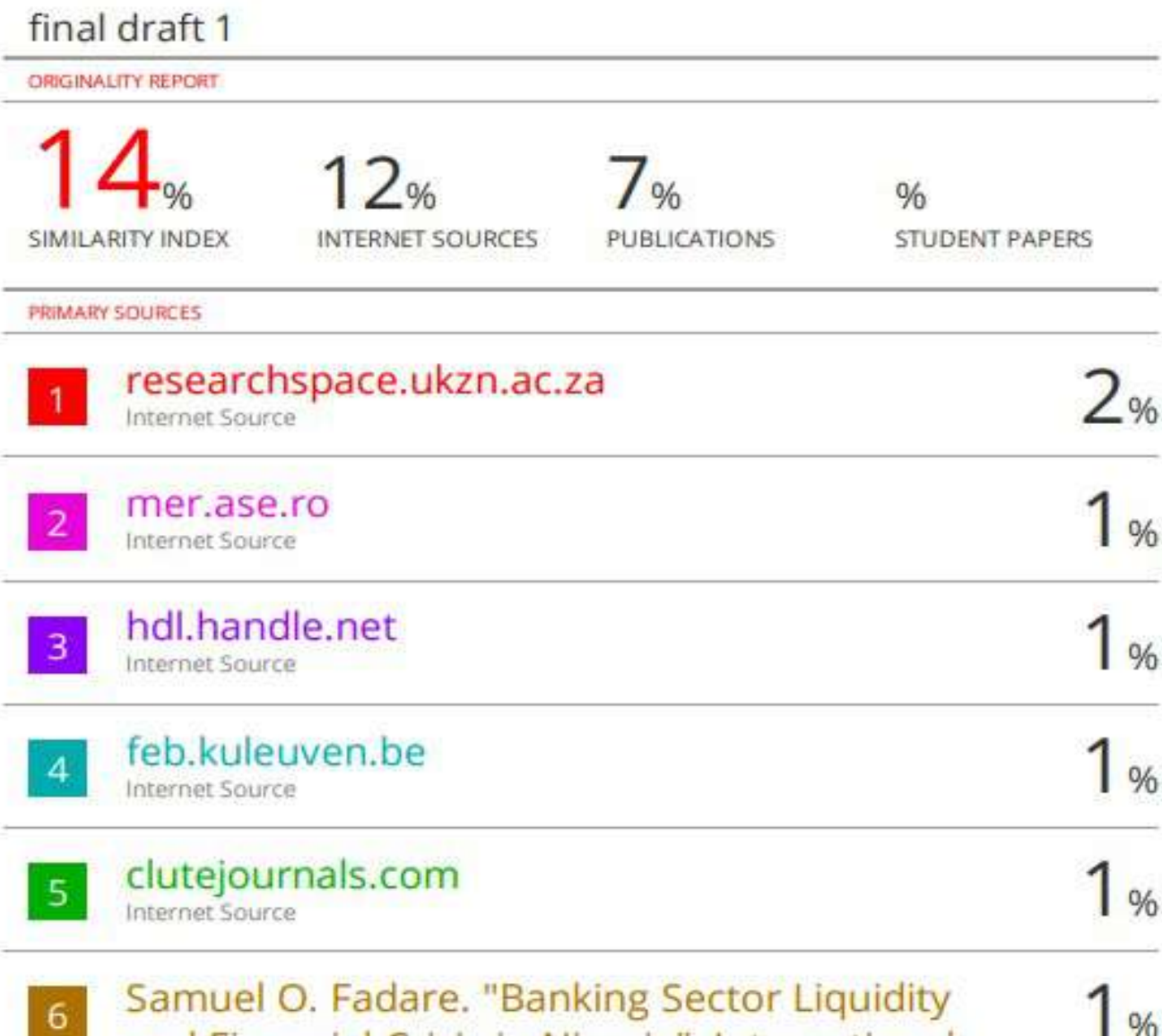
I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

[redacted]

Prof Josue Mbonigaba
Academic Leader Research
School Of Acc Economics&Fin

Appendix B



final draft 1

ORIGINALITY REPORT

14%	12%	7%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	researchspace.ukzn.ac.za Internet Source	2%
2	mer.ase.ro Internet Source	1%
3	hdl.handle.net Internet Source	1%
4	feb.kuleuven.be Internet Source	1%
5	clutejournals.com Internet Source	1%
6	Samuel O. Fadare. "Banking Sector Liquidity	1%