



How IFRS 9 has impacted Deferred Tax Assets and Bank Regulatory Capital in South Africa

by

KEVIN AUGUSTINE ABUKA

ABKKEV001

SUBMITTED TO THE UNIVERSITY OF CAPE TOWN

in partial fulfilment of the requirements for the degree

Master of Commerce specialising in Finance (in the field of Corporate Finance and Valuations)

Faculty of Commerce

UNIVERSITY OF CAPE TOWN

November 2022

Supervised by: Associate Professor Phillip de Jager

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

Declaration

This dissertation has been submitted to Turnitin and I confirm that my supervisor has seen my report. Any concerns revealed have been settled in collaboration with my supervisor.

Furthermore, this body of work has not been previously submitted in whole, or in part, for the award of any degree in this or any other university. It is my own work. Each noteworthy contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, and has been cited and referenced.

Kevin Augustine Abuka
ABKKEV001

Signed by candidate

01/11/2022

Acknowledgment

Firstly, I would like to give thanks to God for the abundance of strength, diligence, and determination He has afforded me throughout this research journey. Secondly, many thanks to my parents who sponsored my education unconditionally. Thirdly, I acknowledge my supervisor, Dr Phillip de Jager. He created an environment that allowed for many valuable discussions, creativity, and constant learning. Finally, I express my gratitude to the rest of my family and friends who supported and wished me well throughout this journey.

Abstract

Gallemore (2012) empirically proved that banks with larger percentages of deferred tax assets in their regulatory capital are more likely to fail and have higher credit risk. However, following the application of IFRS 9 from January 2018, there arose an increasing likelihood that deferred tax assets included in bank regulatory capital would increase. This was due to the expected credit loss model utilised by IFRS 9 while provisioning for loan losses. The model means that credit impairments are larger and recognised earlier. As a result, deferred tax assets likely increase.

This study sought to ascertain whether 1) the nature of the relationship between credit impairments due to loans and deferred tax assets has changed to a stronger positive correlation in the post IFRS 9 era and 2) deferred tax assets are displacing better forms of capital within banks' regulatory capital. The results of the study show that deferred tax assets are increasing in line with credit impairments due to loans in the post IFRS 9 era. Additionally, deferred tax assets arising due to temporary differences make up a larger component of regulatory capital in the post IFRS 9 era. Findings from the study can contribute to the reinforcement and revision of prudential policy set by regulators within the banking sector to ensure that banks maintain sufficient capital adequacy levels.

Table of Contents

Declaration	i
Acknowledgment.....	ii
Abstract.....	iii
List of Tables	v
List of Figures.....	vi
1. Introduction	1
2. Literature Review.....	5
2.1 Theoretical framework.....	5
2.2 Review of Literature	10
2.3 Research Hypotheses	21
3. Methodology	22
3.1 Research Approach	22
3.2 Data and Sample Selection	22
3.3 Measurement of Variables and Research Model.....	25
4. Results and Analysis	29
4.1 DTAs and Credit Impairments in the Banking Sector	29
4.2 The Displacement of Better Capital	37
4.3 Discussion of Results.....	41
4.4 Limitations and Areas for Further Research.....	43
5. Conclusion	45
5.1 Contributions and Policy Implications.....	45
6. References.....	47
7. Appendix.....	54
7.1 Correlation Analysis.....	54
7.2 Stationarity Checks.....	55
7.3 Model Diagnostics	56
7.4 DTA Computations for Five Banks	56

List of Tables

Table 1: Key Definitions from IAS 12 - Income Taxes	17
Table 2: Illustration on how DTAs arise from Impairments	17
Table 3: Date of Adoption of IFRS 9 by Large Banks	23
Table 4: Large Banks in SA by Tier 1 Capital	24
Table 5: Summary of Variables Used in the Study	26
Table 6: Summary of Descriptive Statistics	29
Table 7: Results of test for stationarity of model variables.....	32
Table 8: OLS Regression Results.....	33
Table 9: OLS Regression Results with Newey West Standard Errors	34
Table 10: OLS Regression Results taking first differences	36
Table 11: Rate of year-on-year change in DTAs arising due to temporary differences	40
Table 12: Rate of year-on-year change in the DTA component included in CET1 ..	41

List of Figures

Figure 1: A correlation matrix including model variables	30
Figure 2: Serial correlation in the model residuals	34
Figure 3: No evidence of serial correlation in the model residuals	36
Figure 4: Graphs showing the trends for DTAs and DTLs in the South Africa banking sector	38
Figure 5: A graph showing the trends for DTAs and Credit Impairments due to loans in the South Africa banking sector	39
Figure 6: DTAs arising due to temporary differences included in regulatory capital	40
Figure 7: % of DTAs arising from temporary differences included in CET1 Capital	41

1. Introduction

IFRS 9 – Financial Instruments, introduced on 1st January 2018, requires entities to move from an incurred loss model to an expected credit loss (ECL hereafter) model when measuring credit impairments. Due to the forward-looking nature of this model, larger provisions are made to guard against future credit losses. As a result, credit impairments due to loans are expected to increase which will probably be accompanied by an increase in deferred tax assets (DTAs hereafter).

There is limited research regarding how the new accounting standard has impacted credit impairments and DTAs as well as the implications on bank regulatory capital. This study attempts to investigate the nature of the association between credit impairments and DTAs both before and after IFRS 9 was implemented. Furthermore, the research seeks to investigate whether the DTAs component of regulatory capital is displacing better forms of capital within regulatory capital.

The global financial crisis of 2007 – 2009 led to a host of interventions designed to ensure that such a crisis would not happen again. One such intervention was the replacement of IAS 39 with IFRS 9 as the go-to standard for accounting for financial instruments. The need for this new standard arose from world leaders and several international bodies identifying accounting standards on financial instruments as a major cause of the global financial crisis (Huian, 2012:28).

IFRS 9 is essential to this study as it changes how impairments, and therefore DTAs, are measured inadvertently raising questions about how regulatory bank capital could be affected. The design of the standard means that its impact is mostly felt by financial institutions with large loan portfolios such as banks. IFRS 9 outlines the classification and measurement requirements for financial assets, financial liabilities, and some contracts to purchase or sell non-financial goods (IFRS, 2022).

Under this standard, the ECL model replaced the incurred loss model as a means of recognising impairments of financial assets. When measuring ECL, the ECL model mandates that businesses consider data from past events, current circumstances, and reasonable and supportable forecasts (Novotny-Farkas, 2016:200). The ECL model translates into impairment provisions that are “likely to be larger and recognised earlier” (BDO, 2018).

To complicate matters further, the outbreak of Covid-19 in December 2019 served to exacerbate credit impairment levels within the banking industry. The pandemic reduced the quality of loans and increased the probability of default as well as credit risk. The higher the credit risk on financial assets such as bank loans, the higher the impairment and provisions (Hladika, 2021:142).

A combination of the introduction of IFRS 9 and the outbreak of Covid-19 means that credit impairments have increased significantly in recent years. The implications of this are relevant to our research because DTAs can be expected to move in line with credit impairments. Adediran & Bamidele (2019) point out that majority of tax authorities are not likely to allow impairment losses to be deductible. On DTAs, they find that “A related but indirect impact of the above is the increase in the deferred tax asset that would be carried in the books of the company because of increased non-deductible impairment loss. This creates a deductible temporary difference leading to increased deferred tax asset in the SOFP of the company.”

While considering the potential implications of IFRS 9 on DTAs, it is important to also note that Basel III, introduced in 2009 and implemented in South Africa since 1st January 2013 allows for a portion of DTAs (those relying on temporary differences) to be included in bank regulatory capital (BCBS, 2015). The regulation stipulates that while DTAs relying on future profitability of the bank to be realised are to be deducted in the calculation of Common Equity Tier 1 (CET1 hereafter), DTAs relating to temporary differences such as allowance for credit losses can be included. This inclusion is to be capped at 10% of the bank’s common equity and risk weighted at 250% (BCBS, 2019).

The implementation of Basel III has been accompanied by stricter measures for maintaining regulatory capital at sound levels which allow banks to guard against unforeseen crises and losses. In addition, further scrutiny has been placed on the forms of capital that qualify to be included in regulatory capital. More specifically, the inclusion of DTAs in regulatory capital has long been contentious.

On one hand, regulators have argued that since DTAs are based on the future profitability of banks, they provide a fragile buffer in case of economic crises (Gallemore, 2012:2). Most recently, Credit Suisse Group AG reported a net loss of 4.03 billion Swiss francs of which 3.7 billion was from an impairment of DTAs (Balezou & Halftermeyer, 2022). This came on the back of a major revamp for the bank following prolonged poor performance and management scandals.

On the other hand, bankers use DTAs to meet the strict regulatory capital demands. The displaced capital can be used to generate more loans and, in effect, more deposits thus expanding the bank's balance sheet. Evidence from (Skinner, 2008:218) indicates that bank managers in Japan engaged in regulatory capital arbitrage by exploiting DTAs to supplement their bank's regulatory capital and meet the minimum requirement stipulated by the supervisors. In addition, the Japanese government, through regulatory forbearance, permitted these acts to go on unchecked.

Crucially for South Africa, the Banks Act, 1990 (Act No. 94 of 1990) incorporated these new regulations in section 38(5)(a). Therefore, from the official implementation date of Basel III, all banks were expected to adjust their reporting such that they complied with these requirements. Amendments to regulations are necessary to adapt to the constantly changing global economic environment. However, the interaction of Basel III with the IFRS 9 creates a potential overlap around DTAs which should be monitored closely.

Following the implementation of IFRS 9 and the outbreak of Covid-19, it is important to determine whether banks continue to remain safeguarded from bank failures especially if the DTA portion of bank regulatory capital is found to be significantly affected by the standard. Gallemore (2012:32) found that banks with a higher portion of their regulatory capital consisting of a DTAs component were associated with higher levels of credit risk and a higher risk of bank failure in case of a crisis. The DTA component of regulatory capital should, therefore, not be taken lightly because of the potentially dangerous signals it can send to the market.

To achieve the objectives of this study, the paper seeks to answer the following questions.

1. How has the nature of the relationship between credit impairments and DTAs changed before and after the introduction of IFRS 9?
2. Is the DTAs component of regulatory capital displacing other better quality forms of capital?

In answering these questions, this study seeks to contribute to the debate on the forms of capital that are appropriate for inclusion in regulatory capital by banks. This is crucial as weak forms of capital have previously been associated with increased credit risk and risk of bank failure in banks. It is also important to note that while bank's capital ratios have generally increased following the global financial

crisis and Basel III, the discretionary buffer dictated on banks' terms has shrunk as a result. This discretionary buffer is the gap between required and reported capital. Lubberink (2022) has empirically shown that a decrease in this buffer is linked to increasing risk within banks. Therefore, the risk of bank failure is not fully addressed, and further controls are necessary.

The research also intends to extend the literature on capital management and regulatory capital arbitrage practiced by bankers to appear to meet capital requirements. Majority of the existing research on Deferred Taxes is concentrated in the U.S. (Görlitz & Dobler, 2021). This study is focusing on the South African banking sector which is still a developing economy. In extreme cases such as during the Japanese financial crisis, Skinner (2008) found that DTAs peaked at 60% of total shareholder's equity across the banking sector. Gallemore's (2012) findings from the US of 1.8% of tier 1 capital are expected to be more in line with our findings in South Africa. Finally, the results of this study should contribute to efforts by regulators to understand the impact of IFRS 9 on bank capital regulations.

2. Literature Review

2.1 Theoretical framework

The first key theory relevant to our study is *Opportunism*. Opportunism is a foundational assumption of many economic theories premised on the idea that human beings are inherently self-interested and take advantage of others when the opportunity arises (Schnietz & Kachra, 2013). Additionally, Williamson (1985:47) defines opportunism as “self-interest seeking with guile. This includes but is scarcely limited to more blatant forms, such as lying, stealing and cheating”. He also refers to opportunism as “the incomplete or distorted disclosure of information, especially to calculated efforts to mislead, distort, disguise, obfuscate, or otherwise confuse”.

Proponents of opportunism concede that the concept is too narrow a motivational assumption to adequately describe human behaviour. The mere possibility, however, that some individuals may behave dishonestly some of the time is considered sufficiently important for opportunism to have a prevalent influence on institutional design (Moschandreas, 1997:42). Furthermore, the existence of a few opportunistic individuals means that economic exchanges should be structured in a manner that protects against potential opportunism such as through regulatory institutions.

The self-serving angle of opportunism has been vigorously challenged. Scholars who disagree contend that human behaviour is consistently cooperative and altruistic, contradicting the overuse of the opportunistic premise. Hill (1990:509) explains that behaviors that emphasise cooperation, trust, and forgiving others' individual opportunism have economic worth among a population of economic actors engaging in recurrent transactions. Basing off of game theory, Hill concludes that in the long run, cooperative, and not opportunistic, actors dominate a given population.

Secondly, the *Positive Accounting Theory* (PAT hereafter) can be seen as an extension of Opportunism. Watts & Zimmerman (1978:113) write that PAT assumes that individuals act to maximize their own utility thus relating to the self-interest pointed out by opportunism from an accounting context. Therefore, it stands to reason that management lobbies on accounting standards based on its own self-interest. To better understand the pressures that drove the accounting standard-setting process, the effects of various accounting standards on various groups of people and the allocation of resources, and the reasons why different groups were willing to expend resources to influence the standard-setting process, the two

researchers set out to develop a positive theory of the determination of accounting standards.

The positive theory of the determination of accounting standards is originated from PAT. Jensen (1976) suggested that research in accounting up to that point had been (with one or two notable exceptions) unscientific with a normative and definitive focus. To explain why accounting is what it is, why accountants do what they do, and what impacts these occurrences have on people and resource use, he urged for the development of a positive theory of accounting. PAT, therefore, is concerned with explaining accounting practice by predicting which firms use a particular accounting practice.

Given that a key area of focus for this study is the implementation of the IFRS 9 accounting standard, it is important to understand how bank managers have reacted to the regulators – both accounting and banking supervisors – ever since the standard was introduced. Both theories assume that in the period leading up to the introduction of the standard, bankers would have lobbied for the most beneficial regulation while planning to mitigate any costly consequences. Furthermore, we can expect to find that accounting choices taken by bankers in the period since the standard was passed are those choices that yield the greatest self-interest and utility.

PAT tells us that agents select accounting practices and voluntarily disclose information based on what it means for them. The challenge then falls to principals to entice agents to make decisions for the interests of the company. One function of financial reporting is to restrict management to act in the shareholders' interest. The factors influencing managements attitude on accounting standards affect firm's cashflows and are, in turn, affected by accounting standards. These factors were identified as taxes, regulation, management compensation plans, bookkeeping costs, and political costs (Watts and Zimmerman, 1978). Therefore, firms in favour of change in accounting standards experience reduced earnings due to the change. On the other hand, if the additional bookkeeping costs validate the cost of lobbying, all other firms fight the change.

Due to the shift from an incurred loss model to an ECL model in determining credit impairments, the room for bankers to make in-house judgements on the levels of impairments recognised has increased significantly. *Accounting choice* as a concept is, therefore, significant given the impact of impairments on DTAs and regulatory capital. Fields et al. (2001:256) define accounting choice as “any decision whose primary purpose is to influence (either in form or substance) the output of the

accounting system in a particular way, including not only financial statements published in accordance with GAAP, but also tax returns and regulatory filings”. While accounting standards bodies such as the IASB and FASB are mandated with issuance of standards, these standards only serve as a base for management. Managers are, therefore, free to interpret and make choices which serve their goals. The principals and depositors can mostly rely on regulators to ensure that agents do not stray too far from the overall goals of the organisations.

IFRS 9 became effective for annual periods beginning on or after 1st January 2018. However, the option for early adoption of the standard was permitted (IFRS, 2022). Additionally, European banks were given the option to incorporate transitional provisions while dealing with IFRS 9 during the Covid-19 pandemic. This was meant to strengthen bank’s regulatory capital and mitigate adverse effects of the pandemic (Neisen & Schulte-Mattler, 2021:342). Furthermore, banks all over the world were given the option by the BIS to implement a three-year phase in period for IFRS 9 and its impact on items such as CET1 and DTAs (SARB, 2017). In all these situations, accounting choice was at the forefront. Bank managers would have extensively considered both alternatives and placed their own and shareholders’ interests into consideration.

The fourth theory explored is *Agency Theory* which is also related to opportunism and key to the concepts behind the origination of PAT. Watts and Zimmerman (1983) define an agency relationship as a contract under which one or more people (the principals) engage another (the agent) to perform a service on their behalf which involves delegating decision-making authority to the agent. Agency theory assumes that all actors (principals and agents) can be expected to act in their own self-interest. Agents acting in their own self-interest adopt accounting practices that lead to rewards from the market while avoiding those practices that would be punished by the market. It is key to note that the agency problem in banking is unique. In this case shareholders and bank managers are pitted against the bank’s customers (depositors). Governments step in to protect depositors by requiring banks to have deposit insurance. However, this move reduces the incentive for banks to avoid risk taking measures and thus gives rise to moral hazard (Demsetz, Saidenberg & Strahan, 1997).

Agency theory is important to this study given the need to understand whether decisions taken by managers after the introduction of IFRS 9 were aligned with those of shareholders. More importantly in a banking context, customers deposits should

be sufficiently protected by these decisions. Since DTAs and bank regulatory capital are a focus of this study, there is a need to ensure that banks continue to safely meet minimum capital requirements irrespective of the increased level of judgment afforded to them by IFRS 9.

As self-interest is a recurring theme examined in this study, the *capture theory* of regulation is also important to consider. The theory argues that “regulations are routinely and predictably ‘captured’ and manipulated to serve the interests of those who are supposed to be subject to them, or the bureaucrats and legislators who write or control them” (Etzioni, 2009:319). Etzioni adds that regulatory capture is more prevalent in regulatory agencies that are in their mature phase. The initial vigour with which newly established regulatory agencies protect public interests fades into increasing bureaucratisation as the agencies are drawn deeper into the industries they regulate.

Researchers of the capture theory have highlighted frequent forms through which capture occurs which are briefly discussed below:

- a) Special interest groups shape regulations – Lobbyists from entities within the industry subject to regulation have been known to be involved in the process of drafting legislation. This avenue offers the industry an opportunity to influence the drafting and implementation of new standards, rules, and legislation before they are implemented.
- b) Dilution of existing regulations – In this case, the regulation in question has already been in implementation for a considerable period. The objective of lobbyist groups on this occasion, is to weaken the existing legislation.
- c) Weakened enforcement of existing regulations – Rather than amend the regulations, the major players in the industry work towards influencing regulators to scale back the magnitude of the penalties enforced for criminal acts.
- d) Revocation of existing regulations – Once public interest in a particular issue wane, lobbyists take advantage by getting regulators to repeal regulations that had been passed after a crisis. This way, firms can repeat the same acts that jeopardised the industry without a lot of scrutiny.
- e) Switching regulators – If lobbyist groups are unable to influence regulators, they can switch regulators or manipulate two regulatory agencies against each other. Entities can switch regulators by

restructuring to fit into a different tier within the industry and thus deal with a different regulator who might be more lenient.

The drafting and implementation of IFRS 9 occurred in three phases which involved considerable input from the same firms that were meant to be subject to the standard. This undoubtedly created a window of opportunity for those meant to be regulated to “look out for themselves” and their interests. Another example could lie in the highly concentrated South African banking sector. As of 2020, over 85% of total banking industry assets were held by the five largest banks (Financial Sector Conduct Authority, 2022). This paints the industry as being oligopolistic and signals the lobbying power that these five banks have over the regulator.

Regulatory capital arbitrage has been defined as the use of securitization and other financial innovations to create unprecedented opportunities for banks to reduce substantially their regulatory measures of risk, with little or no corresponding reduction in their overall economic risks (Jones, 2000:36). This allows bankers to lower their effective risk-based capital requirements against certain portfolios to levels below Basel III’s nominal 8% total risk-based capital standard.

Skinner (2008:218) defines regulatory capital arbitrage as “managing reported levels of regulatory capital in such a way as to avoid falling below minimum capital thresholds”. The practice, therefore, occurs when bank managers exploit the discretion available under banking regulations to report regulatory capital levels that satisfy the necessary thresholds. Following empirical analysis, Skinner finds that deferred tax accounting choices of Japanese banks during their financial crisis were driven by incentives to increase reported levels of regulatory capital in the face of shortages of other forms of regulatory capital. He concluded that the relative level of bank’s net DTAs was inversely related to regulatory capital levels thus indicating regulatory capital arbitrage.

Gerding (2016:358) defines regulatory capital arbitrage as the strategies used by financial institutions to avoid capital requirements. He says further that while bank capital regulation is meant to mitigate externalities of bank failures on the broader economy, regulatory capital arbitrage diminishes its effectiveness by creating an illusion that banks possess a significant capital buffer to survive a crisis. Banks are incentivised to engage in regulatory capital arbitrage because of the relative inexpensiveness of debt versus equity financing.

In conclusion, the theories examined in this section suggest that due to the tendency of people to prioritise their self-interest regardless of the moral implications, we can reasonably expect bank managers in South Africa to exploit the increased discretion brought about by IFRS 9. Increasing credit impairments will likely be followed by increasing DTAs which implies that more DTAs are available for inclusion in regulatory capital if the bank remains below the threshold stipulated by Basel III.

2.2 Review of Literature

IAS 39 – Financial Instruments: Recognition and Measurement, was a controversial standard that underwent numerous changes from its inception in 1998 till its replacement after the global financial crisis (Fiechter, 2011). A major criticism of IAS 39 was that it tended to magnify procyclical effects for financial institutions which left them more vulnerable to crises (Beerbaum & Piechocki, 2017; Ecaterina, 2015). The accounting standard which implemented the incurred loss model did not allow for the provisioning for bad loans before a loss event, a measure that was thought to promote cyclicity and considered “too little and too late” (De Haan and Van Oordt, 2018). It was also noted that financial institutions tended to delay provisioning for bad loans during favourable cyclical and income conditions until cyclical downturns set in (Laeven and Majnoni, 2003).

As seen before, IFRS 9 – Financial Instruments specifies how an entity should classify and measure financial assets, financial liabilities, and some contracts to buy or sell non-financial items (IFRS, 2022). The standard replaced IAS 39 and incorporated an ECL model for measuring impairments. While using the ECL approach, an entity must categorise the financial instrument under investigation into one of three stages. This allows the entity to assess the amount of ECL to recognise. In stage 1, financial instruments do not exhibit a significant increase in credit risk since initial recognition. 12-month ECLs are recognised representing ECLs that result from defaults that are possible within 1 year after the reporting date. Additionally, interest is calculated on the gross carrying amount of the asset.

In stage 2, we find financial instruments whose credit risk has increased significantly since initial recognition. For these items, lifetime ECLs are recognised. Interest is calculated similarly to stage 1. Finally, stage 3 comprises of financial instruments for which there is objective evidence of an impairment. Lifetime ECLs

are recognised while interest is calculated on the net carrying amount of the asset after deducting the ECL.

The standard was developed by the IASB over three phases covering the classification and measurement of financial assets, impairment, and hedging (PwC, 2017). The second phase of the development of IFRS 9 covered impairments. This phase was significant for banks as a large portion of their assets are loans for which impairment calculations need to be conducted regularly to address issues like default and credit risk. In an article for Moody's Analytics which surveyed several international banks, Gea-Carrasco (2015) found that IFRS 9 would have significant effects on the provision for loan losses of financial institutions.

Therefore, the aftermath of the global financial crisis heralded the introduction of IFRS 9 – Financial Instruments to fill the gaps in the earlier standard. It was increasingly clear among bank regulators that more explicit recognition needed to be paid to the problems associated with inadequate provisioning policies. The shift was likely prolonged, however, due to the complicated interaction of accounting, fiscal and prudential requirements (Laeven and Majnoni, 2003).

During the transition to IFRS 9, banks reclassified financial assets according to new requirements, determined impairments and provisions in line with the ECL model instead of the incurred loss model and adjusted retained earnings and other comprehensive income accordingly. These adjustments had current and/or deferred tax implications, which further affected bank equity (Groff and Mörec, 2021). Deloitte's Global IFRS Banking Surveys indicated that an increasing number of global banks anticipated loss provisions due to IFRS 9 to be higher than regulatory loss provisions calculated under Basel rules. Further, more than half of the surveyed banks believed that the expected loss approach would increase provisions by up to 50% across all loan assets classes (Sichirolo, 2015)

Having only been introduced in 2018, literature on IFRS 9 is nascent. Nonetheless, the available research can be classified into two periods. The first is the pre IFRS 9 period which consists of researchers' expectations of the impact of IFRS 9 across finance and accounting. While comparing the IAS 39 and IFRS 9 impairment models, Novotny-Farkas (2016) concludes that the significantly larger set of information incorporated by IFRS 9 allows for improved and earlier identification of ECLs. Additionally, the standard can reduce the amplifying effect of the incurred loss approach on procyclicality and reduce capital inadequacy fears during a crisis.

However, European Systemic Risk et al. (2017) conclude differently stating that the standard will lead to sudden rises in impairment allowances in contractionary economies. The study, launched to investigate financial stability implications of the introduction of IFRS 9, develops a recursive model to analyse how different approaches to the measurement of credit impairment losses affects the average levels and dynamics of the impairment allowances associated with a bank's loan portfolio. It goes on to warn that bank profits and, without adequate regulatory filters, CET1 will decline more sharply at the onset of such periods. In a similar fashion, Beerbaum & Ahmad (2015) warn that IFRS 9 will have "a material impact on financial institutions especially bank systems and processes" and a tightening effect on earnings management. Further, investors risk facing decreasing comparability as banks exercise more judgment and discretion in their ECL methodologies. In a SWOT analysis of the adoption of IFRS 9, Huian (2012) also points to reduced comparability between institutions by allowing too more flexibility for managers.

Although the introduction of IFRS 9 could not have anticipated it, the Covid-19 pandemic would also lead to significant increases in ECL provisions as bank clients struggled to stay afloat of their financial obligations. To reduce the potential negative impact of this increase of risk provisions on the regulatory capital, the Basel Committee on Banking Supervision (BCBS) agreed on 3 April 2020, to allow more flexibility in implementing the transitional arrangements that phase-in the impact of IFRS 9. Banks suffering a decrease in CET1 capital due to IFRS 9 could mitigate this decline by adding back increases in ECL provisions for non-credit-impaired assets to CET1 capital (Neisen and Schulte-Mattler, 2021).

The second category of research is the post IFRS 9 period which, until now, has been overshadowed by the outbreak of Covid-19. Literature in this period is focused on early consequences of the introduction of the standard as well as the role Covid-19 has played. Barnoussi, Howieson & van Beest (2020) pointed out that the shift to the expected loss model as a means for providing for credit losses created uncertainty for banks regarding the potential scale of the bad debts, they would need to provide for due to Covid-19.

Kund & Rugilo (2018) attempt to analyse the implications of the introduction of IFRS 9 from a financial stability perspective. They compare the "cliff-effect" – credit losses were recognised when they occurred which made them late and abrupt thus leading to procyclicality in an economic downturn due to sudden increases in

impairments – associated with IAS 39 with the “front-loading effect”, – the gradual and earlier recognition of credit losses jeopardises bank resilience and lowers capital levels – associated with IFRS 9. They conclude that while IFRS 9 mitigates procyclicality, the resulting front-loading effect and the residual cliff-effect arising from transfer of financial assets from stage 1 to stage 2 in the ECL model warrant vigilant supervision by regulators.

Schutte et al. (2020) propose a benchmark model to calculate IFRS 9 ECLs. The model employs a transparent-modularised approach using of Default (PD hereafter), Loss Given Default (LGD hereafter) and Exposure at Default (EAD hereafter). The result is an empirical method for calculating ECLs and provides a solution to the issue of subjectivity and reduced comparability that comes with IFRS 9. They go on to suggest that “in markets where sophisticated IFRS9 models are developed, our proposed methodology can be used as in two settings: either as a benchmark to compare newly developed IFRS9 models, or, in markets where limited resources or technological sophistication exists, our methodology can be used to calculate ECL for IFRS9 purposes”.

Similarly, Volarević & Varović (2018) offer a methodology for implementing IFRS 9 for banks and businesses with a significant number of financial instruments on their balance sheets. They present an internal model featuring theoretical and practical solutions for defining, determining, and computing EAD, LGD, and PD, for the calculation of ECLs for financial instruments.

The early recognition of expected losses during periods of good economic conditions is generally agreed by policy makers to contribute to greater bank resilience and mitigate the impact of crises on bank’s balance sheets (Bholat et al., 2018). The ECL model follows these sentiments through its forward-looking nature. Rather than consider incurred losses as they occur like in the incurred loss model used by IAS 39, provisions are made considering the expectation of credit losses from the initial recognition of assets into the asset’s future life.

Regulators should remain cautious as the rollout of IFRS 9 continues throughout the industry. A major issue that comes with the standard is the increased judgement left to the hands of bank managers. As a result, international consistency has not been achieved. The forward-looking provisioning frameworks require banks to use a higher degree of judgement when calculating provisions which increases the likelihood of variability in impairment recognition and potentially reduces the comparability of banks' financial statements (Bholat et al., 2018).

Another potentially major issue comes from the ECL model used by IFRS 9. The stepwise recognition of loan losses in Stages 1 and 2 often leads to an over- or understatement of loan loss provisions (LLPs hereafter). The magnitude of these depends on how banks apply the IFRS 9 requirements, how timeously they incorporate relevant information and update LLPs (Novotny-Farkas, 2016).

Past studies also indicate that banks use their discretion to decrease the level of their LLPs when an unfavourable impact of IFRS 9 on retained earnings is higher and vice versa (Casta et al., 2019). Furthermore, banks may have an incentive not to draw attention to non-performing loans to avoid scrutiny as to the level of LLPs raised against them. In a crisis, losses from LLPs can reduce shareholders' equity required to cover unexpected losses and leave the bank below the regulatory minimum (Bholat et al., 2018).

For financial institutions, loans are considered to be impaired when accounting rules require LLPs to be made, representing the fact that the amount expected to be repaid falls below the contracted value carried on a bank's balance sheet (Bholat et al., 2018). The IFRS 9 provisions arising from the ECL approach impact entities' profit and loss statements. The standard requires entities to recognise a 12-month ECL from a financial asset at the first reporting date and create an allowance to cover for the loss. In turn, this impact is reflected in the calculation of impairment provisions for regulatory capital (Temim, 2016). The ECL is covered by provisions while the unexpected loss is covered by capital.

LLPs, however, do not only have a reducing effect on regulatory capital. While an increase in LLPs reduces CET1 capital by lowering retained earnings via the profit and loss statement, a part of the reduction is placed back into CET1 using DTAs arising from temporary differences within the stipulated 10% threshold. Additionally, the increase in LLPs can lead to the recognition of higher loan loss reserves which can be found in Tier2 of regulatory capital. The net effect, therefore, is dependent on the amount of loan loss reserves recorded.

Therefore, the fact that the ECL model avails managers with more discretion and judgment in determining the levels of impairments presents an opportunity for earnings and capital management. This section covers literature on instances in which impairments were used by managers to influence earnings and capital.

Earnings management can be explained as "when managers use judgement in financial reporting and in structuring transactions to alter financial reports to

either mislead some stakeholders about the underlying economic performance of the company, or to influence contractual outcomes that depend on reported accounting numbers” (Healy & Wahlen, 1998:6). Alternatively, Schipper (1989:92) defines the term as “a purposeful intervention in the external financial reporting process with the intent of obtaining some private gain”.

The big bath theory of earnings management suggests that firms with consistently low earnings may take discretionary write downs to diminish even further the current period’s earnings (Jordan & Clark, 2004:63). The reason for this lies in the fact that companies will not be punished proportionately more for the big hits they take to their already depressed earnings. In testing for this theory, they analyse the impairment of goodwill, which requires significant managerial discretion, as an opportunity for earnings management. Results considering Fortune 100 companies that had goodwill impairments in 2002 indicate that those firms did, in fact, engage in big bath earnings management.

Duh, Lee & Lin (2009:113) conduct an empirical examination to find out whether the reversal of a previously recognised impairment loss provides an opportunity for earnings management. They find that firms recognising more impairment losses are more likely to reverse impairment losses if doing so would avoid earnings decline in the following period. Furthermore, their results highlight that this process is more pronounced in firms with higher debt ratios signalling that reversal of impairments is also done to avoid violating existing debt covenants. Listed Chinese firms are also found to reverse asset impairments to reduce the possibility of trading suspension or delisting due to the country’s profitability-based regulations (Chen, Wang & Zhao, 2009:614).

Other researchers fail to find clear evidence of the use of impairment reversals for earnings management (Lemans, 2010; Caruso, Ferrari & Pisano, 2016; Cao, Shaari & Donnelly, 2017). However, Cao et al. find that firms with high levels of abnormal accruals, and weak corporate governance avoid earnings declines by reversing previously recognised impairments.

Capital management, on the other hand, concerns the definition of the optimal capital structure of a bank (Saita, 2010:4). In the context of regulatory capital, banks are required to meet a minimum capital requirement to ensure their soundness and safety. Capital management therefore refers to the implementation of measures aimed at the maintenance of adequate capital. The bulk of existing literature focuses on the earnings management angle rather than capital management. The hypothesis

of capital management via LLPs is based on the idea that bank managers use provisions to avoid the cost associated with the violation of capital adequacy requirements (Curcio & Hasan, 2015).

Research as early as Moyer (1990) examining bank managers' incentives to reduce regulatory costs finds that some managers adjust LLPs and exercise discretion over when they are reported to avoid regulatory capital constraints. Ahmed, Takeda & Thomas (1999) find strong support for the hypothesis that LLPs are used for management of capital. Decisions when making provisions for loan losses are found to be influenced not only by changes in loan portfolio quality but also by incentives to manage capital adequacy ratio. Similarly, Anandarajan, Hasan & McCarthy (2007) find evidence that Australian commercial banks use LLPs for capital management. Notably, they do not observe any changes in behaviour following the implementation of the Basel Accord of 1998. Sampling 148 large banks between 1985-1989, Beatty, Chamberlain & Magliolo (1995) find that LLPs are used in association with loan charge-offs and the decision to issue securities to manage capital ratios. They use these three parameters as proxies for financing, bank accounting and operating decisions.

In a study to determine whether the current provisioning system in Europe amplifies credit fluctuations, Bouvatier & Lepetit (2008) also find that poorly capitalised banks use LLPs to manage their regulatory capital. Collins, Shackelford & Wahlen (1995) identify a positive relationship between capital and LLPs. Their findings imply that when bank capital is high, managers tend to increase LLPs. Likewise, Kim & Kross (1998) find that banks with low capital ratios reduced their LLPs and increased write-offs in the period of 1990-1992 compared to 1985-1988. The study is focused on regulatory changes regarding the computation of the capital ratio for banks.

Ng and Roychowdhury (2014) analyse the relationship between loan loss reserves added back as regulatory capital and the risk of bank failure. The research is carried out with a focus on the impact of loan-loss reserves that were added back by US bank around the global financial crisis. They find a positive association between add-backs and bank failure. Additionally, this association is found to be more concentrated for banks that rely on add-backs to increase their regulatory capital.

In contrast to the above findings, Leventis, Dimitropoulos & Anandarajan (2011) use a sample of 91 EU listed commercial banks over a 10-year period to check

for evidence of earnings and capital management before and after the switch from local GAAP to IFRS in 2005. Their analysis categorises banks into early adopters and late adopters of IFRS. Earnings management using LLPs is found to be more pronounced in the period before IFRS adoption compared to after. Additionally, it is found to be more prevalent with riskier banks. However, capital management is not found to be significant in the periods before and after IFRS adoption.

To illustrate how impairment losses lead to an increase in DTAs, we consider an example. Table 1 lists key definition relevant to the example.

Table 1: Key Definitions from IAS 12 - Income Taxes

Key Terms	Definition
Carrying Amount	This is the cost of an asset less the accumulated depreciation.
Recoverable Amount	This is the present value of the expected cash flows that are to arise from the sale or use of asset.
Tax Base	This is the amount attributed to an asset or a liability for tax purposes.
Temporary Differences	The difference between the carrying amount of an asset or a liability in the statement of financial position and its tax bases.
Deductible Temporary Differences	Temporary differences that result in amounts that are deductible in determining taxable profit (tax loss) of future periods when the carrying amount of the asset or liability is recovered.
Taxable Temporary Differences	Temporary differences that result in taxable amounts in determining taxable profit (tax loss) of future periods when the carrying amount of the asset or liability is recovered.

Assume a firm has an asset with a carrying amount of R10,000 and a recoverable amount of R7,500. Additionally, assume a tax rate of 30% and a tax base of R8,000. As seen in Table 2, the impairment of R2,500 gives rise to DTAs of R150.

Table 2: Illustration on how DTAs arise from Impairments

	Before Impairment	Effect of Impairment	After Impairment
Carrying Amount	10,000	(2,500)	7,500
Tax Base	8,000	-	8,000
Taxable (Deductible) Temporary Difference	2,000	(2,500)	(500)
Deferred Tax Liability (Asset) at 30%	600	(750)	(150)

A portion of the DTAs balance on banks' balance sheets is, therefore, arising from the impairment of their loan portfolios. Regarding the relationship between

impairments and DTAs, banks capital adequacy was seen to improve when banks in Greece increased their losses by increasing their provisions of impairments and loan losses (Papadeas, 2019:314). As impairments increased DTAs arising due to temporary differences also increased and these could be utilised to improve the bank's capital adequacy position. These DTAs while being contentious are being included as part of regulatory bank capital if they arise from temporary differences. de Jager (2014:107) refers to a similar situation where liquid assets are replaced in bank capital by fair value accounting-derived value increases in less liquid assets as "a special case of Gresham's law". The law states that "bad money drives out good". Some forms of capital are not viewed as adequate buffers for banks in case of situations of economic crisis. As a result, those that do not view all capital as being good enough to safeguard a bank in the event of a crisis argue that "bad" forms of capital essentially drive out the good.

While considering the Japanese financial crisis, Skinner (2008:218) found that without DTAs on their balance sheets, banks would have been insolvent and in breach of capital regulations. He concludes that the country's regulators used deferred tax accounting as part of a regulatory forbearance strategy, and that bank managers used these assets to bolster their bank's regulatory capital. Regulatory forbearance can be understood as a move by regulators "to give the major Japanese banks the appearance of financial health when in fact they were insolvent".

The DTA component of regulatory capital has come under extensive scrutiny due to its reliance on the future profitability of the financial institution to be realised. The benefit of DTAs can only be realised if a bank earns taxable income. Therefore, in a crisis, a loss-making bank would be stuck with DTA capital that is losing value and no buffer against the losses (Gallemore, 2012). This study attempts to examine whether DTA capital is replacing better quality forms of capital used by banks to meet their capital adequacy ratio requirements.

Existing research on deferred taxes is split between studies on their value relevance and their ability to function as an indicator of earnings management. The value relevance of financial accounting items is defined as "the ability of financial statement information to capture and summarise information that determines the firm's value" (Beisland, 2009:9). Researchers have often argued that DTAs and DTLs are not assets and liabilities of the firm as they usually lack cashflow implications. However, Amir, Kirschenheiter & Willard (1997) find that the separation of deferred taxes into components such as depreciation and amortisation, losses and credits

carried forward, and employee benefits provides value relevant information to readers of financial statements. This methodology is later backed, empirically, up by Ayers (1998) for both DTAs and DTLs.

Lynn, Seethamraju & Seetharaman (2008) also examine whether the partial method for deferred taxes provides incremental information for investors. They find a positive association between year-end share prices from a pooled sample of U.K firms and prices for net DTAs – both recognised and recognised. This is further empirical proof of the value relevance of DTAs and DTLs.

The valuation of DTAs, despite the existence of accounting standards such as IAS 12 – Income Taxes, is reliant on judgement due to the forward-looking nature of DTAs. Another point of controversy with deferred taxes lies in whether the expected time to their reversal impacts their value. Guenther and Sansing (2004) conclude that the amount of time to when DTAs and DTLs reverse does not impact their value.

The valuation allowance is another key term in dealing with deferred taxes. Under the provisions of SFAS No. 109, firms record DTAs provided they expect to generate sufficient taxable income to realize the asset in the form of tax savings in the future. However, if firms do not expect to generate sufficient taxable income to realize the asset, a valuation allowance is created to reduce the balance. Therefore, according to Edwards (2011), the DTAs valuation allowance reflects management's anticipation of future taxable revenue and may be useful in estimating the firm's capacity to make interest and principal payments on debt in the future.

Bauman, Bauman & Halsey (2001) utilise a sample of Fortune 500 firms to investigate earnings management via changes in DTAs valuation allowance. Substituting cross-sectional regression analyses with a contextual approach, they identify specific instances in which earnings management may exist. Phillips et al. (2004) build on their earlier work investigating the usefulness of deferred tax expenses in detecting earnings management (Phillips, Pincus & Rego, 2003) by examining the relation between changes in annual earnings and changes in deferred tax asset and liability components using data hand-collected from firms' income tax footnote disclosures. They find that changes in the net DTL component related to revenue and expense accruals and reserves can be used to detect earnings management to avoid an earnings decline.

Holland & Jackson (2004) investigate a sample of 58 firms for the years 1991 and 1992 – a period where the under or over provision of deferred tax provisions was

found to be economically significant. Their study finds that earnings management was a key factor leading to the under or over provisioning of deferred taxes. They also conclude that the exercise of managerial discretion while dealing with deferred taxes can result in value relevant information as this provides information that would, otherwise, have remained private.

Additionally, Herbohn, Tutticci & Khor (2010) evaluate whether variations in the amount of unrecognised DTAs from carry-forward losses reflect manager's incentives to strategically manage earnings. Using data from listed firms on the Australian Stock Exchange, they find that there is evidence of income-increasing earnings management when pre-tax earnings are below the median analyst forecast. In the context of Malaysia, Kasipillai & Mahenthiran (2013) find that firms in the country use both the accrual and valuation allowance components of net DTLs to avoid a decline in earnings. They go further to state that ownership and board structures affect the extent to which earnings management is associated with a component of deferred tax.

As seen in Table 2, an increase in impairments due to IFRS 9 will likely be followed by an increase in DTAs due timing differences brought about from book and tax accounting for loan loss allowances. This poses questions about the credit risk faced by the banking industry due to the controversial nature of DTAs. Gallemore (2012) investigates the credit risk associated with the DTAs component of bank regulatory capital. He queries why U.S. banks are permitted to include DTAs into regulatory capital even though benefits associated with DTA can only be realised when banks earn taxable income. Using a sample of large U.S. bank holding companies and two measures of credit risk: the Standard & Poor's credit rating and the spread between the yield on the bank's bonds and government securities of similar maturities, Gallemore finds that bank holding companies with a higher percentage of regulatory capital composed of DTAs have more credit risk.

Building on the findings of Gallemore (2012), White (2014) investigates the impact of DTAs on credit ratings for firms. To ascertain if companies with higher levels of DTAs in total assets are linked to lower credit ratings, White employs an ordered logit model. He documents a significant negative association between DTAs and credit ratings. Examining valuation allowance and the credit worthiness of firms, Edwards (2011) finds a positive relationship between the valuation allowance of DTAs and the cost of debt of firms which suggests that increases in the valuation allowance signal a deterioration in a firm's creditworthiness.

As seen from the previous literature, DTAs have largely been investigated in association with earnings management rather than capital management. Skinner (2008) is the most prominent study investigated DTAs with capital management or, more specifically, regulatory forbearance and capital arbitrage. Our study can make significant contributions in this field and in the South African context.

2.3 Research Hypotheses

The theories and research explored throughout this study suggest that the introduction of IFRS 9 has led to an increase in DTAs and credit impairments held by banks. This creates an opportunity for bank managers to engage in practices of capital management and regulatory capital arbitrage. By allowing for more discretion and earlier recognition of impairments, the standard has led to a situation where banks can meet their minimum capital requirement by increasing their DTAs component of regulatory capital. For accounting purposes, the impairment of an asset is eventually followed by the creation of a DTA or DTL depending on accounting criteria. This accounting rule leads to the formulation of our first hypothesis:

H₀: There is no change in the relationship between Credit impairments and DTAs in the post IFRS 9 era relative to the pre IFRS 9 era.

H_a: Credit impairments and DTAs have a more positive relationship in the post IFRS 9 era relative to the pre IFRS 9 era.

As seen from Skinner (2008) the introduction of new deferred tax accounting in Japan was followed by regulatory forbearance and capital management by bank managers looking to meet capital requirements. An increase in DTAs and the DTAs component is bound to increase the credit risk and risk of bank failure faced by banks (Gallemore, 2012). As a result, regulators and bankers should prioritise better quality forms of capital for inclusion in regulatory capital. However, based on the theories and empirical research explored in this study, there is a likelihood that the DTA component of regulatory capital is increasing and displacing better quality forms of capital. Therefore, our final hypothesis is:

H₁: The DTAs component of regulatory capital is increasing relative to other forms of capital.

3. Methodology

3.1 Research Approach

The study employs quantitative research over a qualitative research methodology in order to answer the research questions generated in earlier sections. Quantitative research is defined by Creswell (1994:1-2) as “an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures, in order to determine whether the predictive generalisations of the theory hold true”. He then defines qualitative research as “an inquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting”.

The former definition by Creswell embodies the aims of our study. Thus far, the study has developed hypotheses following a review of relevant theory. The findings and conclusions either agree or disagree with the expectations of the theoretical framework. Additionally, the variables tested in this research are measured numerically and analysed statistically over given periods of time. Therefore, quantitative research is the most suitable approach to achieve the objectives of this study. Furthermore, this quantitative approach provides objective results that can be inferred to the rest of the banking industry and follows the approaches used by most research in finance and bank regulatory capital.

3.2 Data and Sample Selection

The SARB, established in 1921, oversees the soundness of South Africa’s monetary, banking, and financial system. This oversight is implemented through a “Twin Peaks” model including a Prudential Authority and a Financial Sector Conduct Authority (BCBS, 2015). As of 2022, the banking system is made up of 14 domestic banks and 32 foreign banks (28 registered local branches of foreign institutions or international banks, and 4 foreign-controlled banks). The banking sector is highly concentrated with the 5 largest banks accounting for 85% of total banking assets (Financial Sector Conduct Authority, 2022).

A regulatory assessment conducted on the South African banking sector by the Bank for International Settlements (BIS hereafter) in 2015 found the application of the risk-based capital adequacy requirements and the transitional arrangements

agreed upon to be compliant and consistently in line with Basel III regulations (BCBS, 2015).

IFRS 9 became effective in South Africa on 1st January 2018. Table 3 below shows the respective dates on which the five largest banks in the country officially adopted the standard. At a workshop on the impact of IFRS 9 on banks and regulators in Africa, Francois Groepe, the former Deputy Governor of the SARB, noted that the adoption of the the standard would, indeed, give rise to higher levels of credit impairments. He went on to refer to a study carried out by the European Banking Authority which estimated an average increase of 13% in loss provisions and an average decrease of 45 basis points in CET1 ratios once IFRS 9 was implemented (Groepe, 2017).

Table 3: Date of Adoption of IFRS 9 by Large Banks

Large Banks	Date of IFRS 9 Adoption
Standard Bank	1 st January 2018
FirstRand Bank	1 st July 2018
Absa	1 st January 2018
Nedbank	1 st January 2018
Investec	1 st April 2018

To allow for a smooth intergration of IFRS 9, Directive 5/2017 was issued by the SARB to provide transitional arrangement guidelines and direct banks on how to consider credit loss provisions. Most importantly, banks were given the option to apply a 3-year transition period which would be amortised on a straightline basis on a bank legal entity and a bank controlling company. CET1 capital based on the opening balance sheet using IFRS 9 would be compared to CET1 capital based on the closing balance sheet using IAS 39 in order to isolate the impact of the ECL model (SARB, 2017). The difference in net qualifying CET1 would then be phased in over the three year period. Regarding DTAs, these guidelines clarified on the following:

1. The impact of DTAs due to IFRS 9's adoption and tax rule changes would also be phased in over a 3 year period.
2. Banks were requested to calculate the difference between DTAs due to temporary differences based on the opening balance sheet by using IFRS 9, and closing balance under IAS 39.
3. A portion of this DTAs difference in (2) above would be deducted from the DTAs amount arising from temporary differences, net of DTLs.

South Africa, therefore, makes up the scope of this study. The data and sample selection are guided by the research questions of the study. Firstly, this study examines whether the relationship between credit impairments and DTAs has been influenced by the introduction of IFRS 9. The required data for this portion of the study is compiled by the SARB. This consists of aggregated banks statistics for the entire banking sector of South Africa. This data was accessed through Genesis Analytics – an economics-based consulting firm located in South Africa which manages a database of commercial banks and Reserve Bank data. Data from the firm’s database has previously been used to conduct research on benefits of Central Bank digital currencies for African countries (Naidoo, 2022), exploring financial inclusion for women’s economic empowerment (Genesis Analytics, 2018), and investigating access to financial services in Botswana and Swaziland (Genesis Analytics, 2003). For the purpose of our study, BA100, BA120, and BA700 Balance Sheet, Income Statement, and Capital Adequacy data, respectively, for the period January 2008 to December 2021 is utilised. The selected years allow for an examination of the periods before and immediately after the implementation of IFRS 9. Further, the selected years also allow for the examination of the period during the global financial crisis which led to the discussions on moving from IAS 39 to IFRS 9.

Secondly, the study also examines whether DTAs are displacing better quality forms of capital from bank regulatory capital. For this portion of the research, the required data is obtained from CC1: composition of regulatory capital disclosures made by commercial banks. Following the introduction, of Basel III, commercial banks are required to disclose their regulatory capital composition semi-annually. This data is collected for a sample consisting of the largest banks in South Africa ranked by the size of their Tier 1 Capital. This ranking is carried out annually by The Banker Database, a service of the Financial Times, which provides comprehensive coverage of the leading banks in over 190 countries. As seen in Table 4, five banks have been chosen for the research led by Standard Bank. South Africa’s banking sector is highly concentrated. As of 2020, over 85% of total banking industry assets were held by the five largest banks (Financial Sector Conduct Authority, 2022). As a result, this sample of five banks can be considered representative of the sector.

Table 4: Large Banks in SA by Tier 1 Capital

Bank	2021 Tier 1 Capital \$m	2022 Tier 1 Capital \$m
Standard Bank	11,160	11,727
FirstRand	7,746	10,464
Absa	7,611	8,238

Nedbank	5,567	5,887
Investec	3,050	3,282

Source: The Banker Database ranking of the top 1,000 world banks in 2022

3.3 Measurement of Variables and Research Model

3.3.1 Variables

For the purpose of answering the first research question of this study, the dependent variable is deferred income tax assets denoted by DTA. DTA represents the gross deferred income tax assets of the entire banking sector reported monthly by the SARB through the BA100 Balance Sheet. The key independent variable is Credit Impairments arising from loans. Similarly, this variable is also obtained from the BA100 Balance Sheet. The research seeks to investigate the change in the relationship between the two variables following the implementation of IFRS 9 in January 2018. Papadeas (2019:314) previously investigated the relationship between these two variables and their role in managing capital adequacy for banks.

Additional independent variables are also chosen from the BA100 Balance Sheet that should theoretically affect the DTA amount. The objective is to obtain a set of factors that can be used to control for the other changes that might influence the relationship between DTAs and credit impairments. The independent variables selected from the BA100 include Gross Loans and Advances for which provisions for loan losses and impairments are made (Gea-Carrasco, 2015) (Novotny-Farkas, 2016) (Bholat et al, 2018). Investment and Trading Securities are also selected as an independent variable due to the unrealised gains and losses that arise from periodically fair valuing these securities with respect to the market. Investment and Trading Securities also display a high positive correlation with DTAs. Current Income Tax Assets are included because they benefit from a convergence of accounting and tax purposes bookkeeping within the next 12 months as a value of the same amount is deducted from DTAs. Provisions are explored in detail in section 2 of this study. Previous studies have also investigated how this balance sheet item has been used for capital and earnings management (Ahmed, Takeda, Thomas, 1999) (Anandarajan, Hasan, McCarthy, 2007) (Bouvatier & Lepetit, 2008). Derivative Financial Liabilities and Investment Property are also measured using fair value accounting which creates the possibility of unrealised gains or losses. DTAs are likely to arise from these unrealised value changes. Current Income Tax Liabilities are the final control variable selected from the BA100 balanced sheet. All the variables discussed are deflated by Total Assets.

The rest of the independent variables are included following past research into DTAs, bank regulatory capital and capital management. For profitability, Return on Assets is used as a proxy. In order to calculate ROA of the banking sector, Net Income data is obtained from the BA120 Income Statement of the SARB and compared with total assets from the BA100 Balance Sheet. Likewise, the Effective Tax Rate of the banking sector is estimated using profit/ (loss) before tax and the direct taxation amount recorded in the BA120 Income Statement. Finally, to account for the exposure of the banking sector to the country's economic growth and activities, the study includes gross domestic product and Inflation data obtained from Bloomberg. Table 5 provides a summary on all the variables used in the study and their expected effect on DTAs according to previous literature. Since South Africa GDP data is published quarterly, the Cubic Spline Interpolation technique was used in MATLAB to arrive at monthly estimates of the data over the period of the study. One negative consequence of a cubic spline interpolation is the introduction of serial correlation due to the estimated monthly data points being systematically related to each other by a cubic polynomial (Columbia Economics, L.L.C., 2010). To account for serial correlation, Newey West standard errors were used in this study.

Table 5: Summary of Variables Used in the Study

Type	Variables	Measure	Data Source	Expected Effect on DTAs
Dependent Variable	Deferred Income Tax Assets (DTA)	DTAs deflated by total assets	SARB BA100	N/A
Dummy Variable	IFRS	This variable is represented as a 1 in periods after the implementation of IFRS 9 and 0 in periods before	N/A	+
Interaction Variable	CIMPxIFRS	This variable is the product of the CIMP and IFRS variables	Own computation	+
Control Variables	Credit Impairments arising from loans (CIMP)	Credit Impairments deflated by total assets	SARB BA100	+
	Gross loans and Advances (LOANS)	Gross Loans and Advances deflated by total assets	SARB BA100	+
	Investment and Trading Securities (INVSEC)	Investment and Trading Securities deflated by total assets	SARB BA100	+

Provisions (PROV)	Provisions deflated by total assets	SARB BA100	-
Current Income Tax Assets (CITA)	Current Income Tax Assets deflated by total assets	SARB BA100	-
Derivative Financial Liabilities (DERIVLIAB)	Derivative Financial Liabilities deflated by total assets	SARB BA100	-
Investment Property (INVPROP)	Investment Property deflated by total assets	SARB BA100	+
Current Income Tax Liabilities (CITL)	Current Income Tax Liabilities deflated by total assets	SARB BA100	-
Profitability (PROF)	Return on Assets (ROA)	Computed from SARB BA100 and BA120	-
Gross Domestic Product (GDP)	Monthly % change in GDP at constant prices	Quarterly data from Bloomberg, Monthly data estimated using MATLAB	+
Inflation (INF)	Monthly % change in CPI	Bloomberg	+
Effective Tax Rate (TAX)	Monthly Effective Tax Rate	Computed from SARB BA120	-

3.3.2 Econometric Model

To examine the extent of the change in the relationship between DTAs and credit impairments, this study utilises an Ordinary Least Squares model based on 168 bank-year observations. An OLS model is used because it can provide robust results on time series data. The model tests the null hypothesis (H_0) which states that there is no change in the relationship between Credit impairments and DTAs in the post IFRS 9 era relative to the pre IFRS 9 era. The alternative hypothesis (H_a) states that credit impairments and DTAs have a more positive relationship in the post IFRS 9 era relative to the pre IFRS 9 era. The return of a significant result from the variables proves this hypothesis. The model is thus defined as:

$$DTA_t = \beta_0 + \beta_1 IFRS_t + \beta_2 CIMP \times IFRS_t + \beta_3 CIMP_t + \beta_4 LOANS_t + \beta_5 INVSEC_t + \beta_6 PROV_t + \beta_7 CITA_t + \beta_8 DERIVLIAB_t + \beta_9 INVPROP_t + \beta_{10} CITL_t + \beta_{11} PROF_t + \beta_{12} GDP_t + \beta_{13} INF_t + \beta_{14} TAX_t + \varepsilon_t \quad (1)$$

$$\begin{aligned}
d.DTA_t = & \beta_0 + \beta_1 d.IFRS_t + \beta_2 d.CIMPxIFRS_t + \beta_3 d.CIMP_t + \beta_4 d.LOANS_t + \\
& \beta_5 d.INVSEC_t + \beta_6 d.PROV_t + \beta_7 d.CITA_t + \beta_8 d.DERIVLIAB_t + \beta_9 d.INVPROP_t + \beta_{10} d.CITL_t + \\
& \beta_{11} d.PROF_t + \beta_{12} d.GDP_t + \beta_{13} d.INF_t + \beta_{14} d.TAX_t + \varepsilon_t
\end{aligned} \tag{2}$$

Where β_0 represents a constant term, $\beta_{1,\dots,n}$ stand for the coefficients of the independent variables within the model, and ε_t is the error term. Model (1) represents our investigation of the long-term effects of the independent variables on DTAs while model (2) includes differenced (marked by “d.”) dependent and independent variables to indicate the short-term effects. This step has been taken to account for the potential existence of cointegration within the model. The analysis of our model is estimated using R programming software and the results are discussed in the next section.

4. Results and Analysis

4.1 DTAs and Credit Impairments in the Banking Sector

4.1.1 Descriptive Statistics

Table 6 below includes a summary of the descriptive statistics of the variables utilised in the model.

Table 6: Summary of Descriptive Statistics

Descriptive Statistics						
Variables	N	Mean	Standard Deviation	Minimum	Median	Maximum
DTA	168	0.00093	0.00081	0.00021	0.00050	0.00313
IFRS	168	0.28571	0.45310	0.00000	0.00000	1.00000
CIMPxIFRS	168	0.00616	0.00991	0.00000	0.00000	0.02645
CIMP	168	0.01862	0.00336	0.01148	0.01888	0.02645
LOANS	168	0.78085	0.05214	0.69574	0.76681	0.87923
INVSEC	168	0.08403	0.03029	0.03459	0.07588	0.15550
PROV	168	0.00303	0.00041	0.00190	0.00305	0.00394
CITA	168	0.00022	0.00016	0.00003	0.00018	0.00066
DERIVLIAB	168	0.03694	0.02656	0.00270	0.04338	0.09706
INVPROP	168	0.00006	0.00016	0.00000	0.00002	0.00085
CITL	168	0.00138	0.00048	0.00047	0.00132	0.00271
PROF	168	0.00095	0.00032	-0.00056	0.00098	0.00192
GDP	168	0.00317	0.02752	-0.17400	0.00466	0.14391
INF	168	0.00441	0.00439	-0.00945	0.00351	0.01946
TAX	168	0.23297	0.09836	-0.69738	0.23536	0.63455

Note: DTA=Deferred Tax Assets; IFRS=Pre or Post IFRS 9; CIMPxIFRS=CIMP and IFRS interaction term; CIMP=Credit Impairments; LOANS=Gross Loans and Advances; INVSEC=Investment and Trading Securities; PROV=Provisions; CITA=Current Income Tax Assets; DERIVLIAB=Derivative Financial Liabilities; INVPROP=Investment Property; CITL=Current Income Tax Liabilities; PROF=Profitability; GDP=Gross Domestic Product; INF=Inflation; TAX=Effective Tax Rate

It is important to note that the variables DTA, CIMP, LOANS, INVSEC, PROV, CITA, DERIVLIAB, INVPROP, and CITL are deflated by total banking assets. As the dependent variable for our study, the descriptive statistics show that the average DTAs as a proportion of total assets is 0.093%, with a minimum of 0.05% and a maximum of 0.313%. DTAs, therefore, have made up a small portion of the BA100 Balance Sheet in South Africa over the period being investigated. Credit impairments on the other hand have made up a larger portion of the balance sheet during this time with an average of 1.862%, a minimum of 1.148% and a maximum of 2.645%.

As expected of a financial institution, gross loans and advances make up the largest portion of the total assets of the BA100 Balance Sheet. Gross loans and advances are, on average, 78.085% of the total assets with a minimum of 76.681% and a maximum of 87.923%. LOANS can be expected to influence the relationship between DTAs and credit impairments as they give rise to credit impairments which

are the key independent variable of the study. For the remaining BA100 items, investment and trading securities, provisions and current income tax assets, derivative financial liabilities, investment property and current liabilities have averages of 8.403%, 0.303%, 0.022%, 3.694%, 0.006% and 0.138% of total assets, respectively.

Profitability is measured using Return on Assets calculated from the BA100 Balance Sheet and the BA120 Income Statement. The mean Return on Assets over this period is 0.095% with a minimum of -0.056% and a maximum of 0.192%. The mean effective tax rate over this period is 23.297% while the mean monthly rate of change of inflation is 0.441%.

4.1.2 Correlation Analysis

Figure 1 below shows a Pearson correlation matrix including the correlations between DTA (the dependent variable) and the rest of the independent variables. This analysis allows us to investigate the strength, significance, and direction of the relationships between the variables on a univariate basis. This shows us whether the data has got the potential to produce good results when compared within a multivariate regression later.

Figure 1: A correlation matrix including model variables

	DTA	IFRS	CIMPxIFRS	CIMP	LOANS	INVSEC	PROV	CITA	DERIVLIAB	INVPROP	CITL	PROF	GDP	INF	TAX
DTA															
IFRS	0.93 (<i><.001</i>)														
CIMPxIFRS	0.965 (<i><.001</i>)	0.985 (<i><.001</i>)													
CIMP	0.609 (<i><.001</i>)	0.552 (<i><.001</i>)	0.632 (<i><.001</i>)												
LOANS	-0.716 (<i><.001</i>)	-0.707 (<i><.001</i>)	-0.724 (<i><.001</i>)	-0.39 (<i><.001</i>)											
INVSEC	0.912 (<i><.001</i>)	0.855 (<i><.001</i>)	0.892 (<i><.001</i>)	0.574 (<i><.001</i>)	-0.911 (<i><.001</i>)										
PROV	0.121 -0.117	0.103 -0.185	0.086 -0.267	0.069 -0.374	-0.053 -0.494	0.123 -0.113									
CITA	-0.344 (<i><.001</i>)	-0.288 (<i><.001</i>)	-0.306 (<i><.001</i>)	-0.085 -0.272	0.495 (<i><.001</i>)	-0.463 (<i><.001</i>)	-0.12 -0.122								
DERIVLIAB	0.391 (<i><.001</i>)	0.395 (<i><.001</i>)	0.413 (<i><.001</i>)	0.13 -0.094	-0.851 (<i><.001</i>)	0.611 (<i><.001</i>)	-0.138 -0.075	-0.357 (<i><.001</i>)							
INVPROP	-0.175 -0.024	-0.207 -0.007	-0.2 -0.009	-0.409 (<i><.001</i>)	0.501 (<i><.001</i>)	-0.414 (<i><.001</i>)	0.016 -0.835	0.132 -0.088	-0.341 (<i><.001</i>)						
CITL	-0.112 -0.147	-0.19 -0.013	-0.179 -0.02	-0.03 -0.697	-0.041 -0.594	-0.032 -0.678	0.242 -0.002	-0.498 (<i><.001</i>)	0.024 -0.758	-0.065 -0.403					
PROF	-0.24 -0.002	-0.241 -0.002	-0.268 (<i><.001</i>)	-0.325 (<i><.001</i>)	0.305 (<i><.001</i>)	-0.249 (<i><.001</i>)	0.243 -0.002	0.113 -0.143	-0.398 (<i><.001</i>)	0.195 -0.011	0.06 -0.437				
GDP	-0.036 -0.639	-0.047 -0.543	-0.029 -0.706	0.049 -0.531	0.044 -0.575	-0.014 -0.855	0.15 -0.052	-0.063 -0.415	-0.095 -0.222	0.034 -0.664	0.081 -0.297	0.291 (<i><.001</i>)			
INF	-0.107 -0.166	-0.122 -0.116	-0.115 -0.139	-0.175 -0.023	0.191 -0.013	-0.17 -0.028	-0.045 -0.564	-0.001 -0.985	-0.109 -0.158	0.424 (<i><.001</i>)	-0.072 -0.353	0.103 -0.184	0.029 -0.709		
TAX	0.058 -0.455	0.048 -0.533	0.051 -0.513	-0.002 -0.984	-0.112 -0.149	0.102 -0.188	0.059 -0.449	-0.078 -0.316	0.122 -0.116	-0.016 -0.835	0.045 -0.561	0.019 -0.807	-0.14 -0.07	-0.029 -0.707	

Computed correlation used pearson-method with listwise-deletion.

The correlation between DTAs and credit impairments is positive and significant at 0.609 implying that as credit impairments of loans increase, there is also an increase in DTAs. Notably, the correlation between DTAs and the variable CIMPxIFRS indicates a stronger positive relationship at 0.965 which is also statistically significant. CIMPxIFRS is a product of the independent variables, CIMP and IFRS. The IFRS dummy variable is set as 0 in the pre IFRS 9 period and 1 in the post IFRS 9 period. This provides preliminary support to the alternative hypothesis (H_a) which states that there is a stronger positive relationship between DTAs and credit impairments in the post IFRS 9 period. Appendix 7.1 graphically indicates the correlations between DTA and the independent variables.

Furthermore, we can use the correlation matrix to identify any signs of multicollinearity that might affect the integrity of our model. Since the dependent variable and majority of the independent variables are obtained from the BA100 balance sheet, the likelihood of multicollinearity occurring was high. As seen in Figure 1, there is high correlation between some of the independent variables such as LOANS and DERIVLIAB at -0.851 and LOANS and INVSEC at -0.911. Since LOANS and INVSEC are important independent variables, neither variable was eliminated from the model, and this was noted as a limitation of the research. There were also issues of structural multicollinearity arising because of using an interaction term to combine CIMP and IFRS. To mitigate the structural multicollinearity, variables CIMP and IFRS were centred by their means before obtaining the product CIMPxIFRS. The equation is illustrated below:

$$CIMP.c = CIMP - mean(CIMP)$$

$$IFRS.c = IFRS - mean(IFRS)$$

$$CIMPxIFRS = CIMP.c \times IFRS.c$$

4.1.3 Check for Stationarity

Time series data is said to be stationary when its values tend to revert to its long-run average value and as a result the properties of data series are not impacted by the movement of time (Shrestha & Bhatta, 2018). It is, therefore, essential to understand our research data and examine whether it follows the rules of stationarity. Appendix 7.2 includes graphical checks for stationarity of the data by plotting the model variables over time. Variables with upward or downward trends are initially identified to be non-stationary. Table 7 below highlights the results of a

statistical test for stationarity based on the Augmented Dickey-Fuller (ADF) unit root test.

Table 7: Results of test for stationarity of model variables

ADF tests results (lag order = 5).

Variable	Intercept					
	Level		First Difference		Second Difference	
	t-stat	p-value	t-stat	p-value	t-stat	p-value
DTA	-0.95431	0.9428	-5.5567	0.01		
logDTA	-2.1071	0.5316	-6.64	0.01		
IFRS	-1.927	0.6067	-5.2237	0.01		
CIMPxIFRS	-2.6734	0.2952	-5.3945	0.01		
CIMP	-2.1133	0.529	-3.3318	0.06824	-7.7358	0.01
logCIMP	-2.2828	0.4582	-3.368	0.06219	-7.9047	0.01
LOANS	-3.315	0.07101	-6.2717	0.01		
logLOANS	-3.4367	0.05072	-6.3148	0.01		
INVSEC	0.12204	0.99	-5.8977	0.01		
logINVSEC	-2.5091	0.3638	-5.9226	0.01		
PROV	-3.9793	0.01188	-7.5216	0.01		
logPROV	-4.0478	0.01	-7.5898	0.01		
CITA	-2.1159	0.5279	-6.7405	0.01		
LogCITA	-1.902	0.6172	-7.0453	0.01		
DERIVLIAB	-2.3497	0.4303	-6.0458	0.01		
logDERIVLIAB	-1.8003	0.6596	-5.3347	0.01		
INVPROP	-11.397	0.01	-5.746	0.01		
LogINVPROP	-1.8804	0.6262	-5.3396	0.01		
CITL	-1.2917	0.8719	-5.235	0.01		
LogCITL	-1.4664	0.799	-4.8523	0.01		
PROF	-3.4782	0.04658	-8.0295	0.01		
GDP	-3.7566	0.02281	-4.7468	0.01		
INF	-7.1664	0.01	-9.3261	0.01		
TAX	-5.4004	0.01	-8.8247	0.01		

Note: DTA=Deferred Tax Assets; IFRS=Pre or Post IFRS 9; CIMPxIFRS=CIMP and IFRS interaction term; CIMP=Credit Impairments; LOANS=Gross Loans and Advances; INVSEC=Investment and Trading Securities; PROV=Provisions; CITA=Current Income Tax Assets; DERIVLIAB=Derivative Financial Liabilities; INVPROP=Investment Property; CITL=Current Income Tax Liabilities; PROF=Profitability; GDP=Gross Domestic Product; INF=Inflation; TAX=Effective Tax Rate

The null hypothesis of the ADF test is that there is no evidence of stationarity in a time series. Therefore, in case of a p value less than 0.05, we reject the null hypothesis and conclude that the series is stationary. Based on our results, the ADT test for shows that majority of the variables are non-stationary at level data as well as at log transformation. DTA, CIMP, LOANS, INVSEC, CITA, DERIVLIAB, INVPROP, CITL, IFRS and CIMPxIFRS are non-stationary in both level and log transformation forms. PROV, PROF, GDP, TAX, and INF on the other hand are found to be stationary

immediately at level. For all variables except CIMP, stationarity is identified after taking first differences.

4.1.4 Results from Regression Model

Table 8 and Table 9 included below indicate the results of our OLS regression on our model variables. As earlier discussed, the use of numerous variables from the BA100 Balance Sheet introduced serial correlation implications into our results. Table 8 shows the results of our OLS regression using the standard variance-covariance matrix and standard errors without taking serial correlation into account. To improve our model results, tests for heteroskedasticity and serial correlation were conducted.

Table 8: OLS Regression Results

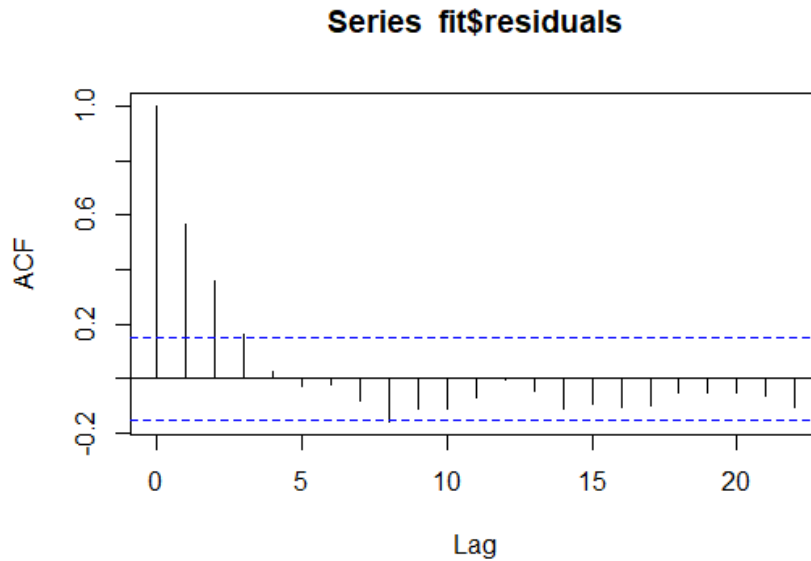
	Coefficient	Standard Errors	p-value
Constant	-0.0086876	1.782e-03	2.69e-06 ***
IFRS	-0.0009054	7.109e-05	< 2e-16 ***
CIMPxIFRS	0.0727156	1.720e-02	4.04e-05 ***
CIMP	-0.0014229	5.523e-03	0.797044
LOANS	0.0090296	1.958e-03	8.35e-06 ***
INVSEC	0.0232782	2.966e-03	6.84e-13 ***
PROV	0.0246761	3.214e-02	0.443758
CITA	0.1651285	1.062e-01	0.121899
DERIVLIAB	0.0033998	1.859e-03	0.069355 .
INVPROP	0.1338992	1.407e-01	0.342761
CITL	0.1079223	3.152e-02	0.000792 ***
PROF	-0.0395575	4.460e-02	0.376489
GDP	-0.0006962	4.348e-04	0.111383
INF	-0.0014035	2.826e-03	0.620119
TAX	-0.0001349	1.158e-04	0.245645
Adjusted R-squared			0.9695
F-Statistic			380.5
p-value			< 2.2e-16

Note: DTA=Deferred Tax Assets; IFRS=Pre or Post IFRS 9; CIMPxIFRS=CIMP and IFRS interaction term; CIMP=Credit Impairments; LOANS=Gross Loans and Advances; INVSEC=Investment and Trading Securities; PROV=Provisions; CITA=Current Income Tax Assets; DERIVLIAB=Derivative Financial Liabilities; INVPROP=Investment Property; CITL=Current Income Tax Liabilities; PROF=Profitability; GDP=Gross Domestic Product; INF=Inflation; TAX=Effective Tax Rate
 *** Significant at 0.01%, ** Significant at 1%, * Significant at 5%, . Significant at 10%

The Breusch-Pagan test for heteroskedasticity in our model returned a test statistic of 25.203 and a corresponding p-value of 0.03261. Since the p-value is less than 0.05, we reject the null hypothesis and conclude that heteroskedasticity exists in the model. Additionally, the Durbin-Watson test for serial correlation returns a score of 0.74316. A low score indicates that serial correlation exists in the model while a score closer to 2 indicates that there is no serial correlation in the model.

Furthermore, plotting the serial correlation within the residuals of the regression confirms that serial correlation exists within the model as seen in Figure 2.

Figure 2: Serial correlation in the model residuals



Serial correlation is displayed by the lags between 1 and 3 that extend beyond the boundaries marked by the blue hidden detail lines. To account for serial correlation and heteroskedasticity, Newey West standard errors are utilised. Newey & West (1987, 1994) devised a method for estimating heteroskedasticity and autocorrelation consistent (HAC) covariance matrices.

Table 9: OLS Regression Results with Newey West Standard Errors

	Coefficient	Standard Errors	p-value
Constant	-0.0086876	2.3691e-03	0.0003380 ***
IFRS	-0.0009054	9.7479e-05	< 2.2e-16 ***
CIMPxIFRS	0.0727156	2.5679e-02	0.0052533 **
CIMP	-0.0014229	6.0442e-03	0.8142039
LOANS	0.0090296	2.5344e-03	0.0004896 ***
INVSEC	0.0232782	4.2848e-03	2.141e-07 ***
PROV	0.0246761	4.0603e-02	0.5442647
CITA	0.1651285	1.0103e-01	0.1042178
DERIVLIAB	0.0033998	2.5065e-03	0.1769759
INVPROP	0.1338992	1.5341e-01	0.3841380
CITL	0.1079223	3.5481e-02	0.0027690 **
PROF	-0.0395575	4.0648e-02	0.3320084
GDP	-0.0006962	6.2755e-04	0.2689678
INF	-0.0014035	2.4303e-03	0.5644486
TAX	-0.0001349	5.0362e-05	0.0081945 **
Adjusted R-squared			0.9695
F-Statistic			380.5
p-value			< 2.2e-16

Note: DTA=Deferred Tax Assets; IFRS=Pre or Post IFRS 9; CIMPxIFRS=CIMP and IFRS interaction term; CIMP=Credit Impairments; LOANS=Gross Loans and Advances; INVSEC=Investment and

Trading Securities; PROV=Provisions; CITA=Current Income Tax Assets; DERIVLIAB=Derivative Financial Liabilities; INVPROP=Investment Property; CITL=Current Income Tax Liabilities; PROF=Profitability; GDP=Gross Domestic Product; INF=Inflation; TAX=Effective Tax Rate
*** Significant at 0.01%, ** Significant at 1%, * Significant at 5%, . Significant at 10%

As a result of the Newey West method, the standard errors and the p-value are adjusted to make it harder to obtain statistical significance amongst the independent variables in our regression. Further model diagnostics are included in Appendix 7.3.

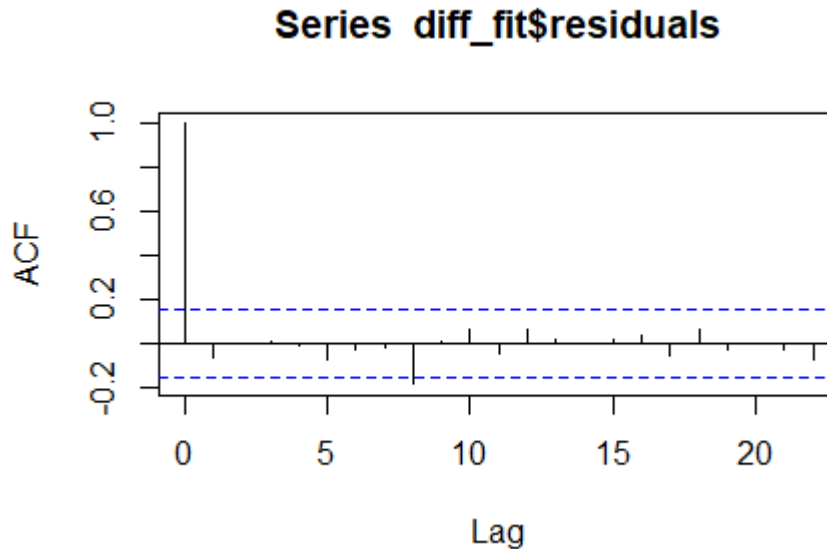
From the results in Table 9, we see that credit impairments on loans (CIMP) have a negative but insignificant impact on DTAs. However, the results also show that the interaction term between credit impairments on loans and the IFRS dummy variable (CIMPxIFRS) has a positive impact on DTAs which is significant at 1%. This supports the expected direction of the relationship between DTAs and credit impairments following the implementation of IFRS 9. Importantly, the significance of this relationship allows us to reject the null hypothesis (H_0) and conclude that credit impairments and DTAs have a stronger positive relationship in the post IFRS 9 era. Additionally, the coefficient of 0.073 for CIMPxIFRS is only bettered by that of current income tax liabilities (CITL) at 0.165 among the significant explanatory variables. This suggests that CIMPxIFRS accounts for more variation in DTAs than other BA100 Balance Sheet items such as gross loans and advances (LOANS) and investment and trading securities (INVSEC). Further review of the variables considered shows that LOANS, INVSEC and CITL have a positive impact on DTAs significant at 0.1%, 0.1% and 1% respectively. On the other hand, effective tax rate (TAX) and IFRS have a negative impact on DTAs significant at 1% and 0.1% respectively.

As a result of using non-stationary time series data in our OLS regression model, we are required to test for cointegration between the variables. The timeseries data is identified as cointegrated if the residuals of the regression are stationary. Running the Augmented Dickey-Fuller (ADF) test on the model residuals returns a Dickey Fuller test score of -4.2224 and a p-value of 0.01. Since the p-value is less than 0.05, we reject the null hypothesis and conclude that the residuals of our OLS regression model are stationary. Therefore, cointegration exists between our variables. This implies that the regression results obtained in Table 9 above can be interpreted as long term relationships between the variables.

To examine the short-term relationships between the variables, our OLS regression is redone using first-differenced dependent and independent variables. Using first differences ensures non-stationary time series data is considered for each

of the variables. Running the Durbin-Watson test for serial correlation returns a score of 1.9092 which is close to 2. This implies that there is no serial correlation after taking first differences. This can also be observed in Figure 3 where the lags immediately drop into the boundaries indicated by the blue hidden detail lines after lag 0.

Figure 3: No evidence of serial correlation in the model residuals



Additionally, testing for heteroskedasticity using the Breusch-Pagan test returns a BP score of 14.443 and a p-value of 0.4173. Since the p-value is greater than 0.05, we fail to reject the null hypothesis and conclude that our model is homoscedastic. Therefore, we can interpret the results of our short-term representative model without incorporating the Newey West standard errors method.

Table 10: OLS Regression Results taking first differences

	Coefficient	Standard Errors	p-value
Constant	3.666e-06	8.722e-06	0.674831
d.IFRS	6.564e-04	1.774e-04	0.000301 ***
d.CIMPxIFRS	4.841e-02	3.594e-02	0.180008
d.CIMP	-9.102e-03	2.081e-02	0.662500
d.LOANS	4.024e-03	3.028e-03	0.185891
d.INVSEC	1.169e-02	3.840e-03	0.002745 **
d.PROV	-3.441e-02	2.781e-02	0.217825
d.CITA	3.895e-02	7.806e-02	0.618558
d.DERIVLIAB	-4.646e-04	2.749e-03	0.865997
d.INVPROP	6.614e-02	1.581e-01	0.676262
d.CITL	2.894e-02	2.290e-02	0.208208
d.PROF	-1.546e-02	2.625e-02	0.556804
d.GDP	-3.858e-04	4.594e-04	0.402414

d.INF	-1.534e-03	1.764e-03	0.385710
d.TAX	-1.388e-04	6.267e-05	0.028260 *
Adjusted R-squared			0.1916
F-Statistic			3.81
p-value			1.613e-05

*Note: DTA=Deferred Tax Assets; IFRS=Pre or Post IFRS 9; CIMPxIFRS=CIMP and IFRS interaction term; CIMP=Credit Impairments; LOANS=Gross Loans and Advances; INVSEC=Investment and Trading Securities; PROV=Provisions; CITA=Current Income Tax Assets; DERIVLIAB=Derivative Financial Liabilities; INVPROP=Investment Property; CITL=Current Income Tax Liabilities; PROF=Profitability; GDP=Gross Domestic Product; INF=Inflation; TAX=Effective Tax Rate
*** Significant at 0.01%, ** Significant at 1%, * Significant at 5%, . Significant at 10%*

The results of our short-term OLS regression vary from those observed in the long-term relationships. For starters, while d.CIMPxIFRS has a positive impact on d.DTA, this impact is not significant. The d.IFRS dummy variable, however, has a positive impact on d.DTA significant at 0.01%. This suggests that DTAs are higher in periods after the implementation of IFRS 9. This is in line with the expectations of our study. Consistent with its long-term relationship, d.TAX has a negative impact on d.DTA. In this scenario, however, this impact is only significant at the 5% level. d.INVSEC also follows its long-term relationship with a positive impact on d.DTA. The short-term coefficient is significant at 1% while the long-term coefficient was significant at 0.1%. While the long-term regression in Table 9 has an R² of 96.95%, the short-term regression in Table 10 has a lower R² of 19.16%. This implies that there are other explanatory variables that affect DTAs in the short term that are not explored in our model.

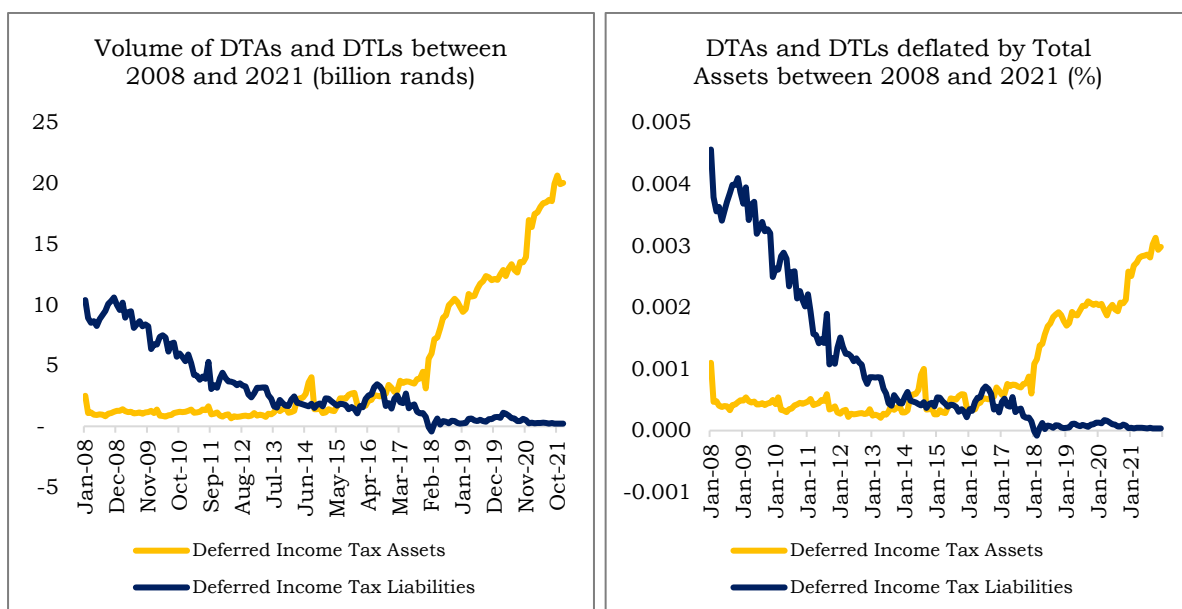
4.2 The Displacement of Better Capital

This section is dedicated to answering our second research question. Figure 4 plots the aggregate DTAs and DTLs in the South African banking sector as reported by the SARB from January 2008 to December 2021. As discussed above, IFRS 9 was officially adopted on 1st January 2018. Of the five largest commercial banks examined in this study, only FirstRand Bank (1st July, 2018) and Investec (1st April, 2018) did not adopt the standard immediately. As a result, we can reasonably expect to see the impact of the new standard from the start of 2018 onwards. While the banks investigated in South Africa have raised capital ratios since the global financial crisis and the introduction of Basel III, their discretionary buffers – the gap between reported and required capital – have shrunk as a result. Lubberink (2022) shows that this reduction in buffer is associated with an increase in bank risk, even for well-capitalised banks.

Prior to 2018, DTAs were fairly stable with a few significant fluctuations such as in 2014. However, from 2018 onwards, DTAs grew rapidly despite the availability of a three year phase-in period in the transitional arrangements. For example, while DTAs reported in December 2017 were R3.11 billion, figures reported in December 2018 (one year into IFRS 9) and December 2021 were R9.8 billion and R20.0 billion respectively. This represents changes of 216% over 1 year and 544% over 4 years.

By deflating DTAs and DTLs by total assets on the right-hand side of Figure 4, we see that DTAs as a proportion of total assets increased from 0.0604% in December 2017 to 0.29% in December 2021. Besides increasing in volume, DTAs also started to make up a larger portion of South African banks' assets. It is also worth noting the trend of DTLs which have steadily declined since 2008 as a consideration for future research.

Figure 4: Graphs showing the trends for DTAs and DTLs in the South Africa banking sector



In Figure 5, the relationship between DTAs and credit impairments due to loans is examined. Similarly, 2018 coincides with a significant change in the trajectory of both variables. Furthermore, while January 2008 to December 2017 exhibits an almost inverse relationship, the post IFRS 9 era exhibits a more positive correlation between DTAs and credit impairments. The period of January 2008 to December 2017, which is longer than that from January 2018 to December 2021, might explain the negative coefficient observed between the variables CIMP and DTAs in our OLS regressions in the previous section. The inverse nature of the relationship

between DTAs and credit impairments is more pronounced when analysed after deflating both variables by total assets as seen on the right-hand side.

Figure 5: A graph showing the trends for DTAs and Credit Impairments due to loans in the South Africa banking sector

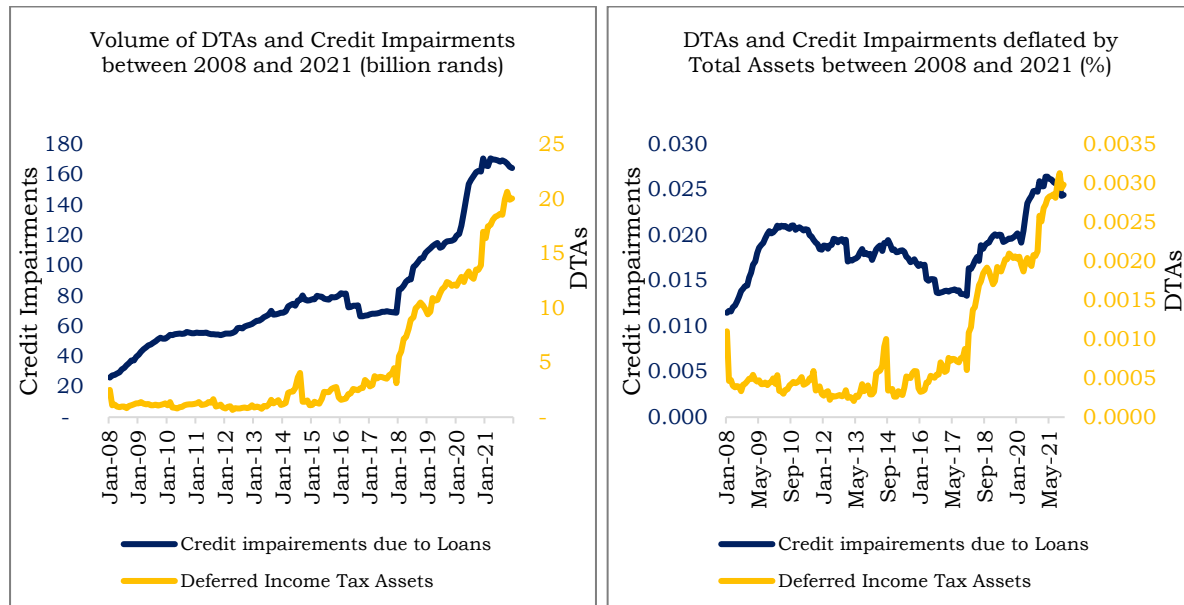
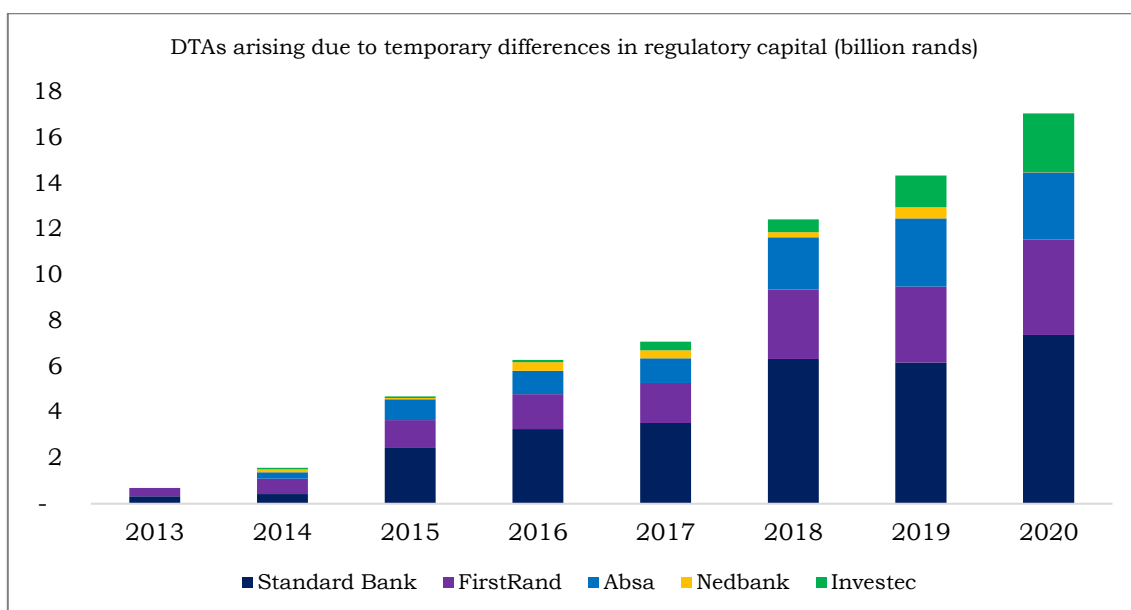


Figure 4 and Figure 5 show us that 1) the rate of increase of DTAs in the South African banking sector has increased and 2) the relationship between DTAs and credit impairments due to loans has changed from an inverse relationship to a positive direct relationship since the introduction of IFRS 9 in January 2018. This is further supported by our findings in the previous section. To analyse these findings further, we consider an analysis of DTAs across individual banks in South Africa.

As discussed in earlier sections, the introduction of Basel III in 2009 stipulated that DTAs relating to temporary differences could form a part of regulatory capital for banks all over the world. The regulation stated further that while DTAs relying on future profitability of the bank to be realised were to be deducted in the calculation of CET1, DTAs relating to temporary differences could be included with the inclusion capped at 10% of the bank’s common equity and risk weighted at 250% (BCBS, 2019). Figure 6 shows that this specific component of DTAs increased for the five largest commercial banks examined in this study. More specifically, DTAs arising due to temporary differences increased from 0.686 billion in 2013 to 17.057 billion in 2020. Standard Bank (43.23%) and FirstRand (24.42%) made up the biggest proportion of this amount among the five largest banks in 2020. This implies that bank size might be a crucial factor for future cross-sectional regression analyses

building onto this study. The data computed for this section is included in Appendix 7.4.

Figure 6: DTAs arising due to temporary differences included in regulatory capital



To supplement Figure 6, we look at Table 11 below. The rate of increase of DTAs arising from temporary differences in the five commercial banks was 129% and 199% in 2014 and 2015. These periods came shortly after South Africa implemented Basel III on 1st January 2013 which allowed the inclusion of those specific DTAs in banks’ regulatory capital (BCBS, 2015). This rate of increase fell to 34% and then to 13% in 2016 and 2017 respectively before rising to 76% in 2018 coinciding with the introduction of IFRS 9. IFRS 9 allowed bank managers more discretion over impairments of loans which in turn gave rise to DTAs.

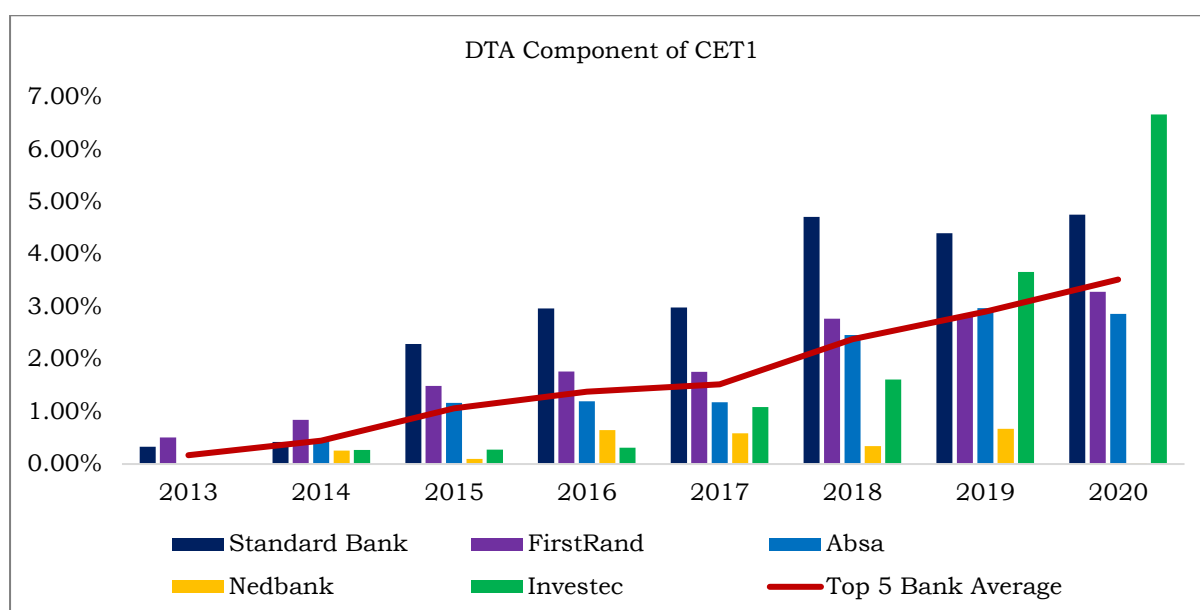
Table 11: Rate of year-on-year change in DTAs arising due to temporary differences

Year	2014	2015	2016	2017	2018	2019	2020
Rate of year-on-year change in DTAs arising due to temporary differences	129%	199%	34%	13%	76%	15%	19%

CET1 is defined by Basel as “the highest quality of regulatory capital, as it absorbs losses immediately when they occur” (BCBS, 2019). Contrastingly, DTAs have been identified by researchers as a fragile buffer during crises (Gallemore, 2012:2). This implies that their inclusion within CET1 is analogous to the bad money driving out good money theory referred to by Graham’s law in section 2. Figure 7 below emphasises my argument by showing that amongst the five largest banks in

South Africa, the average proportion of the DTA component included in CET1 increased between 2013 and 2020.

Figure 7: % of DTAs arising from temporary differences included in CET1 Capital



In similar fashion to Table 11, we see in Table 12 that the rate of increase of the DTA component included in CET1 was highest in 2014 and 2013 which immediately followed the introduction of Basel III in South Africa. The rate of increase fell to 30% and 10% in 2016 and 2017 respectively before rising to 57% in 2018 which coincided with the adoption of IFRS 9.

Table 12: Rate of year-on-year change in the DTA component included in CET1

Year	2014	2015	2016	2017	2018	2019	2020
Rate of year-on-year change in the DTA component included in CET1	165%	139%	30%	10%	57%	22%	21%

In conclusion, I argue that for the proportion of DTAs included in CET1 to increase, it must displace another form capital within CET1. Considering that CET1 is expected to consist of the highest quality forms of capital, DTA can be said to have displaced better-quality forms of capital.

4.3 Discussion of Results

Our first hypothesis predicted that credit impairments and DTAs would have a more positive relationship in the post IFRS 9 era relative to the pre IFRS 9 era. While the relationship in the post IFRS 9 era was indeed a significant stronger

positive relationship, the relationship in the pre IFRS 9 era was negative and insignificant. Further analysis, as seen in Figure 5, showed that when both variables were deflated by total assets, the longer pre IFRS 9 period exhibited an inverse relationship before the relationship turned positive in the shorter post IFRS 9 period. Since our CIMP \times IFRS variable was more positive and significant compared to our CIMP variable, we rejected our null hypothesis (H_0) and accepted our alternative hypothesis (H_a). The results suggest that the introduction of IFRS 9 in the South African banking sector has led to increased impairments on loans which has in turn led to increased recognition of DTAs.

It should be noted that gross loans and advances, investment and trading securities and current income tax liabilities also show positive significant coefficients in relation to DTAs. Therefore, the increase in DTAs over the analysis period cannot be attributed only to the introduction of IFRS 9. In terms of the magnitude of the coefficients, however, only current income tax liabilities (CITL) have a higher coefficient than CIMP \times IFRS among the significant variables implying that these two variables contribute the most to the variation in DTAs.

Our second hypothesis posited that the DTAs component of regulatory capital is increasing relative to other forms of capital. If proved, this would imply that DTAs are displacing better quality forms of capital. Our analysis showed us that across all five commercial banks examined, the proportion of DTAs included in CET1 had increased following 1) the introduction of Basel III within South Africa in 2013, and 2) the introduction of the IFRS 9 accounting standard in 2018. The average composition of DTAs in CET1 capital for the five banks increased from 0.17% in 2013 to 3.52% in 2020.

The results of this study showed the impact which regulation can have on the banking system of an economy. Changes in the Basel Accords from Basel II to Basel III allowed for the inclusion of DTAs arising from temporary differences to be included in regulatory capital within the highest quality of capital – CET1 capital. This was the first instance in which bank managers could exercise their self-interests discussed through theories on Opportunism, Agency Theory and Capture theory in section 2. Bank managers must strike a balance between safeguarding their banks' capital bases and profitability. Basel III provided South African bank managers with a weaker form of capital to include within their regulatory capital. This allowed them to continue to appear to have capital adequacy.

The second instance for bankers to exercise self-interest came with the introduction of IFRS 9. As we have seen in Table 3, PAT which partially deals with the adoption of favourable accounting standards was emphasised by the difference in dates of adoption of IFRS 9 among the five commercial banks. Crucially, the discretion afforded to bank managers in measuring impairments on loans created room for self-interest to manifest. The ECL model of IFRS 9 affords managers with more discretion in impairing loans and, due to its past, present, and forward-looking nature, contributes to larger impairment provisions. Therefore, managers looking to increase profitability without jeopardising their capital adequacy ratios could record larger impairments which would in turn give rise to larger DTAs. A portion of these larger DTAs would arise due to timing differences between book and tax accounting for loan loss allowances and therefore meet Basel III requirements. Their inclusion in regulatory capital would displace better quality forms of capital which would be diverted to profit generating ventures.

4.4 Limitations and Areas for Further Research

The first limitation of this study is the brief period since the introduction of IFRS 9 which reduces the reliability of our findings. The period of 2018 to 2021 prevented us from answering the second research question empirically due to limited data. Commercial banks are required to disclose their capital compositions semi-annually which meant that data would be insufficient over the four-year period.

Secondly, some variables that might explain variations in DTAs were omitted from our OLS regression to mitigate issues of multicollinearity. These include derivative financial assets and short-term negotiable securities. On the other hand, while gross loans and advances and investments in trading securities evoked multicollinearity issues within our model, they were not the key element being investigated. These two variables were left in the model because of high correlations with DTAs. This compromise was important as it helped to minimise the risk of having misleading results due to omitted variables.

Thirdly, in attempting to answer the second research question on whether DTAs are displacing better forms of capital, I provide descriptive evidence to support my hypothesis. This makes it difficult to causally claim that DTAs are, in fact, displacing better forms of capital. This provides a segway into our discussion on further areas for research.

Opportunity exists to empirically test whether DTAs are displacing better forms of capital and ascertain to what extent IFRS 9's implementation has enabled

this. Furthermore, while this study provides evidence that DTAs arising from temporary differences are displacing better quality forms of capital in CET1, it does not investigate which specific forms of capital have been displaced by DTAs. The study assumes the capital is of a high quality since the DTAs are included in CET1. The study also opens a pathway for an empirical analysis of whether DTAs are utilised by bank managers for capital and earnings management. Finally, another area of further research is to find out whether DTAs are used as a proxy for provisions in earnings and capital management. These analyses would provide more knowledge into the impact of IFRS 9 on DTAs and bank regulatory capital.

The data used for this study is part of an extensive monthly database compiled by the SARB. More specifically, the BA100 Balance Sheet captures the total assets, liabilities, and equity of the South African banking sector. Future bank capital regulation research can leverage this data set to investigate 1) the effect of increased required capital reserves on aggregate bank loans and 2) the effects brought about by new regulations on the financial stability of the banking sector.

5. Conclusion

The debate about what forms of capital should be included within banks' regulatory capital to satisfy regulators' requirements to safeguard against crises while maintaining and/or improving profitability for bank managers rages on. DTAs remain a key focus of this debate. Crucially, Gallemore (2012) found, empirically, that banks with higher portions of DTAs in their regulatory capital had a higher credit risk and a higher risk of bank failure. Furthermore, Skinner (2008) provided evidence that the Japanese government and bank managers exploited regulations around DTAs through regulatory forbearance and arbitrage, respectively, to ensure Japanese banks appeared more capitalised than they were. These two studies show that bank managers can leverage regulations on DTAs to achieve pseudo capital adequacy in the interest of increasing their profitability.

This study, therefore, set out to examine the impact of the adoption of the IFRS 9 accounting standard in South Africa on the level of DTAs that were recorded in regulatory capital. Firstly, the study sought to prove that the levels of aggregate DTAs within the banking sector had increased at a higher rate in the post IFRS 9 period in line with increasing credit impairments due to loans. The argument being that bank managers, armed with self-interest and increased discretion over loan impairments, would have increased the credit impairments recorded due to loans. Timing differences associated with book and tax accounting would then give rise to DTAs which could be plugged into regulatory capital. This argument was the second point that this study set out to prove by analysing the capital compositions of the five largest commercial banks in South Africa.

The results showed that the relationship between DTAs and credit impairments due to loans was a more positive and significant one in the post IFRS 9 period with increasing credit impairments being followed by increasing DTAs. The results also showed that across all five banks, the DTAs component in regulatory capital had increased inevitably following the adoption of 1) Basel III in 2013 and 2) IFRS 9 in 2018.

5.1 Contributions and Policy Implications

The study sought to contribute to the debate on the forms of capital that are appropriate for inclusion in regulatory capital by banks. Previous research by Gallemore (2012) investigated whether the proportion of the DTA component of

regulatory capital was directly related to the level of credit risk and risk of bank failure. Our study, first, shifts the scope of research from the U.S. to South Africa which is an emerging market economy compared to the developed U.S. economy. Secondly, our study investigates DTAs from a regulatory and standard setting angle. Financial systems are often regulated by more than one body and this study aims to show how two different bodies (Basel and the IASB) can impact the decisions made by bank managers regarding capital adequacy. Finally, this study can contribute to future iterations of the IFRS 9 accounting standard. Huian (2012), Casta et al. (2019), and Novotny-Farkas (2016) have all pointed out the potential consequences of increased discretion afforded to managers by IFRS 9.

Potential consequences of increasing DTAs included in regulatory capital in the South African banking sector are still relatively minimal. For example, while the percentage of DTAs arising from temporary differences included in CET1 increased steadily, all the five banks were below the Basel threshold of 10%. Investec had the highest observable proportion during the analysis period with 6.6% in 2020. In contrast, major Japanese banks held DTAs totalling to ¥7.5 trillion (60% of their total equity) in fiscal 2002 (Skinner, 2008). This was the peak of the Japanese banking crisis that had been allowed through regulatory forbearance and arbitrage by the government and bank managers to appear adequately capitalised. However, Figure 4 shows just how much DTAs have grown within the South African economy in a short period of time due to IFRS 9. Concerns for bank safety will continue to increase should this growth go unchecked.

6. References

- Adediran, A., Bamidele, S. 2019. *IFRS 9 changes to financial assets accounting and its tax implications*. Available: <https://www.mondaq.com/nigeria/income-tax/829442/ifrs-9-changes-to-financial-assets-accounting-and-its-tax-implications> [2022, May 06].
- Ahmed, A. S., Takeda, C. & Thomas, S. 1999. Bank loan loss provisions: a re-examination of capital management, earnings management and signalling effects. *Journal of Accounting and Economics*. 28(1):1-25.
- Amir, E., Kirschenheiter, M. & Willard, K. 1997. The valuation of deferred taxes. *Contemporary accounting research*. 14(4):597-622.
- Anandarajan, A., Hasan, I. & McCarthy, C. 2007. Use of loan loss provisions for capital, earnings management and signalling by Australian banks. *Accounting and Finance*. 47(3):357-379.
- Ayers, B.C. 1998. Deferred tax accounting under SFAS No. 109: An empirical investigation of its incremental relative to APB No. 11. *Accounting Review*. 73(2):195-212.
- Balezou, M. & Halftermeyer, M. 2022. Credit Suisse posts \$4bn loss on charge, investment bank. Bloomberg. 27 October. Available: <https://www.moneyweb.co.za/news/international/credit-suisse-posts-4bn-loss-on-charge-investment-bank/#:~:text=The%20net%20loss%20of%204.03,revamp%2C%20Credit%20Suisse%20said%20Thursday> [2022, October 29].
- Bauman, C.C. Bauman, M.P. & Halsey, R.F. 2001. Do firms use the deferred tax asset valuation allowance to manage earnings. *Journal of the American Taxation Association*. 23(s-1):27-48.
- BCBS. 2015. Regulatory Consistency Assessment Programme (RCAP): Assessment of Basel III risk-based capital regulations – South Africa. Available: <https://www.bis.org/bcbs/publ/d322.pdf> [2022, August 20].
- BCBS. 2019. *Cap 30 – Regulatory Adjustments*. Available: https://www.bis.org/basel_framework/chapter/CAP/30.htm?tldate=20250101&inforce=20191215&published=20191215&export=pdf [2022, May 04].
- BCBS. 2019. Definition of Capital in Basel III – Executive Summary. Available: https://www.bis.org/fsi/fsisummaries/defcap_b3.htm [2022, October 06].
- BDO. 2018. *Tax considerations from the introduction of IFRS 9*. Available: <https://www.bdo.co.uk/en-gb/insights/business-edge/business-edge-2018/tax-considerations-from-the-introduction-of-ifrs-9> [2022, May 04].
- Beatty, A., Chamberlain, S. & Magliolo, J. 1995. Managing financial reports of commercial banks: the influence of taxes, regulatory capital, and earnings. *Journal of Accounting Research*. 33(2):231-262.
- Beisland, L.A. 2009. A review of the value relevance literature. *The Open Business Journal*. 6(2):7-27.

- Beerbaum, D.O., Ahmad, S. 2015. Credit risk according to IFRS 9: Significant increase in credit risk and implications for financial institutions. *SSRN Electronic Journal*.
- Beerbaum, D.O., Piechocki, M. 2017. IFRS 9 and IFRS 7 disclosure requirements – an analysis of the IASB taxonomy. *SSRN Electronic Journal*.
- Bholat, D., Lastra, R. M., Markose, S. M., Miglionico, A. & Sen, K. 2018. Non-performing loans at the dawn of IFRS 9: Regulatory and accounting treatment of asset quality. *Journal of Banking Regulation*. 19:33-54.
- Bouvatier, V. & Lepetit, L. 2008. Banks' procyclical behaviour: does provisioning matter? *Journal of International Financial Markets, Institutions & Money*. 18(5):513–526.
- Cao, T., Shaari, H. & Donnelly, R. 2017. Impairment reversals: unbiased reporting or earnings management. *International Journal of Accounting & Information Management*. 26(2):245-271.
- Caruso, G.D., Ferrari, E.R. & Pisano, V. 2016. Earnings management and goodwill impairment: an empirical analysis in the Italian M&A context. *Journal of Intellectual Capital*. 17(1):120-147.
- Casta, J.-F., Lejard, C. & Paget-Blanc, E. 2019. The implementation of the IFRS 9 in banking industry. Eufin 2019 : The 15th Workshop on European Financial Reporting. Vienne, Austria.
- Chen, S., Wang, Y. & Zhao, Z. 2009. Regulatory incentives for earnings management through asset impairment reversals in China. *Journal of Accounting, Auditing & Finance*. 24(4):589-620.
- Creswell, J. W. 1994. *Research design: qualitative and quantitative approaches*. Thousand Oaks, CA: Sage.
- Curcio, D. & Hasan, I. 2015. Earnings and capital management and signalling: the use of loan-loss provisions by European banks. *The European Journal of Finance*. 21(1):26-50.
- Collins, J., Shackelford, D. & Wahlen, J. 1995. Bank differences in the coordination of regulatory capital, earnings, and taxes. *Journal of Accounting Research*. 33(2):263–292.
- Columbia Economics, L.L.C. 2010. How Economists Convert Quarterly Data into Monthly: Cubic Spline Interpolation. Available: <https://columbiaeconomics.com/2010/01/20/how-economists-convert-quarterly-data-into-monthly-cubic-spline-interpolation/comment-page-1/> [2022, September 30].
- De Haan, L. & van Oordt, M. R. C. 2018. Timing of banks' loan loss provisioning during the crisis. *Journal of Banking & Finance*. 87:293-303.
- de Jager, P. 2014. Fair value accounting, fragile bank balance sheets and crisis: A model. *Accounting, Organisations and Society*. 39(2):97-116.

- Demsetz, R.S., Saidenberg, M.R. & Strahan, P.E. 1997. Agency problems and risk taking at banks. FRB of New York Staff Report No. 29. Available: <https://ssrn.com/abstract=943507> [2022, October 19].
- Duh, R., Lee, W. & Lin, C. 2009. Reversing an impairment loss and earnings management: the role of corporate governance. *The International Journal of Accounting*. 44:113-137.
- Ecaterina, O.O. 2015. Expected credit losses – IFRS 9 and Basel III moving towards convergence. *Ovidius University Annals, Series Economic Sciences*. 15(1):872-876.
- Edwards, A.S. 2011. Does the deferred tax asset valuation allowance signal firm creditworthiness? University of Washington.
- Etzioni, A. 2009. The capture theory of regulations – Revisited. *Society*. 46(4):319-323.
- European Systemic Risk, B., Abad, J. & Suarez, J. 2017. Assessing the cyclical implications of IFRS 9 : A recursive model. *European Systemic Risk Board*.
- Fiechter, P. 2011. Reclassification of financial assets under IAS 39: Impact on European banks' financial statements. *Accounting in Europe*. 8:49-67.
- Financial Sector Conduct Authority. 2022. *Financial Sector Outlook Study*. Available: <https://www.fsca.co.za/Documents/FSCA%20Financial%20Sector%20Outlook%20Study%202022.pdf> [2022, June 16].
- Gallemore, J. 2012. Deferred tax assets and bank regulatory capital. *EBC Discussion Paper*.
- Gea-Carrasco, C. 2015. IFRS 9 will significantly impact bank's provisions and financial statements. *Whitepaper, Moody's Analytics*. Available: <https://www.moodyanalytics.com/risk-perspectives-magazine/risk-data-management/regulatory-spotlight/ifrs-9-will-significantly-impact-banks-information> [2022, May 26].
- Genesis Analytics. 2018. Harnessing the transformative potential of financial inclusion for women's economic empowerment in agriculture and micro and small businesses. International Development Research Centre. Available: <http://hdl.handle.net/10625/57158> [2022, October 21].
- Genesis Analytics. 2003. Access to Financial Services in Botswana. FinMark Trust Research Paper No.1. Available: <https://www.findevgateway.org/sites/default/files/publications/files/mfg-en-paper-access-to-financial-services-in-botswana-2003.pdf> [2022, October 21].
- Genesis Analytics. 2003. Access to Financial Services in Swaziland. FinMark Trust Research Paper No.4. Available: <https://www.findevgateway.org/sites/default/files/publications/files/mfg-en-paper-access-to-financial-services-in-swaziland-2003.pdf> [2022, October 21].

- Gerding, E.F. 2016. The dialects of bank capital: regulation and regulatory capital arbitrage. *Washburn Law Journal*. 55(2):357-384.
- Görlitz, A.& Dobler, M. 2021. Financial accounting for deferred taxes: a systematic review of empirical evidence. *Management Review Quarterly*.
- Groepe, F. 2017. *Opening remarks by Francois Groepe, Deputy Governor of the South African Reserve Bank, at the workshop on the impact of IFRS 9 on banks and regulators in Africa, jointly hosted by the Working Group on Cross-border Banking Supervision and the South African Reserve Bank*. 26 September, South African Reserve Bank, Pretoria. Available: <https://www.bis.org/review/r170928c.pdf> [2022, August 13].
- Groff, M. Z. & Mörec, B. 2021. IFRS 9 transition effect on equity in a post bank recovery environment: The case of Slovenia. *Economic Research-Ekonomska Istraživanja*. 34:670-686.
- Guenther, D.A. & Sansing, R.C. 2004. The valuation relevance of reversing deferred tax liabilities. *Accounting Review*. 79(2):437-451.
- Healy, P.M. & Whalen, J.M. 1998. A review of the earnings management literature and its implications for standard setting. *SSRN Electronic Journal*.
- Hladika, M. 2021. Impact of Covid-19 pandemic on the loans quality, provisions, and profitability of the banking sector. *Economic and Social Development (Book of Proceedings), 69th International Scientific Conference on Economic and Social Development - "Sustainability and Post Covid World"*. 3rd June. Varazdin Development and Entrepreneurship Agency, Varazdin, Croatia / Heriot-Watt University, Dubai, United Arab Emirates / University North, Koprivnica, Croatia / Faculty of Management University of Warsaw, Warsaw, Poland / Faculty of Law, Economics and Social Sciences Sale - Mohammed V University in Rabat, Morocco / Polytechnic of Medimurje in Cakovec, Cakovec, Croatia. 138-149.
- Huian, M.C. 2012. Accounting for financial assets and liabilities according to IFRS 9. *Analele științifice ale Universității 'Al. I. Cuza' din Iași*. 59(1):27-47.
- Herbohn, K., Tutticci, I. & Khor, P.S. 2010. Changes in unrecognised deferred tax accruals from carry-forward losses: earnings management or signalling. *Journal of Business Finance & Accounting*. 37(7-8):763-791.
- Holland, K. & Jackson, R.H.G. 2004. Earnings management and deferred tax. *Accounting and Business Research*. 34(2):101-123.
- IFRS. 2022. *IFRS 9 Financial Instruments*. Available: <https://www.ifrs.org/issued-standards/list-of-standards/ifrs-9-financial-instruments/#about> [2022, May 04].
- Jensen, M.C. 1976. Reflections on the state of accounting research and the regulation of accounting. *Stanford Lectures in Accounting*. 11-19.
- Jones, D. 2000. Emerging problems with the Basel Capital Accord: Regulatory capital arbitrage and related issues. *Journal of Banking & Finance*. 24(1-2):35-58.

- Jordan, C.E. & Clark, S.J. 2004. Big bath earnings management: the case of goodwill impairment under SFAS No. 142. *Journal of Applied Business Research*. 20(2):63-70.
- Kasipillai, J. & Mahenthiran, S. 2013. Deferred taxes, earnings management, and corporate governance: Malaysian evidence. *Journal of Contemporary Accounting & Economics*. 9(1):1-18.
- Kim, M. & Kross, W. 1998. The impact of the 1989 change in bank capital standards on loan loss provisions and loan write-offs. *Journal of Accounting and Economics*. 25(1):69-100.
- Kund, A., Rugilo, D. 2018. Does IFRS 9 increase financial stability. *SSRN Electronic Journal*.
- Laeven, L. & Majnoni, G. 2003. Loan loss provisioning and economic slowdowns: too much, too late? *Journal of Financial Intermediation*. 12:178-197.
- Lemans, J.D. 2010. Goodwill impairment as a tool for earnings management. Erasmus MC: University Medical Centre Rotterdam.
- Leventis, S., Dimitropoulos, P.E. & Anandarajan, A. 2011. Loan loss provisions, earnings management, and capital management under IFRS: the case of EC commercial banks. *Journal of Financial Services Research*. 40(1):103-122.
- Lubberink, M. 2022. Max headroom: Discretionary capital buffers and bank risk. *International Review of Financial Analysis*.
- Lynn, S.G., Seethamraju, C. & Seetharaman, A. 2008. Incremental value relevance of unrecognised deferred taxes: evidence from the United Kingdom. *The Journal of the American Taxation Association*. 30(2):107-37.
- Moschandreas, M. 1997. The role of opportunism in transaction cost economics. *Taylor & Francis, Ltd*. 31(1): 39-57.
- Moyer, S. E. 1990. Capital adequacy ratio regulations and accounting choices in commercial banks. *Journal of Accounting and Economics*. 13(2):123-154.
- Naidoo, B. 2022. The benefits of Central Bank digital currencies for African countries. Global Digital Development Forum Central Bank Digital Currency: Feasibility in Africa. Available: <https://www.ictworks.org/benefits-central-bank-digital-currencies-african-countries/#.Y1JXonZBy02> [2022, October 21].
- Neisen, M. & Schulte-Mattler, H. 2021. The effectiveness of IFRS 9 transitional provisions in limiting the potential impact of covid-19 on banks. *Journal of Banking Regulation*. 22:342-351.
- Newey, W.K. & West, K.D. 1987. A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica*. 55:703-708.
- Newey, W.K. & West, K.D. 1994. Automatic Lag Selection in Covariance Matrix Estimation. *Review of Economic Studies*. 61:631-653.

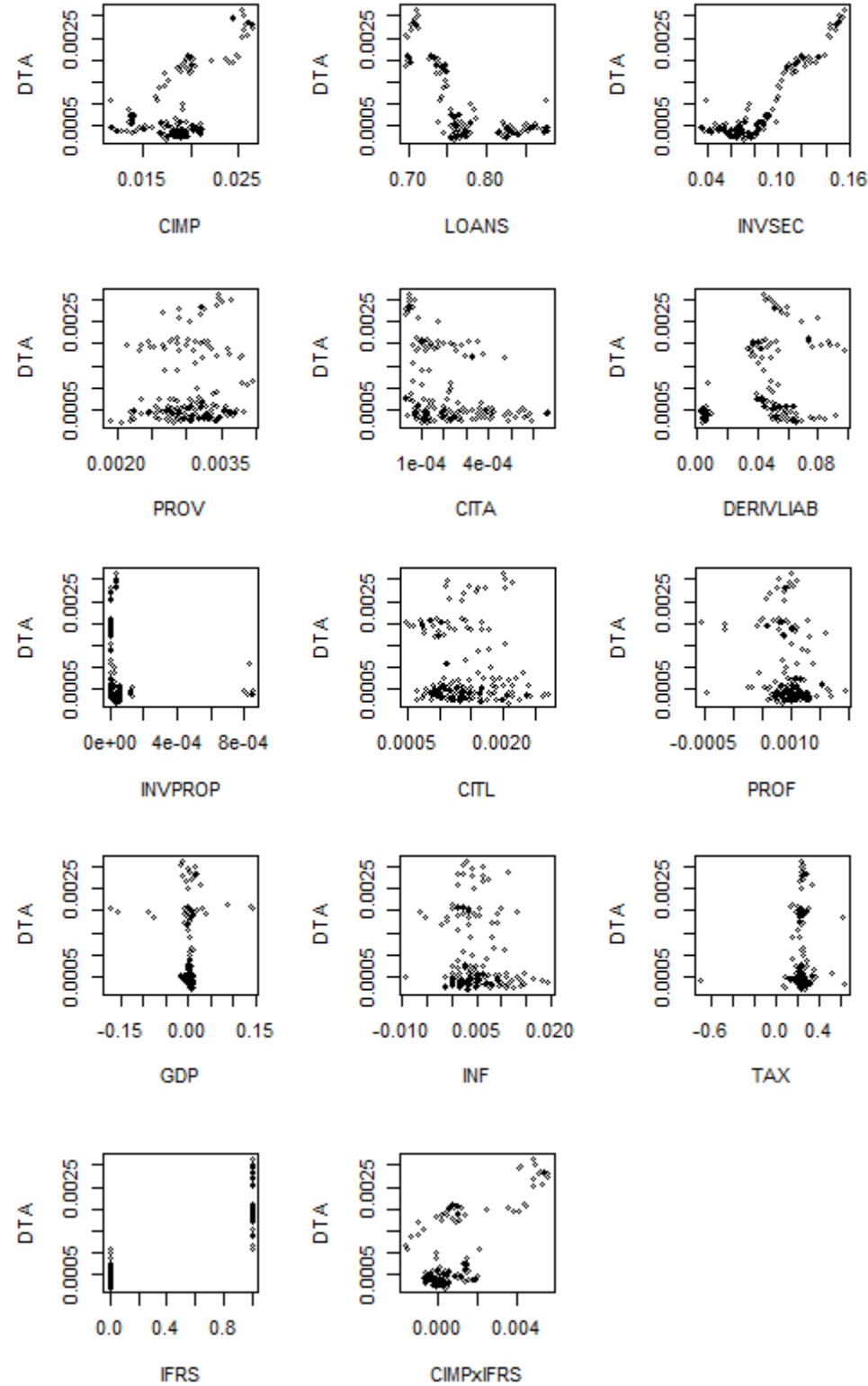
- Ng, J. & Roychowdhury, S. 2014. Do loan loss reserves behave like capital? Evidence from recent bank failures. *Review of Accounting Studies*. 19:1234-1279.
- Novotny-Farkas, Z. 2016. The interaction of the IFRS 9 expected loss approach with supervisory rules and implications for financial stability. *Accounting in Europe*. 13(2):197-227.
- Papadeas, P. 2019. The conversion of bank deferred tax assets in 2016 to bank shares in 2017. *Economic and Financial Challenges for Eastern Europe*.
- Phillips, J.D., Pincus, M. & Rego, S.O. 2004. Earnings management: new evidence based on deferred tax expense. *Journal of the American Taxation Association*. 78(2):491-521.
- Phillips, J.D., Pincus, M., Rego, S.O. & Wan, H. 2004. Decomposing changes in deferred tax assets and liabilities to isolate earnings management activities. *Journal of the American Taxation Association*. 26(s-1):43-66.
- PwC. 2017. IFRS 9, financial instruments: Understanding the basics. Available: <https://www.pwc.com/gx/en/audit-services/ifrs/publications/ifrs-9/ifrs-9-understanding-the-basics.pdf> [2022, May 25].
- Saita, F. 2010. *Value at Risk and Bank Capital Management: Risk Adjusted Performances, Capital Management and Capital Allocation Decision Making*. Elsevier. Available: https://books.google.co.za/books?id=EHrEDrIpcqC&dq=bank+capital+management+review&lr=&source=gbs_navlinks_s [2022, June 20].
- SARB. 2017. D5/2017: Regulatory treatment of accounting provisions – interim approach and transitional arrangements including disclosure and auditing aspects. Available: <https://www.resbank.co.za/content/dam/sarb/publications/prudential-authority/pa-deposit-takers/banks-directives/2017/8100/D5-of-2017.pdf> [2022, August 16].
- Schipper, K. 1989. Commentary on Earnings Management. *Accounting Horizons*. 3(4):91-102.
- Schnietz, K. & Kachra, A. 2013. *Opportunism*. Available: <https://www.britannica.com/topic/opportunism> [2022, June 14].
- Schutte, W. D., Verster, T., Doody, D., Raubenheimer, H. & Coetzee, P. J. 2020. A proposed benchmark model using a modularised approach to calculate IFRS 9 expected credit loss. *Cogent Economics & Finance*. 8, 1735681.
- Shrestha, M.B. & Bhatta, G.R. 2018. Selecting appropriate methodological framework for time series data analysis. *The Journal of Finance and Data Science*. 4(2):71-89.
- Sichirolo, A.E. 2015. IFRS 9 “Financial Instruments”: Background, Development and Expected Impact. *Università Ca' Foscari Venezia*.

- Skinner, D.J. 2008. The rise of deferred tax assets in Japan: The role of deferred tax accounting in the Japanese banking crisis. *Journal of Accounting and Economics*. 46(2-3):218-239.
- Temim, J. 2016. The IFRS 9 impairment model and its interaction with the Basel framework. *Moody's Analytics Risk Perspectives*. 8(1):13-33.
- Volarević, H.& Varović, M. 2018. Internal model for IFRS 9 – Expected credit losses calculation. *Ekonomski pregled*. 69(3):269-297.
- Watts, R. L. & Zimmerman, J. L. 1978. Towards a positive theory of the determination of accounting standards. *The Accounting Review*. 53: 112-134.
- Watts, R.L. & Zimmerman, J.L. 1983. Agency problems, auditing, and the theory of the firm: some evidence. *The Journal of Law and Economics*. 11(4):23-34.
- Williamson, O.E. 1985. *The economic institutions of capitalism: firms, markets, relational contracting*. Free Press, New York, NY.

7. Appendix

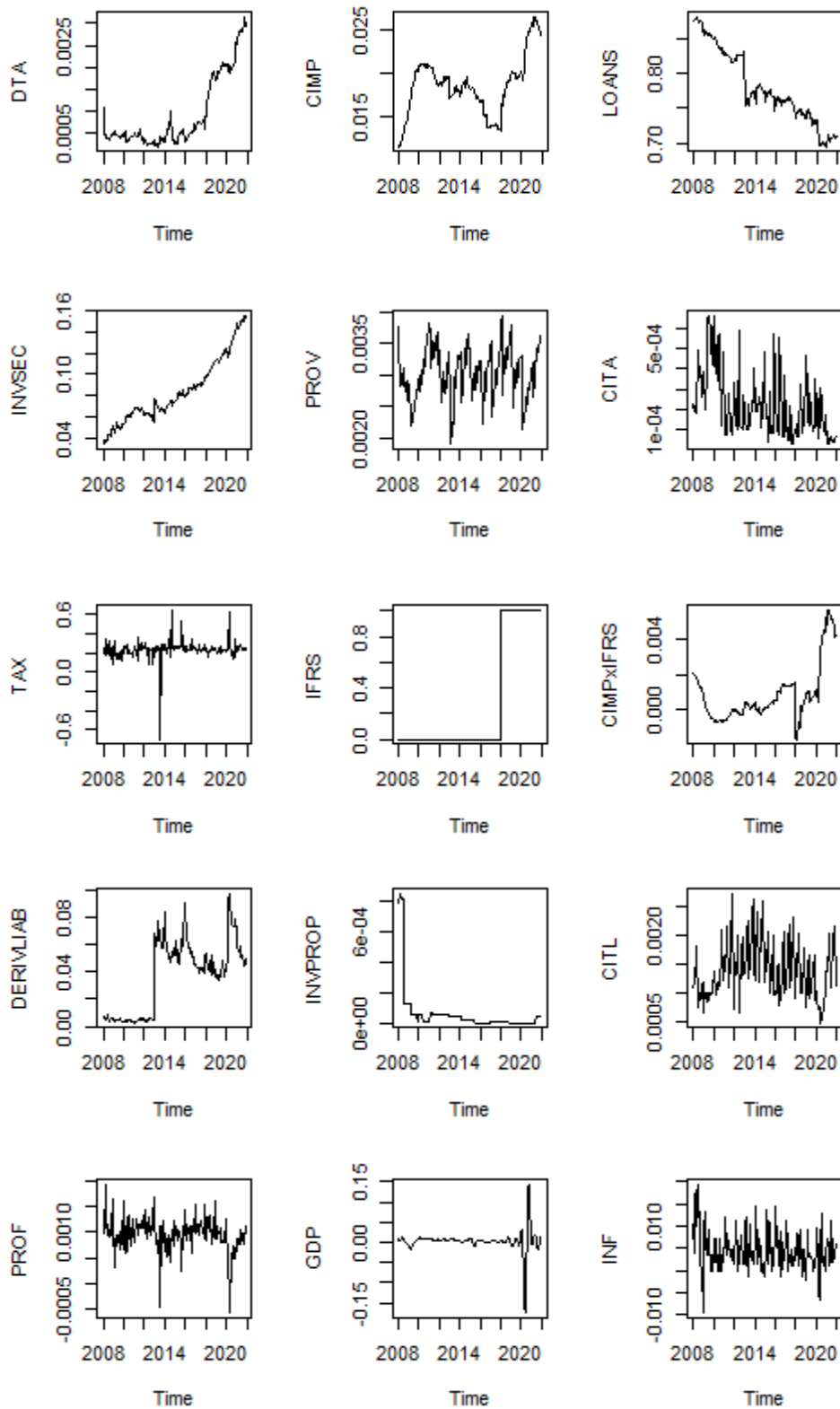
7.1 Correlation Analysis

This section includes scatter plots of DTAs against all the independent variables.



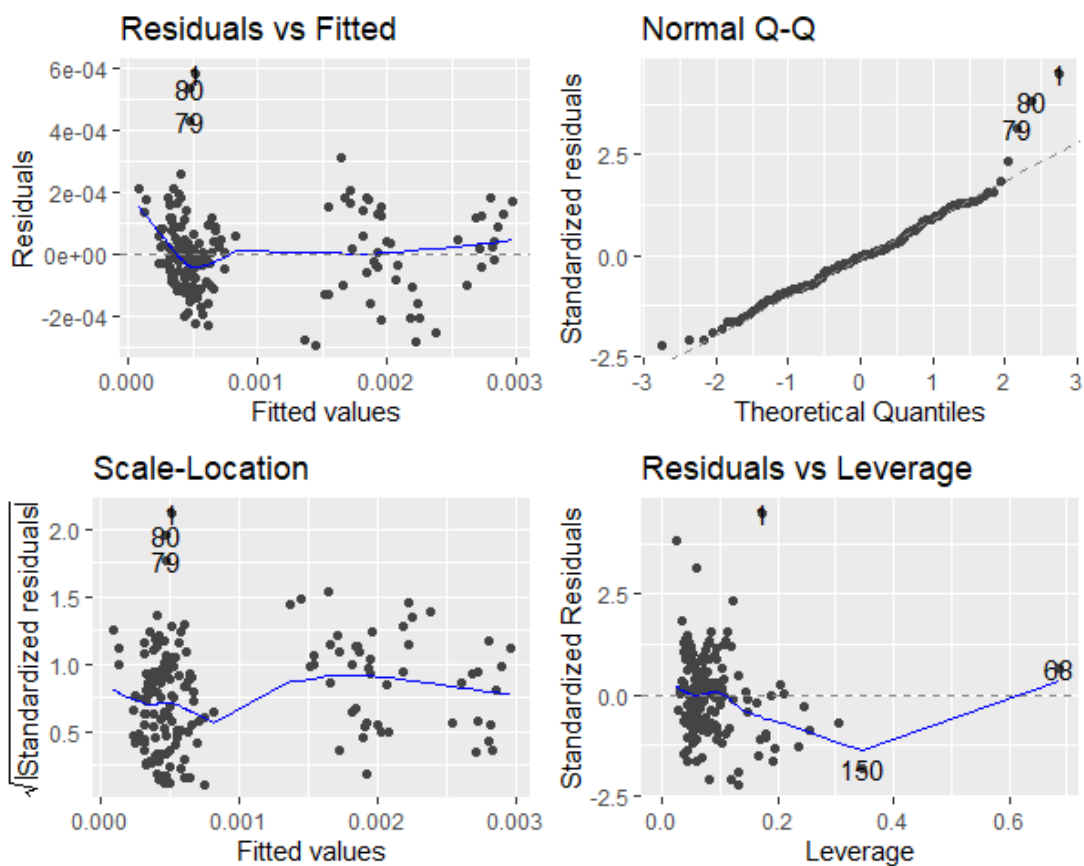
7.2 Stationarity Checks

By observing the trends of the variables, preliminary views on stationarity (or lack thereof) of the time series can be made.



7.3 Model Diagnostics

From the residuals vs fitted plot, we can conclude that the linearity assumption is reasonably satisfied by our OLS model. The normal q-q plot shows the normal distribution of our data since majority of data points lie on the diagonal.



7.4 DTA Computations for Five Banks

This information was obtained from Composition of Capital (CC1) reports disclosed bi-annually by the major banks as required by Basel III.

7.4.1 Standard Bank

R (millions)	2013	2014	2015	2016	2017	2018	2019	2020
CET1 before regulatory adjustments	119,608	123,936	141,597	142,589	150,608	158,869	162,681	174,892
Regulatory Adjustments to CET1	23,102	23,530	35,394	32,676	32,326	24,628	22,459	19,813
CET1 Capital	96,506	100,406	106,203	109,913	118,282	134,241	140,222	155,079
Significant Investments in Common Shares of Unconsolidated Financial Institutions	10,121	10,448	12,246	12,283	12,862	13,859	14,321	15,750
Mortgage Servicing Rights	-	-	-	-	-	-	-	-
DTAs	320	422	2,432	3,257	3,530	6,327	6,172	7,373
Total of these 3 adjustments	10,441	10,870	14,678	15,540	16,392	20,186	20,493	23,123
DTAs as a proportion of common equity (after regulatory adjustments)	0.33%	0.42%	2.29%	2.96%	2.98%	4.71%	4.40%	4.75%

Total of the 3 adjustments as a proportion of common equity (after regulatory adjustments)	10.8%	10.8%	13.8%	14.1%	13.9%	15.0%	14.6%	14.9%
Tier 1 Capital	101,506	104,921	116,238	118,020	124,989	140,328	147,981	163,945
Total Capital	126,756	128,914	138,526	138,150	141,939	160,649	169,983	189,848
Total RWA	841,272	914,213	944,039	883,179	957,046	1,079,642	1,099,528	1,229,478
DTA Component of Regulatory Capital	0.3%	0.3%	1.8%	2.4%	2.5%	3.9%	3.6%	3.9%
CET1 (% RWA)	11.5%	11.0%	11.2%	12.4%	12.4%	12.4%	12.8%	12.6%
Tier 1 (% RWA)	12.1%	11.5%	12.3%	13.4%	13.1%	13.0%	13.5%	13.3%

7.4.2 FirstRand Bank

R (millions)	2013	2014	2015	2016	2017	2018	2019	2020
CET1 before regulatory adjustments	73,532	81,207	85,016	90,093	103,963	119,688	127,951	140,394
Regulatory Adjustments to CET1	1,663	1,863	2,500	3,139	4,194	10,248	10,870	13,491
CET1 Capital	71,869	79,344	82,516	86,954	99,769	109,440	117,081	126,903
Significant Investments in Common Shares of Unconsolidated Financial Institutions	2,055	2,926	3,110	3,541	4,239	4,511	6,193	5,759
Mortgage Servicing Rights	-	-	-	-	-	-	-	-
DTAs	366	668	1,226	1,532	1,752	3,032	3,306	4,166
Total of these 3 adjustments	2,421	3,594	4,336	5,073	5,991	7,543	9,499	9,925
DTAs as a proportion of common equity (after regulatory adjustments)	0.5%	0.8%	1.5%	1.8%	1.8%	2.8%	2.8%	3.3%
Total of the 3 adjustments as a proportion of common equity (after regulatory adjustments)	3.4%	4.5%	5.3%	5.8%	6.0%	6.9%	8.1%	7.8%
Tier 1 Capital	77,212	84,647	87,563	91,641	104,237	115,107	125,376	133,568
Total Capital	84,690	95,368	99,563	107,482	121,995	137,062	149,210	160,512
Total RWA	519,960	572,446	633,830	698,732	781,996	972,199	1,024,252	1,114,321
DTA Component of Regulatory Capital	0.4%	0.7%	1.2%	1.4%	1.4%	2.2%	2.2%	2.6%
CET1 (% RWA)	13.8%	13.9%	13.0%	12.4%	12.8%	11.3%	11.4%	11.4%
Tier 1 (% RWA)	14.8%	14.8%	13.8%	13.1%	13.3%	11.8%	12.2%	12.0%

7.4.3 ABSA

R (millions)	2013	2014	2015	2016	2017	2018	2019	2020
CET1 before regulatory adjustments	43,818	72,046	81,065	91,774	99,122	99,400	110,301	119,417
Regulatory Adjustments to CET1	4,587	6,332	3,425	6,340	7,825	6,571	9,664	16,921
CET1 Capital	39,231	65,714	77,640	85,434	91,297	92,829	100,637	102,496
Significant Investments in Common Shares of Unconsolidated Financial Institutions	-	-	-	-	1,065	4,312	4,193	3,947
Mortgage Servicing Rights	-	-	-	-	-	-	-	-
DTAs	-	289	904	1,023	1,073	2,281	2,990	2,936
Total of these 3 adjustments	-	289	904	1,023	2,138	6,593	7,183	6,883
DTAs as a proportion of common equity (after regulatory adjustments)	0.0%	0.4%	1.2%	1.2%	1.2%	2.5%	3.0%	2.9%
Total of the 3 adjustments as a proportion of common equity (after regulatory adjustments)	0.0%	0.4%	1.2%	1.2%	2.3%	7.1%	7.1%	6.7%
Tier 1 Capital	43,411	70,286	82,053	88,991	95,661	98,547	109,062	111,803
Total Capital	57,887	80,889	95,355	104,486	110,874	119,835	133,411	137,454
Total RWA	405,942	619,705	702,663	703,785	736,892	818,592	870,406	915,061
DTA Component of Regulatory Capital	0.0%	0.4%	0.9%	1.0%	1.0%	1.9%	2.2%	2.1%
CET1 (% RWA)	9.7%	10.6%	11.0%	12.1%	12.4%	11.3%	11.6%	11.2%
Tier 1 (% RWA)	10.7%	11.3%	11.7%	12.6%	13.0%	12.0%	12.5%	12.2%

7.4.4 Nedbank

R (millions)	2013	2014	2015	2016	2017	2018	2019	2020
CET1 before regulatory adjustments	56,398	64,382	71,355	71,687	75,931	80,868	86,873	89,056
Regulatory Adjustments to CET1	11,356	15,597	17,847	14,295	15,618	15,698	15,453	16,000
CET1 Capital	45,042	48,785	53,508	57,392	60,313	65,170	71,420	73,056
Significant Investments in Common Shares of Unconsolidated Financial Institutions	1,410	5,205	5,852	6,304	5,653	5,754	5,611	5,581
Mortgage Servicing Rights	-	-	-	-	-	-	-	-
DTAs	-	126	51	371	354	222	480	14
Total of these 3 adjustments	1,410	5,331	5,903	6,675	6,007	5,976	6,091	5,595
DTAs as a proportion of common equity (after regulatory adjustments)	0.0%	0.3%	0.1%	0.6%	0.6%	0.3%	0.7%	0.0%
Total of the 3 adjustments as a proportion of common equity (after regulatory adjustments)	3.1%	10.9%	11.0%	11.6%	10.0%	9.2%	8.5%	7.7%
Tier 1 Capital	49,712	52,803	56,867	61,771	64,737	70,068	79,315	81,380
Total Capital	57,744	62,058	67,304	73,504	75,920	83,496	93,155	99,954
Total RWA	392,926	440,696	501,243	509,221	528,206	586,626	628,725	673,688
DTA Component of Regulatory Capital	0.0%	0.2%	0.1%	0.5%	0.5%	0.3%	0.5%	0.0%
CET1 (% RWA)	11.5%	11.1%	10.7%	11.3%	11.4%	11.1%	11.4%	10.8%
Tier 1 (% RWA)	12.7%	12.0%	11.3%	12.1%	12.3%	11.9%	12.6%	12.1%

7.4.5 Investec

R (millions)	2013	2014	2015	2016	2017	2018	2019	2020
CET1 before regulatory adjustments	22,991	24,068	27,364	30,331	33,631	36,531	39,994	39,754
Regulatory Adjustments to CET1	-466	-419	-950	-1,144	-217	1,702	1,843	1,203
CET1 Capital	23,457	24,487	28,314	31,475	33,848	34,829	38,151	38,551
Significant Investments in Common Shares of Unconsolidated Financial Institutions	-	-	-	-	-	3,694	4,030	4,015
Mortgage Servicing Rights	-	-	-	-	-	-	-	-
DTAs	-	65	78	98	368	561	1,396	2,568
Total of these 3 adjustments	-	65	78	98	368	4,255	5,426	6,583
DTAs as a proportion of common equity (after regulatory adjustments)	0.0%	0.3%	0.3%	0.3%	1.1%	1.6%	3.7%	6.7%
Total of the 3 adjustments as a proportion of common equity (after regulatory adjustments)	0.0%	0.3%	0.3%	0.3%	1.1%	12.2%	14.2%	17.1%
Tier 1 Capital	24,838	25,714	29,388	32,395	34,615	35,792	39,071	39,302
Total Capital	35,379	36,384	39,708	43,121	48,116	49,801	53,866	52,207
Total RWA	232,849	238,396	257,931	295,752	313,010	320,607	340,315	319,090
DTA Component of Regulatory Capital	0.0%	0.2%	0.2%	0.2%	0.8%	1.1%	2.6%	4.9%
CET1 (% RWA)	10.1%	10.3%	11.0%	10.6%	10.8%	10.9%	11.2%	12.1%
Tier 1 (% RWA)	10.7%	10.8%	11.4%	11.0%	11.1%	11.2%	11.5%	12.3%