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2022

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Pillay, Melissa Dianne. (2022). Credit growth and its impact on profitability and liquidity in the local Banking Industry of South Africa and the United Kingdom [Master's dissertation, University of the Witwatersrand, Johannesburg]. WireDSpace. https://hdl.handle.net/10539/38638

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Credit growth and its impact on profitability and liquidity in the local Banking Industry of South Africa and the United Kingdom

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A research report submitted to the Faculty of Commerce, Law, and Management, University of Witwatersrand,

in fulfilment of the requirements for the degree of Master of Commerce.

Ethics Clearance/Waiver Number: WSOA-2020-11-27W

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Johannesburg, 2022

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Declaration

I, Melissa Dianne Pillay, declare that this research paper is my own, unaided work. It is being submitted for the Degree of Master of Commerce at the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



15th Day of December 2022 in Johannesburg

Acknowledgements

I thank my supervisors, Samantha Gomez and Liandi van Wyk, for their continued support, motivation, and valuable feedback, which made it possible to submit this research. I am thankful to Professor Ilse Botha who completed the statistical analysis and by whom no question was left unanswered throughout the write-up of my results.

A huge thank you to my family and friends who supported me throughout my master's journey. A special thanks to my sister Eleanor Singh and my friends Nicole Dyason and Matshemo Matlala for their guidance and reviews throughout my writing process. I am grateful to all of you for believing in me.

Abbreviations

BoE	Bank of England
EU	European Union
FE	Fixed Effects
FPC	Financial Policy Committee's
GDP	Gross Domestic Product
HHI	Herfindahl–Hirschman Index
LR	Liquidity Ratio
QLFS	Quarterly Labour Force Survey
RE	Random Effects
ROAA	Return on Average Assets
ROAE	Return on Average Equity
SA	South Africa
SARB	South African Reserve Bank
SRB	Systemic Risk Buffer
UK	United Kingdom

Abstract

The study aims to review the impact of credit growth on local bank profitability and liquidity in both South Africa (SA) and the United Kingdom (UK) between 2015 and 2020. A quantitative approach is used in the study, using descriptive statistics and panel regression analysis. The sample data were extracted from The Banker database; this is a key source of data and analysis for the world's banking sector, South African Reserve Bank (SARB), Statistics SA, and Trading Economics. Explanatory variables for profitability in the panel regression analysis include return on average assets (ROAA), return on average equity (ROAE), total assets, equity assets, loan assets, cost-to-income, Gross Domestic Product (GDP) growth rate, Herfindahl-Hirschman Index (HHI), consumer price index (CPI), the interest rate on loans, interest rate margin (IRM), unemployment rates, and credit growth. Explanatory variables for liquidity in the panel regression include ROAE, total assets, equity assets, GDP growth rate, CPI, interest rate on loans (IRL), IRM, unemployment, and credit growth. The findings indicate that credit growth is insignificant for bank profitability and liquidity in SA and the UK, so no relationship exists. The main issue is not credit growth per se but the combination of high credit growth, low provisioning, and looser lending. Based on the findings, a negative relationship exists between cost-to-income and bank profitability, reflecting that a higher cost-to-income ratio does decrease bank profitability in both SA and the UK. Other variables for SA were statistically significant: equity assets, total assets, the cost-to-income ratio, and GDP growth rate. In the UK, the following other variables were statistically significant: loan assets, total assets, cost-to-income, GDP growth rate, HHI, ROAE, CPI, and IRM. Further research can focus on expanding the period and the countries reviewed to assess credit growth in more depth.

Keywords: Banks, Credit Growth, Liquidity, Profitability, South Africa, The United Kingdom

Chapter 1: Introduction

1.1 Background of the study

Given the previous financial crisis in 2008, banks have faced abnormally rapid credit growth because of excessively relaxed credit standards (Han, 2016). Credit booms[1] are followed by poor economic performance (Fahlenbrach, Prilmeier, & Stulz, 2018). Consequently, global banks are introducing new products, banking strategies and facing increased credit and macroeconomic risks (Ghosh, 2010). Banks have responded by modifying, repurposing, and revamping their products and services to meet customer needs (Talbot & Ordonez-Ponce, 2020). Banks also have additional pressure to implement new cost-reducing strategies, which differ in developed versus developing countries. In developing countries, the deficiency of electronic banking infrastructure impact cost-effectiveness and profitability (Akhisar, Tunay, & Tunay, 2015). For banks to meet these ever-increasing demands and grant more credit, they must be completely aware of the risks involved and act with caution by providing for credit losses (Rossi, Borroni, Piva, & Lippi, 2019). Berge & Boye (2007) confirm that banks play a crucial role as credit and payment services providers in the financial system.

Profitable banks are essential because they act as financial resource allocation institutions: a profitable banking system is more likely to absorb adverse shocks, which retain the banking system's stability (Kumar & Bird, 2020). These roles make banks significant for economic growth and development (Javed & Basheer, 2017). The global banking industry is considered a vital business which helps integrate the country’s economic activities (Shah, Yiwen, Ali, & Sharif, 2018). In addition, banks facilitate technological innovation through their intermediary function[2] (Oluitan, 2012). For instance, the efficient allocation of savings by identifying and funding entrepreneurs who have the best odds of effectively implementing innovative products and production processes (Gurley & Shaw, 1967; King & Levine, 1993; McKinnon, 1973; Oluitan,

[1] Credit booms – defined as periods of rapid credit growth – are a common phenomenon in both advanced and emerging economies (Mendoza and Terrones 2008, Bakker et al. 2012). They are generally accompanied by a strong macroeconomic performance, including high asset prices and high rates of investment and GDP growth.

[2] Financial intermediaries serve as middlemen for financial transactions, generally between banks or funds. These intermediaries help create efficient markets and lower the cost of doing business.

2012), which will encourage economic growth (Sipahutar, 2016). As confirmed by Javed & Basheer (2017) financial intermediation is essential for economic development.

Policies aimed at stabilising inflation and Gross Domestic Product (GDP) growth should be critical in promoting financial intermediation (Francis, 2013). However, the financial intermediation function leaves the banking industry open to several risks: liquidity risk, credit risk, market risk, and operational risk (Lartey, Antwi, & Boadi, 2013; Noman, Pervin, Chowdhury, & Banna, 2015). Worldwide, banks face significant challenges in lending because of misunderstanding risk and its related factors and an inappropriate response to these risks (Laidroo & Männasoo, 2014). Rapid credit growth, for one, directly impacts credit risk attributable to consumer indebtedness and macroeconomic shocks (Antoshin, Arena, Gueorguiev, Lybek, Ralyea, & Yehoue, 2017). Antoshin et al. (2017) confirmed that credit growth negatively correlates with credit risk. The higher the possibility of a borrower defaulting, the less likely a bank is to grant credit. High credit risk reflects consumers' inability to repay debts. Many credit risk mistakes are made during the expansion phase of credit; banks lend too much credit too fast but fail to provide for loan losses (Fernández de Lis, Martínez Pagés, & Saurina Salas, 2000). This study aims to assess credit growth in South Africa's (SA) and the United Kingdom's (UK) local banking industries since it contributes to credit risk[3].

Credit growth in SA and the UK is analysed by assessing the total credit granted. In the fourth quarter of 2020 in SA, the total credit for banks totalled R127.99 billion, making up 82.89% of the total credit granted (National Credit Regulator, 2020b). The total credit granted by South African banks over 2015-2020 showed a growth rate of 25%, from R96.53 billion to R127.99 billion (National Credit Regulator, 2020a). M4[4] lending to the household sector in the UK for the fourth quarter of 2020 amounted to £138.58 million. £75.29 million related to lending secured on dwellings and £61.13 related to consumer credit such as credit cards, loans, and overdrafts (Bank of England, 2020d). Gross lending in the UK only realised a 4% increase over 2015-2020, from £466.52 million to £484.15 million (Bank of England, 2020a). A comparative study of this nature between SA and the UK local banking industries is significant as in previous studies; it was

[3] Credit risk is the possibility of a loss resulting from a borrower's failure to repay a loan or meet contractual obligations.
[4] The Broad money aggregate M4 is a measure of the quantity UK money supply

discovered that high credit growth rates and declining economies will result in consumer indebtedness (Fernández de Lis et al., 2000).

Rapid consumer indebtedness results in higher credit risk and, as a response to this, SA initiated responsible lending principles by enacting the South African National Credit Act of 2005 (Republic of South Africa, 2006) also referred to as NCA (Migiro, 2017). The NCA was enacted in SA to curb reckless borrowing by consumers and encourage lenders to provide credit more responsibly. Similarly, the UK and Netherlands established the European Union (EU) Consumer Mortgage Credit Directive, which builds a standard responsible lending policy. It contains regulatory tools which are considered responsible lending obligations (Mak, 2015). However, despite attempts to curb reckless borrowing, credit risk is considered the most critical banking risk (Hussain & Al-Ajmi, 2012; Perera, Ralston, & Wickramanayake, 2014).

More than 80% of the balance sheet items of banks are exposed to credit risk (Noman et al., 2015). Credit risk may increase when banks overstretch credit supply at a rate that may exceed customers' ability to repay their loans (Laidroo & Männasoo, 2014). Various studies such as Boahene, Dasah, & Agyei (2012), Kithinji (2010), and Kolapo, Ayeni, & Oke (2012) have been completed to assess the impact of credit risk on bank profitability. The Ghanaian study found a positive relationship between the profitability and credit risk of six commercial banks. The findings suggest that they experience high profitability when credit risk variables are high. The credit risk variables referred to in the study are non-performing loan rate, net-charge off rate, and pre-provision profit (Boahene et al., 2012)

In contrast, a study on Kenyan commercial banks established a neutral relationship between credit risk and profitability (Kithinji, 2010). The Kenyan study used net profits as an indicator of profits. Its findings reveal that most commercial banks' profits are not influenced by the amount of credit and non-performing loans. This key point suggests that commercial banks whose focus is on making high profits should consider other factors like existing credit policy, industry norms, and economic conditions (Van Greuning, 1999). The requirement of Basel II[5] may have allowed commercial banks to control their non-performing loans and, in this way, reduce credit risk.

[5] Basel II is the second of three Basel Accords. It is based on three main "pillars": minimum capital requirements, regulatory supervision, and market discipline. Minimum capital requirements play the most important role in Basel II and obligate banks to maintain certain ratios of capital to their risk-weighted assets.

Contrary, a Nigerian study used return on assets as an indicator of profitability and found a negative relationship between credit risk and profitability (Kolapo et al., 2012). The Nigerian study findings differ from the Ghanaian and Kenyan studies because the period studied was between 2000 and 2010, when the economy experienced a downward trend, an economic melt-down. The findings reveal that Nigerian banks should improve their credit analysis and loan administration processes. This indicates that credit risk plays a crucial role in the banking sector. Notably, higher credit growth emphasises the importance of credit quality because of the decline of the global economy, and it is linked to consumer indebtedness (Kim, Kim, & Yoo, 2016).

Credit quality is determined by the macroeconomic environment shown in business cycle variables such as inflation and real GDP growth (Laidroo & Männasoo, 2014). When a country's GDP slows down, this can mean a possible recession; this, in turn, causes unemployment and declining business revenues. The scale of the economic downturn caused by Covid-19 impacted the UK with a decrease in GDP of 9.8% in 2020 (Harari & Keep, 2021), the sharpest drop since 1948. SA likewise recorded a drop of 2% in GDP in the first quarter of 2020. Investment spending in SA decreased by 20.5% (the most significant drop since the 2008-2009 financial crisis), and consumer spending remained constant (Statistics South Africa, 2020c). For this reason, it is apparent that the pandemic has impacted the period of the study.

Covid-19 has strapped the global economy financially with lockdowns, reduced business activities, and added loss of employment (School of Accountancy, 2020). The SA economy was facing a recession before the pandemic and the pandemic exacerbated the impact on businesses and consumers (Reuters, 2020). The economic shock resulting from Covid-19 may have long-lasting effects on the economy. Covid-19 reached the UK on 31 January 2020, with the first two Covid cases confirmed (Stewart, 2021); the UK was the third-worst affected country as there were many cases in Europe (Stewart, 2021). Two months later, SA declared a state of national disaster on the 15th of March 2020, applying the Disaster Management Act of 2002 (Republic of South Africa, 2003), and announcing a 21-day nationwide lockdown on the 23rd of March 2020 (Ozili & Arun, 2020).

These measures have negatively impacted the economy, with small businesses struggling to stay afloat and individuals facing job losses and reductions in household income (Arndt, Davies,

Gabriel, Harris, Makrelov, Modise, Robinson, Simbanegavi, van Seventer, & Anderson, 2020). The negative impact of Covid-19 on SA can additionally be confirmed by Moody's announcement that the country is at sub-investment status (School of Accountancy, 2020). South African President Cyril Ramaphosa announced a R500 billion social support and economic relief fund at 10% of SA's GDP (De Villiers, Cerbone, & Van Zijl, 2020). This fund was to be used for various measures, including increased social grants and subsidies for businesses and wages (Tromp & Kings, 2020). In the UK, The Office for Budget Responsibility (OBR) forecasts that this impact will lower the level of GDP in the UK by 3% as compared to what it would have been pre-pandemic, £2.70 trillion in February 2020 (Harari & Keep, 2021). At the same time, the Bank of England's (BoE) recent prediction decreased by over 1%. Companies which have gone into liquidation, resulting in a loss of income for those employed, may increase demand for credit to build up cash flow. The UK's public finances (central government, devolved administrations, local councils, and public corporations) have been seriously affected by Covid-19. Their budget deficit reached a record of £323 billion for 2020/21 (Harari & Keep, 2021). As the revenue of the country fell, their spending increased. The UK government opted to provide financial assistance to UK businesses and households at about £340 billion between 2020/21 and 2021/22 (Harari & Keep, 2021). These added factors are key to understanding how banks respond to possible credit expansion. However, the possibility of a banking crisis after abnormal credit growth is marked (Gourinchas, Valdes, & Landerretche, 2001; Tunay, Yüceyılmaz, & Çilesiz, 2020).

Because of several market failures, the global banking sector is particularly susceptible to crisis. External factors can lead to an under-provision of liquidity and bank runs[6] (Alessi & Detken, 2018). Strong credit growth in emerging markets is expected to end up in a financial crisis (Tunay et al., 2020). The financial crisis in the United States (2007-2009) was caused by lenders supplying more credit to borrowers during the credit boom from 2001 to 2006 (Albanesi, De Giorgi, & Nosal, 2017). The increase in consumer borrowing led to individuals not being able to keep up with their debt and led to increased defaults and foreclosures which prompted the financial crisis (Albanesi et al., 2017). Major commercial banks have incurred significant losses because of the financial crisis in the United States (Han, 2016). Liquidity was one of the problematic factors during the financial crisis of 2008 (Saeed, 2014). The global financial crisis has also indicated that excessive

[6] A bank run or run on the bank occurs when many clients withdraw their money from a bank because they believe the bank may cease to function soon.

credit growth often leads to increased systemic risks[7], which might materialise into a systemic banking crisis (Alessi & Detken, 2018).

The effect of systemic risk on the South African local banking industry versus the UK's local banking industry may differ. SA is an emerging market economy, while the UK is a developed economy. Systemic risk in emerging economies can be primarily attached to a slowdown in capital flows intermediated through the domestic banking sector (Foggitt, Heymans, van Vuuren, & Pretorius, 2017). In contrast, banks which operate in a developed economy with developed financial markets should contribute less to global systemic risk because of enhanced access to liquidity and funding (Bostandzic & Weiss, 2018).

An instance of systemic risk in SA was the failure of African Bank in 2014, a shock to the South African markets which introduced systemic risk in the South African financial system. It was brought about by issuing too many loans and credit cards (at exorbitant interest rates) and accepting low deposits[8] (Foggitt et al., 2017). The growth in African Bank's unsecured lending book by 2011 was above fifty percent per year relative to the industry average of ten percent (Havemann, 2019). In addition to expanding credit too quickly, the bank granted most of these loans to consumers who were not adequately vetted, leading to a failure to meet payment against these loans. The failure of customers to pay their loans caused losses of about R6.4 million as non-performing loans grew to 31.7% of gross loans in March 2014 compared to 28.2% in September 2013 (Havemann, 2019). The increase in non-performing loans resulted in the need for a South African Reserve Bank (SARB) bailout of R17 million (Batra, 2014; Foggitt et al., 2017). The rapid response by SARB was significant in avoiding contagion. However, the bailout could sanction a re-examination of the SA financial sector, its institutions, activities, and the actual level of systemic risk. The re-examination demonstrated that traditional regulation and supervision were not enough to prevent the failure of African Bank (Sanderson, De Jongh, & Maré, 2017). SA's financial sector may also not be as well-regulated as believed to be (Foggitt et al., 2017).

Contrary, the development of systemic risk in the UK was strongly related to financial variables (Li & Zinna, 2014). For example, the systemic risk decreases when the medium-term government

[7] Systemic risk is an event in which a considerable number of financial institutions default simultaneously.
[8] Bank deposits consist of money placed into banking institutions for safekeeping. These deposits are made to deposit accounts such as savings accounts, checking accounts, and money market accounts.

bond and stock market increase. The UK's bank systemic exposure is like their sovereign exposure[9]: this displays how extensive the UK banking industry is relative to UK's economy. There is a possibility that the sovereign[10] is allowed to default with joint defaults of banks – known as systemic events (Li & Zinna, 2014). A Royal Commission was set up in the UK to study events which may encourage diversity and modularity[11] in banking systems to increase systemic resilience (Haldane & May, 2011). In addition, The Financial Policy Committee (FPC) proposed framework for the systemic risk buffer (SRB) for UK banks (Vickers, 2016). The BoE published this proposed framework by the FPC for consultation[12]. The SRB is the additional equity capital buffer on top of capital requirements which generally apply to banks. The UK is proactive in managing its systemic risk; the BoE has a biannual Systemic Risk Survey to examine market participants. These market participants include, building societies, UK banks, asset managers, large non-financial companies and their perception of risks, and confidence in the stability of the UK financial system (Bank of England, 2021). Results from the survey for the second half (H2) of 2021 showed that the perceived chances of a high-impact event in the UK financial system have decreased over the short and medium term. Confidence in the stability of the UK financial system has also increased. These are just a few of the risks imposed on banks. Several other contributing factors within the banking sector make it significant to assess the influence of credit growth on the profitability and liquidity of local banks within SA and the UK.

1.2 Purpose

The study aims to evaluate credit growth and its effects on the profitability and liquidity of the South African and UK local banking industries. Firstly, the study contributes to a range of studies to assess the potential drivers of credit growth; secondly, the study supplements bank-level studies which analyse the impact of credit growth on bank profitability and liquidity. The study

[9] Sovereign exposures are used by banks for liquidity management, credit risk mitigation, asset pricing, financial intermediation, and investment purposes. Banks' holdings of sovereign exposures play an important role as part of monetary policy operationalisation.
[10] It often describes a person who has supreme power or authority, such as a king or queen. ... Nations and states are also sometimes described as "sovereign." This means that they have power over themselves; their government is under their own control, rather than under the control of an outside authority.
[11] Modularity is a measure of the structure of networks or graphs which measures the strength of division of a network into modules (also called groups, clusters, or communities). Modularity is often used in optimization methods for detecting community structure in networks.
[12] This guidance sets out the principles that government departments and other public bodies should adopt for engaging stakeholders when developing policy and legislation.

analyses the South African and UK's local banking industry. SA has a developed and well-regulated banking system which compares favourably with the regulatory environment applied by the developed countries (Moloi, 2014). UK banks are highlighted as superior in setting fee structures, communication strategies, and ethical behaviour (Rootman, 2006; Rootman, Tait, & Sharp, 2011).

The credit growth is analysed by reviewing profitability and liquidity through bank-specific and macroeconomic variables. The impact of changes in monetary policy in SA and the UK is among the chief factors in assessing the pattern of credit growth. The changes in inflation, interest rates, and more robust exchange rates place less pressure on household budgets, allowing consumers to spend more in real terms (The World Bank, 2018). It is significant to assess the impact of credit growth on the bank's profitability and liquidity because of unemployment and income inequality in SA (Statistics South Africa, 2020d). SA's unemployment rate for 2020 was 28.74%, and the UK's was 4.34% (Statista, 2021). The UK is relatively low compared to SA, and the unemployment rates in the UK do not reflect the adverse effects of the pandemic, which may, to a point, be a result of the government support schemes in the UK (Stewart, 2021). One such UK scheme is the Coronavirus Job Retention Scheme initiated to support workers and businesses.

1.3 Significance of the study

This research provides new insights into the increase in consumer borrowing and how it has been heightened by the economic downturn and job losses. The South African economy has shrunk by 1.4% in the fourth quarter of 2019 (Statistics South Africa, 2020b). The growth for 2019 was 0.2%, the lowest since the 2008-2009 global financial crisis. For the first quarter of 2020, unemployment has increased by 1% to 30.1%, with the number of unemployed individuals having increased by 344 000 (Statistics South Africa, 2020d). Increased consumer spending can lead to increased credit, leading to a rise in defaults, and could spark a financial crisis which could cause economic weaknesses (Albanesi et al., 2017). Banks tend to lower their lending criteria during periods of fast credit growth which could worsen the credit portfolio (Tunay et al., 2020) and lead to financial pressure and loan losses. The impact of this possible spike in credit in a weakened economy may prove key in assessing the financial performance on the bank's side. Reuters (2020) notes that SA's bad debts could rise to 10% of lending executed by banks this year as compared to the 6%

during the 2007-2009 financial crisis. The total debt defaults in SA reached R4 billion in 2020 (Business Insider South Africa, 2021) and £851 million in the UK (de Best, 2021).

Banks provide credit based on a customer's expected future income and expenditure. If there are changes to customers' income and expenditure, the bank's debt-servicing capacity may be decreased (Berge & Boye, 2007). The unemployment rate is an essential driving force contributing to financial institutions' loss on loans (Berge & Boye, 2007). Unemployment is likely to affect bank profitability and liquidity because customers may not be able to keep up with their credit commitments because of a loss of income. In addition to the current supply shocks, consumers are cautious in spending. Cautious spending happens because of not knowing how long the crisis will last, coupled with voluntary restricting of movements and, with it, their spending (Harari & Keep, 2021). An increase in unemployment could decrease profitability by causing a rise in possible non-payment loans. Unemployment could decrease liquidity by reducing available cash flow for the bank (Bordeleau & Graham, 2010). This paper may aid local banks in assessing how credit growth can impact their profitability and liquidity. Therefore, providing insight on how to manage credit lending policies to achieve business goals and maximise benefits.

Lenders are motivated to build on future business opportunities increasing profitability, but often fail to understand that every decision has potential risks (Han, 2016). Internal factors may fundamentally affect banks' profitability, while macroeconomic factors can largely influence the performance of the entire banking sector (Saeed, 2014). The analysis presented in this study may provide valuable information to the banking sector for future research exploring the impact of internal and external determinants on bank profitability and liquidity. As a result, a study reviewing credit growth in local banks in SA and the UK is significant because of the current state of the global economy and the banking industry's response to increased consumer demand. Credit growth is a good predictor of a financial crisis, specifically a banking crisis (Alessi & Detken, 2018).

1.4 Research questions and hypotheses

The research questions for this study are:

1. Does credit growth increase profitability in the local banking industry in South Africa?

The null and alternate hypotheses of interest are:

$$H_0: Credit\ growth\ will\ not\ increase\ profitability\ in\ the\ local\ banking\ industry\ in\ South\ Africa$$
$$H_1: Credit\ growth\ will\ increase\ profitability\ in\ the\ local\ banking\ industry\ in\ South\ Africa$$

2. Does credit growth decrease liquidity in the local banking industry in South Africa?

The null and alternate hypotheses of interest are:

$$H_0: Credit\ growth\ will\ not\ decrease\ liquidity\ in\ the\ local\ banking\ industry\ in\ South\ Africa$$
$$H_1: Credit\ growth\ will\ decrease\ liquidity\ in\ the\ local\ banking\ industry\ in\ South\ Africa$$

3. Does credit growth increase profitability in the local banking industry in the UK?

The null and alternate hypotheses of interest are:

$$H_0: Credit\ growth\ will\ not\ increase\ profitability\ in\ the\ local\ banking\ industry\ in\ the\ UK$$
$$H_1: Credit\ growth\ will\ increase\ profitability\ in\ the\ local\ banking\ industry\ in\ the\ UK$$

4. Does credit growth decrease liquidity in the local banking industry in the UK?

The null and alternate hypotheses of interest are:

$$H_0: Credit\ growth\ will\ not\ decrease\ liquidity\ in\ the\ local\ banking\ industry\ in\ the\ UK$$
$$H_1: Credit\ growth\ will\ decrease\ liquidity\ in\ the\ local\ banking\ industry\ in\ the\ UK$$

5. Does a higher cost-to-income ratio decrease profitability for banks?

The null and alternate hypotheses of interest are:

$$H_0: A\ higher\ cost\ to\ income\ ratio\ does\ not\ decrease\ bank\ profitability$$
$$H_1: A\ higher\ cost\ to\ income\ ratio\ does\ decrease\ bank\ profitability$$

1.5 Assumptions, limitations, and delimitations

The study aims to assess the impact of credit growth on local SA and UK bank profitability and liquidity: it is assumed that high credit growth will increase bank profitability. The assumption is that the SA local banks sample factors in a solid analysis for SA in representing the growth in credit as banks are a typical facility for consumer credit (Berge & Boye, 2007). There are thirteen local banks in SA: the dataset is limited to eleven SA banks because of the lack of data, making up 84.62% of the sample. There are eighty-seven local banks in the UK (Bank Info UK, 2020). The dataset is limited to fifty-four UK banks, representing 62% of the sample because of the availability of information.

The major limitation faced in the study is a data constraint, the use of eight independent variables for profitability (total assets; equity assets; loan assets; cost/Income ratio; credit growth; GDP; CPI and HHI) and nine independent variables for liquidity (ROAE; total assets; equity assets; credit growth; GDP; CPI; interest rate on loans; interest rate margin and unemployment rates). The following lack of data is a limitation of the study. Two local SA banks, Discovery Bank Limited and Tyme Bank Limited, are excluded from the dataset because the data are not publicly available. Discovery Bank Limited specifically was launched in March 2019, placing it out of the scope for the sample. In the UK sample, Noble Grossart Limited was removed from the list at the time of data collection because its financial statements did not reflect any loan amounts; this precludes the bank from the dataset. Cheltenham & Gloucester PLC did not have loan data for 2015 to 2018, Marsden Building Society, and Virgin Money UK PLC did not have data for 2014. Therefore, the growth rate for 2014-2015 and 2018-2018 has been recorded as a blank in the statistical analysis. The regression allows for blank data. Financial data for 2021 was not available for specific banks in the dataset, so the year 2021 for all banks in the sample has been excluded from the sample period so as not to skew the results.

The scope of this study has a delimitation in the geographical setting. It is limited to reviewing the credit growth's impact on SA and UK local bank profitability and liquidity. So, the results are applicable within the domains of these countries. SA and the UK were selected for this study because of their practicality and the researcher's interest. The Banks Act in South Africa is based on similar legislation as in the United Kingdom, Canada, and Australia (Rootman et al., 2011), therefore a comparative study with the United Kingdom (UK) will be added to the study. It would be valuable for South African banks to partner with UK banks and benchmark themselves against these banks to develop as institutions and to learn how to adapt their banking aspects (Rootman et al., 2011). SA is a developing country with different administrative conditions from the UK, a developed country, making the results only beneficial for South African and UK policymakers. The purposive sampling procedure decreases the generalisability[13] of the findings because the study analyses annual data sets of the variables in SA and the UK over six years, 2015-2020, and is a delimitation on sample size. South Africa also has a sophisticated financial market with strong banking frameworks which is reflected by the UK's investment in SA (Mendez Parra, Raga, & Sommer, 2020). The investment in SA displays robust and well-established trade and investment linkages between the two countries, underpinned by the below (Mendez Parra et al., 2020):

1. Deep historical ties, similarities in legal frameworks, and cultural associations
2. A two-hour time difference
3. Sharing English as a common language for business

1.6 Definitions of terms

Credit: the term 'credit' used in this paper refers to total credit relating to mortgages, secured credit, credit facilities, unsecured credit, short-term credit, and development credit as described in the Consumer Credit Market Report (National Credit Regulator, 2019).

Gross Debtors Book: the outstanding balances at the end of the period, including fees and interest which have been earned and capitalised to the debtor's book (National Credit Regulator, 2019).

[13] Generalisability is the extent to which the findings of a study can be applied to other situations. Generalisability can be divided into population generalisability, environmental generalisability, and temporal generalisability

Financial performance: is a subjective measure of how well a company can use assets from its primary business mode to generate revenue. It is also used as a general measure of a company's overall financial health over a given period (Kenton, 2020).

M4 Lending: the term 'M4 lending' used in this paper refers to lending to the household sector, such as lending secured on dwellings (mortgages), credit cards, loans, overdrafts, and lending to unincorporated businesses and non-profit institutions, as defined in the bankstat tables (Bank of England, 2020b).

Lending secured on dwellings: relates to mortgages in the UK (Bank of England, 2020b).

Chapter 2: Literature Review

A bank's focal point is three main principles which guide its operations: profitability, liquidity, and solvency (Javed & Basheer, 2017). The literature review evaluates the impact of credit growth on bank profitability and liquidity as a function of microeconomic and macroeconomic determinants. Microeconomic determinants are internal factors affected by a bank's management decisions. Macroeconomic determinants are external factors which reflect the economic and legal environment in which the bank operates and affect bank performance. Microeconomic and macroeconomic activities fundamentally depend on the banking sector (Rahman, Hamid, & Khan, 2015). This section reviews three main areas which affect credit growth, bank profitability, and liquidity: firstly, economic inefficiencies and unemployment; secondly, other micro and macro determinants which are fundamental to the study; thirdly, banking strategies influenced by internal and external factors and lastly, a discussion on credit growth.

2.1 Economy inefficiencies and unemployment

The relationship between the development of the banking system and the total credit disbursed is closely influenced by the level of economic development (Lucchetti, Papi, & Zazzaro, 2001). Bank failure will directly impact economic activities in other sectors, such as services, because banks are linked to the whole economy (Zeitun & Benjelloun, 2012). This section reviews GDP,

unemployment, and Covid-19 (the global pandemic is vital in understanding a further decline in GDP) to examine the economy and its inefficiencies' impact on bank profitability and liquidity.

GDP reflects the upturns and downturns in business cycles; as a result, movements in general activity level are likely to impact bank profitability directly (Gul, Irshad, & Zaman, 2011). Lower GDP levels reflect poor economic environments, resulting in lower household income caused by unemployment. However, higher GDP levels may mean that banks can allow looser lending standards and make credit more affordable for consumers. Credit loss provisions tend to be low in emerging economies such as SA if GDP growth is high, boosting bank profits (Kohlscheen, Murcia Pabón, & Contreras, 2018). As noted by Saeed (2014), the study in the UK tends to agree with this finding. An increase in GDP reflects a healthier economic condition, and this positively impacts a bank's profitability levels (Saeed, 2014). A study on Anglo-Saxon countries found that GDP influences net interest income through lending activity and loan loss provisions (Albertazzi & Gambacorta, 2009); the effect of GDP represents the correlation between net interest income and the bank business cycle. In contrast, findings in a study in Sub-Saharan Africa show that GDP and inflation have a negative impact on bank profitability; this implies diminished economic growth (Francis, 2013). Essentially, the relationship between GDP growth and profitability could be pro-cyclical[14] (Albertazzi & Gambacorta, 2009; Francis, 2013). This relationship exists because bank credit may decrease during economic downswings, which is associated with increased risk (Naceur, 2003).

When we review the GDP levels in both SA and the UK, we find the following: the GDP in SA was 1.4% down in the second quarter of 2021 from the first quarter of 2020 (Statistics South Africa, 2020c). The GDP level in the UK for the second quarter of 2021 was 4.4% below the pre-Covid-19 pandemic at the end of 2019 (Office for National Statistics, 2021b). Consequently, the effects of Covid-19 had damaging consequences on GDP in both SA and the UK. The lockdown and other efforts to contain the virus impact economic activity. The impact on activities is related to a forced decrease in production and household demand for goods/services, interrupted global production with exports and imports, and an impact on business investments (Arndt et al., 2020). During this pandemic, banks have further seen a decline in bank transactions: this includes a decrease in credit card payments and fewer individuals using automated teller machines (ATMs).

[14] Strictly speaking, procyclicality refers to the tendency of financial variables to fluctuate around a trend during the economic cycle. Increased procyclicality simply means fluctuations with broader amplitude.

The decreased levels reduce fee collections by banks, impacting their profitability (Ozili & Arun, 2020). While the pandemic has impacted GDP, it also has a ripple effect on unemployment. The pandemic increases the unemployment rate negatively (Su, Dai, Ullah, & Andlib, 2021). Unemployment is another macroeconomic indicator of bank profitability.

Unemployment may impact credit growth because many households are becoming destitute, so a review is significant. The unemployment rate is crucial in estimating the economic condition (Jadah, Alghanimi, Al-Dahaan, & Al-Husainy, 2020). Extreme unemployment rates are reflected in SA, which experiences a high level of inequality; Maradza (2018) notes that this is primarily because of race and geographical circumstances. There have been developments in the reasoning behind income inequality: it is now determined by job ranks, unemployed and employed individuals, and the overall level of skill in existence: inequality results in higher levels of unemployment (Maradza, 2018). Unemployment increased from 23.3% in July 2020 to 34.4% in July 2021, a 47.6% increase over a year (Statistics South Africa, 2021). The number of unemployed increased by 584 000 between quarters one and two of 2021, closing on a total of 7.8 million unemployed at the end of quarter two of 2021 (Statistics South Africa, 2021). The Quarterly Labour Force Survey (QLFS) refers to the number of discouraged work-seekers which increased by 186 000 more between quarters one and two of 2021, ending at 3.3 million discouraged work-seekers. The most significant decline in unemployment was in the finance industry, with a reduction of 50 000 employees (Statistics South Africa, 2020d). This cut relates to banks closing branches to digitise their operations.

On the contrary, the UK experienced only a 0.3% increase in unemployment from 4.3% in June 2020 to 4.6% in June 2021 (Office for National Statistics, 2021d) compared to 47.6% in SA. The unemployment levels in the UK have shown signs of recovery, with their payroll employees showing another monthly increase of 241 000 in August 2021, reverting to levels reflected before Covid-19 (Office for National Statistics, 2021c). The number of job vacancies in the second quarter of 2021 was 1.034 million, the first increase of over a million since records began, with job vacancies growing by 35.2% (Office for National Statistics, 2021c). As illustrated by the unemployment rates, SA faces a higher unemployment rate than the UK, a developed country. The higher the percentage of unemployment, the further it will impact the cash flow streams of households (Jadah et al., 2020).

Unemployment has a roll-on effect on bank profitability; it is affected by consumers being incapable of meeting their obligations. Particularly low-income households recently experienced increased unsecured debt caused by unemployment circumstances (Arndt et al., 2020). The weakened economy and increased unemployment have led to a rise of 250 basis points in non-performing loans in the banking sector (Ozili & Arun, 2020). It is further confirmed by Bordeleau & Graham (2010) that the weakened economy, coupled with a reduction in GDP, is predicted to harm bank profitability, resulting in a higher probability of defaulting on loans. There is an apparent demand for bank managers to react to risks linked with fluctuating macroeconomic factors, namely GDP growth, unemployment, and inflation (Francis, 2013). Nonetheless, the GDP decline and unemployment are not the only factors that trigger economic inefficiencies. The following section discusses additional internal and external factors which can impact the economy and credit growth.

2.2 Micro and macro determinants

The noted literature on factors impacting bank profitability and liquidity is extensive; internal and external factors may influence a bank's profitability. This section of the study discusses those internal and external factors and macroeconomic strategies.

The internal determinants are micro or bank-specific factors (Lartey et al., 2013). The micro or bank-specific factors can be split into two categories: financial statement and non-financial statement variables. Financial statement variables are expense control, loan structure, bank credit, market interest rates, bank operating efficiency, and capital or liquidity management changes. Non-financial statement variables relate to bank size, location, and the number of branches the bank has. The external determinants are macro factors and relate to variables that expose the legal and economic environment, impacting the banking sector's operation and functioning. These factors include competition, ownership, financial regulation, market share, and market concentration (Lartey et al., 2013; Ramadan, Kilani, & Kaddumi, 2011). The bank-specific determinants have more power to control banks' profitability; these variables are considered independent, which may influence profitability internally (Javed & Basheer, 2017; Sufian, 2009).

A profitable and intact banking sector is in a more significant position to withstand adverse shocks and contribute to the permanence of the financial system (Athanasoglou, Brissimis, & Delis, 2008; Javed & Basheer, 2017). Developing countries such as SA need to ensure that the banking system is stable and efficient (Javed & Basheer, 2017). Notably, Rahman et al. (2015) indicate that the banking sector of developing countries is less stable than in developed countries, such as the UK. However, SA has strong banking frameworks, a refined financial market and reasonably high skills base compared with other African countries (Mendez Parra et al., 2020). Phenomena like globalisation, deregulation, growing international financial markets, and advances in technology, identifying the internal and external determinants of bank performance are significant predictors of volatile economic conditions (Albertazzi & Gambacorta, 2009; Javed & Basheer, 2017).

The numerous studies completed in several countries (Athanasoglou et al., 2008; Rossi et al., 2019; Vodová, 2013; Vong & Chan, 2009) demonstrate these effects of internal and external determinants on bank performance. A study in Greece assessed the impact of bank-specific, industry-specific and macroeconomic factors on bank profitability and found that all bank-specific variables, excluding bank size, considerably affect bank profitability (Athanasoglou et al., 2008). Another study in Macao assessed the impact of bank-specific and macroeconomic factors and the financial structure on the performance of banks (Vong & Chan, 2009). The research found that only the inflation rate reflected a relationship with the performance of banks and that capital strength is fundamental to a bank's profitability. If inflation is not controlled, an influential economic structure cannot materialise and bank profitability is not expected (Korkmaz, 2015). Inflation can be kept under control by following an effective monetary policy and the banking system should be strengthened. These studies show the link between internal and external determinants of bank profitability. However, it is essential to note an additional link between liquidity and profitability.

Prior studies in Jordan, Pakistan, Canada, and Nigeria (Alshatti, 2015; Arif & Anees, 2012; Bordeleau & Graham, 2010; Olagunju, David, & Samuel, 2012) have identified liquidity as a contributing factor to bank profitability. Bank liquidity is found to decrease with the size of the bank. Larger banks depend on the interbank market, and small to medium-sized banks hold liquid assets as a safeguard (Vodová, 2013). Notably, liquidity was also found to have a negative relationship with the interest margin and monetary policy interest rate. These variables lead to increased lending activity by banks and reduce liquidity (Vodová, 2013). Further noted were a

positive relationship between liquidity and capital adequacy, interest rates on loans, and bank profitability. Central banks have responded to the pandemic by lowering interest rates, Ozili and Arun (2020) argue that this alone would not encourage demand from consumers.

Researchers have claimed that liquid assets create an opportunity cost for the bank because of their low return compared to other assets (Bordeleau & Graham, 2010; Lartey et al., 2013). In contradiction, other researchers claim that sufficient liquidity assists banks in reducing liquidity risk and improves profitability (Bourke, 1989; Saeed, 2014). Another comparative study of the United States and Asia (Abbas, Iqbal, & Aziz, 2019) has further found that liquidity and bank capital positively correlate with bank profitability, while credit risk negatively impacts bank profitability. A study on SA commercial banks found a positive relationship between liquidity risk and bank profitability (Cheng, Nsiah, Ofori, & Ayisi, 2020). Positive liquidity means SA banks have enough cash and cash equivalents to combat the insistent withdrawal of customers. The findings of the SA study support previous studies in Kenya and Ghana (Lartey et al., 2013; Njure, 2014). A study in the UK supplements the results of SA; it finds that liquidity has a positive impact on return on assets and return on equity which, in essence, measure bank profitability (Saeed, 2014). Liquidity was a challenging factor for UK banks during the 2008 financial crisis, as examined by Berrios (2013) but the UK banking sector held its liquidity and performed well. The positive relationship between liquidity and bank profitability does not mean banks need to hold significant cash and idle funds to become profitable. Instead, banks should balance lending credits to borrowers and cash reserves because lending helps with profitability (Berrios, 2013).

Other studies have found a negative relationship between liquidity risk and bank profitability (Mamatzakis & Bermpei, 2014; Marozva, 2015; Rifqah Amaliah & Hassan). Some reasoning is that while liquid assets ultimately decrease liquidity risk, these assets can carry high costs and negatively impact bank profitability (Mamatzakis & Bermpei, 2014). Liquid assets held excessively could reduce profitability (Lartey et al., 2013). Therefore, according to conflicting studies, profitability is negatively related to liquidity risk (Arif & Anees, 2012; Ramadan et al., 2011). Nevertheless, many other variables impact profitability. Competition is another variable which is considered.

Moyo (2018) found that competition negatively affects bank efficiency, impacting a bank's soundness, further confirmed by a study in Malaysia (Ab-Rahim, Md-Nor, Ramlee, & Ubaidillah, 2012). This could be because competition may lead to inefficiencies in the banking industry since the motivation for market share reduces lending relationships (Alhassan & Ohene-Asare, 2016). Banks may become desperate to retain existing customers and appeal to new customers with increased competition. Moreover, banks may not use proper credit scoring systems (Moyo, 2018); consequently, inefficient credit scoring systems may attract customers incapable of meeting their credit commitments, increasing non-performing loans. Hicks (1935), on the other hand, discusses that there is less pressure to compete in highly concentrated markets, which causes a decrease in management's effort to operate efficiently (Hicks, 1935). This contributes to lower profits and corresponds with a study in Sub-Saharan Africa which found bank profits are likely to be lower in highly concentrated markets (Sarpong-Kumankoma, Abor, Aboagye, & Amidu, 2018).

In contrast, other conflicting views find a positive relationship between market structure or share and bank profitability (Petria, Capraru, & Ihnatov, 2015; Staikouras & Wood, 2004; Yuanita, 2019). A concentrated market allows firms to have market power, as Yuanita (2019) noted, and set prices above marginal cost, resulting in higher profits. A study in Macao tends to agree with this concept of increased profitability (Vong & Chan, 2009). However, a study on the banking sector in Korea finds that increasing concentration does not necessarily add to profitability (Karasulu, 2001). Table 1 summarises the various conflicting views; it is evident that macroeconomic factors affect bank profitability; therefore, implemented macroeconomic strategies could also impact credit growth.

Table 1: Other study findings – Macro-economic variable impact on bank profitability

Country	Impact on Bank Profitability	Reference
Greece	All bank-specific variables, excluding bank size, considerably affect bank profitability.	(Athanasoglou et al., 2008)
Macao	Only the inflation rate reflected a relationship with the performance of banks, and that capital strength is fundamental to a bank's profitability.	(Vong & Chan, 2009)
Hungary	There is a positive relationship between liquidity and capital adequacy, interest rates on loans, and bank profitability.	(Vodová, 2013)

Comparative: United States & Asia	Liquidity and bank capital positively correlate with bank profitability, while credit risk negatively impacts bank profitability.	(Abbas et al., 2019)
SA	A positive relationship between liquidity risk and bank profitability	(Cheng et al., 2020)
UK	Liquidity has a positive impact on return on assets and return on equity which, in essence, measure bank profitability	(Saeed, 2014)
Switzerland	Found that while liquid assets ultimately decrease liquidity risk, these assets can carry high costs and negatively impact bank profitability	(Mamatzakis & Bermpei, 2014)
SA	Competition negatively affects bank efficiency, impacting a bank's soundness, and lowers profitability.	(Moyo, 2018)
Sub-Saharan Africa	Bank profits are likely to be lower in highly concentrated markets	(Sarpong-Kumankoma et al., 2018)
Europe & Indonesia	Found a positive relationship between market structure or share and bank profitability.	(Petria et al., 2015; Staikouras & Wood, 2004; Yuanita, 2019)
Korea	Increasing concentration does not necessarily add to profitability	(Karasulu, 2001)

Macroeconomic strategies which stimulate low inflation and steady output growth will encourage credit expansion (Ramadan et al., 2011). An increase in credit may lead to poor financial performance and can be explained by macroeconomic phenomena[15]. Banks would sensibly allow more credit based on their present opportunities without taking more risks; subsequently, the economy would suddenly face a shock and end the credit boom, causing poor performance (Fahlenbrach et al., 2018). Banks who realise significant amounts of fast credit growth usually perform worse than other banks because they fail to set aside provisions for expected loan losses (Fahlenbrach et al., 2018). Banks must properly screen and observe customers, leading to a lower level of non-performing loans. The 2008 global financial crisis resulted from a credit boom and loose monetary policy (Albanesi et al., 2017). This caused subprime mortgages, weakened regulatory structures, and high leverage in the banking sector (Ozili & Arun, 2020). SARB initiated changes to monetary policy to rapidly raise liquidity: through reductions in the repo rate amounting to a cumulative 275 basis points between January 2020 and May 2020. There were changes to prudential regulations to allow a sufficient flow of funds in banking and financial systems (South African Reserve Bank, 2020b). In November 2020, The BoE's Monetary Policy Committee (MPC) set their monetary policy to meet the 2% inflation target, which would help sustain growth and

[15] Macroeconomics studies economy-wide phenomena such as inflation, price levels, rate of economic growth, national income, GDP, and changes in unemployment.

employment (Bank of England, 2020a). These factors encourage banks to implement new strategies to counteract the effects of economic inefficiencies and unemployment. The following section examines banking strategies employed by banks.

2.3 Banking strategies employed

This section highlights the essential function of banks and how it leads to banking strategies employed by banks. These banking strategies consist of lower interest rates and relaxed credit standards. The section further elaborates how such strategies can increase credit granted and possibly result in credit losses. The review of the three extensive competitive forces, information technology, globalisation, and deregulation which destabilise the banking sector concludes in section 2.3.

The service of banks providing credit to customers is an essential function (Berge & Boye, 2007; Foos, Norden, & Weber, 2010). The significance of low to moderate income households being capable of accessing emergency funds is key to consumer credit (Brobeck, 2008). To provide this service, Foos et al. (2010) confirms that banks work on various strategies based on the opportunities to advertise their products, such as lowered interest rates and relaxed credit standards. The BoE held a special MPC meeting on 19 March 2020. They decided to cut their bank rate by 15 basis points to 0.1%, the most critical interest rate in the UK, which acts as a base rate for all other financial products (Bank of England, 2020d). The bank rate cut will mean cheaper loans for businesses and households. The number of capital banks and building societies needed to set against their lending to UK businesses and households has also been reduced in response to Covid-19. Therefore, supporting the expansion of bank lending in the UK.

In SA, a 2020 working paper on the South African bank lending practices (Brits, Jackson, & Mahlaba, 2020) confirms that a reduction in policy interest rates by 300 basis points had no considerable impact on bank credit decisions, but a purchase of bonds by the SARB to inject liquidity had a positive impact. The working paper looks at the impact on household lending and strategic decisions taken by banks and found the below key points:

1. Terms and conditions for mortgage lending were made more stringent.

2. Stricter credit scoring and loan-to-value[16] ratios.
3. Higher interest rate margins, specifically on riskier loans.

In response to Covid-19, the credit stance of banks towards households is shown to be far more stringent. This is plausible from a bank perspective because of increased default risk through salary reductions, retrenchments, and uncertainty (Brits et al., 2020). However, it is noteworthy to mention that while the credit stance of banks increased caution, SARB's MPC lowered the repo rate through four consecutive reductions from March to June 2020 (Meyer & Morope, 2020). The private sector banks followed these reductions and lowered their weighted average deposit and lending interest rate. Therefore, lower interest rates or relaxed credit standards significantly increase credit because many consumers have unfavourable credit scores. Occasionally, this may be a credit barrier, but lenders allowing relaxed credit standards will result in more customers applying for and granted credit. Increased credit growth with lower credit scores points to the possibility of loan losses (Fernández de Lis et al., 2000).

Abnormal loan growth leads to increased loan losses, decreased profits, and solvency (Fernández de Lis et al., 2000; Foos et al., 2010). A shift in mortgage supply in the United States led to a faster rise in borrowers' risk and increased mortgage credit growth (Mian & Sufi, 2009). The strategies employed by banks to lighten credit standards would allow previously unqualified consumers to be accepted, increasing the likelihood of borrowers defaulting on loans (Han, 2016). The strategic response of the majority of large banks is to move toward mega-mergers[17] and internal cost-cutting, but these prove to be inadequate in the long run to equalise income reduction and counter new competitive forces (Holland, Lockett, & Blackman, 1997)

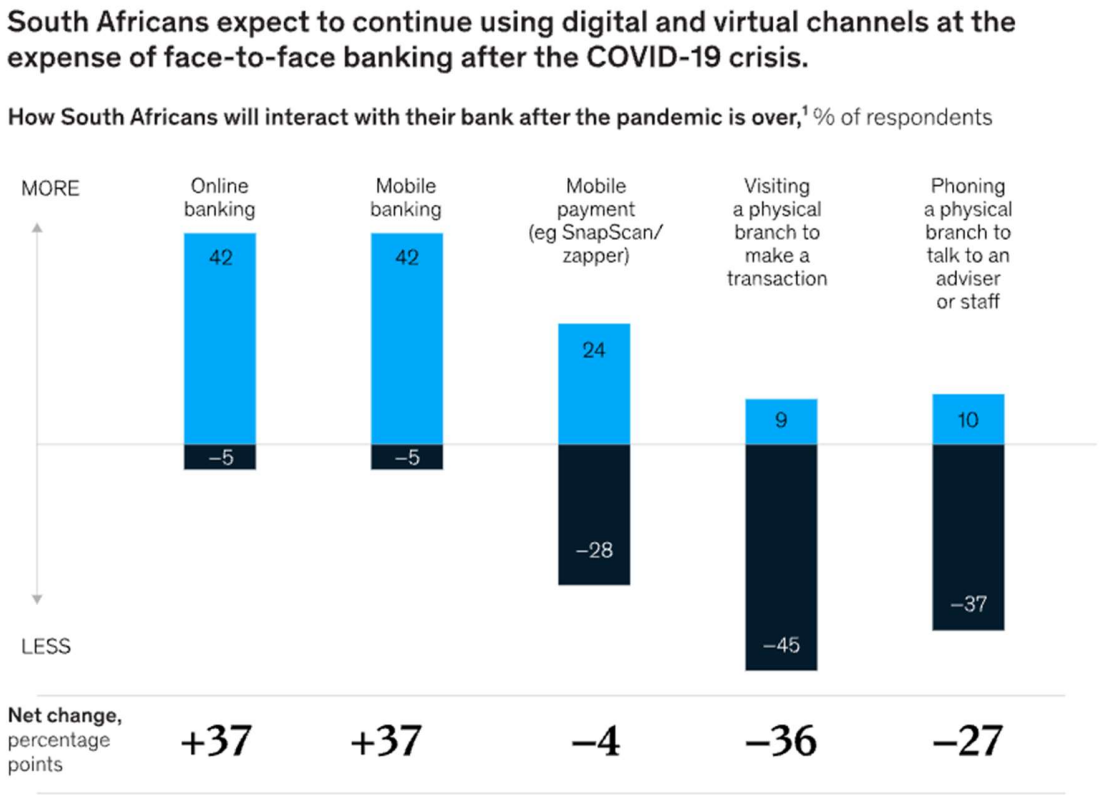
The three extensive competitive forces of information technology, globalisation, and deregulation destabilise the banking sector, causing changes on a larger scale to innovative customer tastes and allowing new entrants (Holland et al., 1997). Banks worldwide are under pressure to constantly find solutions to meet the challenges of a rapidly changing environment. A strategy implemented by banks is embracing and enhancing technological avenues to match demand and

[16] The loan-to-value (LTV) ratio is an assessment of lending risk which financial institutions and other lenders examine before approving a mortgage.
[17] A megamerger is an agreement that unites two large corporations, typically in a transaction worth billions of dollars, into one new legal entity.

have a minimal impact on performance. Information technology allows banks to coordinate product development, delivery, and marketing (Holland et al., 1997). Banks with the ability to invest and incorporate information technology will allow them to be leaders in a highly competitive global market (Tiwari, 2012). The global pandemic has further forced businesses to think strategically by embracing information technology.

Banks which have not already digitised their processes started initiating electronic banking channels. Holland et al. (1997) discuss how virtual banking replaces traditional banking channels, eliminating the need for customers to go into a branch by providing electronic banking channels. The upsurge of advancements in technology has changed the banking industry from paper and branch-based systems to digitised and networked banking services (Tiwari, 2012). The banking sector continues to operate despite the impact of Covid-19 (Arndt et al., 2020). While branch activity may be reduced, there is an increase in online activities. Covid-19 has specifically made South Africans more comfortable with online banking. In November 2020, 45% of South Africans said they would visit a physical bank branch less often, while 42% said they would increase their online and mobile interactions with their respective banks (Bagus, 2020). Figure 1 depicts the impact of Covid-19 on the use of virtual and digital channels.

Figure 1: How South Africans will interact with their banks after the pandemic is over



Adapted from McKinsey Financial Insights Pulse Survey, conducted June 7, 2020, sampled, and weighted to match South Africa's general population aged ≥ 18 years (n = 697). The margin of error for wave-over-wave changes is ± 6 percentage points for all financial decision-makers and is larger for sub-audiences. https://www.mckinsey.com/featured-insights/middle-east-and-africa/beyond-covid-19-charting-the-road-to-recovery-for-south-african-insurers.

A 2021 report by the UK Payment Market Information found that at the end of 2020, over 17 million people registered for mobile payments (Cooper, 2021). The adoption of digital innovations by banks and their customers has been accelerated by the pandemic and improved service quality and satisfaction (Financial Conduct Authority, 2022). Research from the Financial Conduct Authority (FCA) showed that 3 in 5 UK customers would consider banking with a bank with no physical branches, as Cooper (2021) confirmed. Information technology plays a vital role in the banking sector but could have a ripple effect on deregulation. A study showed that the

technological innovations caused branch deregulation[18] in the United States and changed income distribution (Beck, Levine, & Levkov, 2010). Branch deregulation improved bank efficiency and performance while also intensifying bank competition.

To assess the economics of bank regulation, financial individuals need to understand the economic role of banks (Bhattacharya, Boot, & Thakor, 1998). The banking sector is more regulated than other industries. Such regulation has been more rigorous in developing economies where controls on banking activities have been enforced to meet social and economic objectives of development (Kumbhakar & Sarkar, 2003). Over time, many of these banking systems experienced poor performance and were perceived to be caused by the regulations. Deregulation[19] can encourage increased international competition between banks' financial and non-financial organisations (Holland et al., 1997). Bank deregulation enhances competition and correspondingly decreases corporate volatility by lessening credit constraints and reducing the procyclicality of borrowing[20] (Jiang, Levine, Lin, & Wei, 2020). So, banks employ a range of strategic options which allow them to thrive in a new banking environment, namely, those related to their cost structure and different sizes of different banks (Holland et al., 1997).

A higher level of bank profitability in the UK and US was linked to their more flexible cost structure (Albertazzi & Gambacorta, 2009). However, the strategic response for several European banks was to increase the total size of their operations, in this way, decreasing unit costs and accelerating the move towards a universal banking model (Nellis, McCaffery, & Hutchinson, 2000). This structure allows the banking firm to link all the critical areas within the financial services industry. However, there has been debate about implementing a universal banking strategy and whether such a strategy's outcome is the globalisation of the banking sector. The contention is that with low levels of banking concentration in several European countries, banks are developing market share through mergers and consolidations (Hutchinson & Nellis, 1998; Lee, 1996). These views are challenged because they presume globalisation is a natural extension of the universal banking model; it disregards the limitations on the development of

[18] Removal of restrictions on intrastate branching.
[19] Deregulation is the removal or reduction of government regulations in a specific industry. The goals are to allow industries to operate businesses more freely, make decisions efficiently, and remove corporate restrictions.
[20] Procyclicality is the idea that the banking sector, through a variety of channels or 'causal' links with the real economy, can exacerbate economic cycles.

economies of scale (Nellis et al., 2000). It disregards that specialisation attained by focusing on core areas of business can be a feasible strategy. The globalisation of financial services has been motivated by technology, deregulation, and intensifying financial integration between countries (Álvarez, García, & Gouveia, 2016).

Regulation aspects also cause global banks to question their expansion in specific regions; these relate to strict liquidity or capital requirements, segregation of activities, ring-fencing, and the countries' regulatory reform implementation speed and level. Globalisation creates an environment where institutional investors effectively challenge banks' quasi-monopoly positions in deposit gathering[21] and loan financing facilities (Nellis et al., 2000). The banking sector is a rapidly changing and globally competitive environment. Banks seek to further economies of scale through growth and adopt the fundamental goal of endeavouring to become global players (Nellis et al., 2000). Expansion can occur in two ways: 1) cross-border lending from the home country and 2) forming physical branches or subsidiaries (Álvarez et al., 2016). Therefore a blend of globalisation, advancements in technology, and deregulation ensure that innovation expands quickly and that the traditional barriers to entry are disconnected (Holland et al., 1997).

All these strategies function well during regular economic periods; the question is which strategies allow the banking sector to thrive during periods of distress. It is argued that abnormal credit growth is seen as a sign of health during financial distress and not a compulsive strategy banks follow (Rossi et al., 2019). Several factors allow credit growth even during a financial crisis. Banks which were capitalised well were more profitable and had fast credit growth (Chen & Wu, 2014), showing a sign of health. More resistance is shown in countries with a flexible exchange rate system during a crisis (Feldkircher, 2014). Research findings indicate that a rapid increase in credit is usually linked to low loan provisions. Lower provisions lead to higher profitability in the year of growth but lower performance following the rapid increase and are considered a myopic[22] approach by banks. Banks focus more on profitability while ignoring the possible risk effects of increased lending. A myopic approach is unlikely to occur during a crisis since the need for profitability drives managers to have more sensible lending policies and to adopt quality strategies (Rossi et al., 2019). Therefore, under these assumptions, fast credit growth during a crisis may

[21] Some banks provide deposit collection services which involve bank couriers collecting cash deposits from businesses.
[22] Lacking foresight or intellectual insight.

increase bank profitability because if a bank increases credit, it usually represents good financial health. Increased credit is one of the critical drivers of increasing profitability for traditional commercial banks. Their crucial form of business relates to loaning money (Rossi et al., 2019). Chen & Wu (2014) found that countries with better banking regulations experienced faster credit growth during the 2008-2009 crisis.

The risk posed by credit growth is perceived to be high and the real risk lies with the banking industry. Suppose a bank's strategy is to contract with riskier credit. In that case, it is assumed that its provision for credit losses will be higher to reflect this high risk (Fahlenbrach et al., 2018). If this is not the case, it may mean that these banks are not entirely realising the risk involved with increasing credit when they are growing at a quicker rate than are other banks. For example, major players in the industry perceive their credit process as being sound and take for granted the risk factor because they control the bulk of the market. Bank profits are considered a crucial source of equity. A strategy which can lead to more secure banks is if they do not pay out all of their profits and, instead, retain them as equity (Sahyouni & Wang, 2018).

High profits could help a country's financial stability. Banks with higher equity to assets ratio support this relationship as they are more profitable than banks with lower equity (Anbar & Alper, 2011; Goddard, Molyneux, & Wilson, 2004; Sahyouni & Wang, 2018). Implementing a more traditional approach such as the deposit and loan-based business model will allow banks to enhance profits with lower liquid assets (Bordeleau & Graham, 2010). Liquidity is considered a significant factor during a crisis. Banks have low cash levels and cannot meet their obligations as they become due (Bordeleau & Graham, 2010). All the strategies employed by banks are used to increase profitability and to maintain financial resources. These strategies can impact credit growth amongst the various environmental factors.

2.4 Credit growth

The importance of credit in economic development is that countries with improved functioning banks grow faster (Akinlo & Oni, 2015). Consumer tastes and needs are significant in assessing the level of credit within a country because customer satisfaction substantially affects purchasing decisions (Laksana, Tj, & Wahyoedi, 2022). These needs assist banks in assessing possible

increases in credit since certain characteristic biases may influence consumer behaviour. Migiro (2017) confirms that these biases may cause consumers to misjudge their borrowing needs and borrow more than they require. However, the factors discussed in the above sections show that micro and macroeconomic swings influence credit growth.

As discussed, SA experiences a higher level of unemployment than the UK, resulting from income inequality, which impacts consumer borrowing and household income. For this reason, microfinance institutions (MFIs) have an increased consumer base as their customers are drawn from poorer communities (Baumann, 2005). Coupled with this, the global banking industry faces difficulties such as rising default rates and outstanding stock of distressed assets which leads banks to intensify risk aversion, which increases the risk premium banks require from customers (Maudos, 2013). This increases the financial constraints on businesses and households. Banks, however, need to use the consumers' funds efficiently while carrying most of the risk (Shah et al., 2018). As a result, banks adapt to changing banking environments and consumer tastes to reduce risk and increase profits.

Technological advancements are one way banks attempt to cut costs and meet customers' ever-changing needs. FirstRand (FNB), Standard Bank of South Africa (SBSA), ABSA, and Nedbank have increased their IT expenditure over the last five years, making up an average of 21% of total expenses compared to the global average of 18% (Businesstech, 2020). Businesstech (2020) notes that analysts' predictions show that the pandemic will change consumer behaviour. Cooper (2021) found that customers in the UK prefer to transact with no physical branches, allowing UK banks to reduce costs while providing improved customer service. Additionally, low inflation rates will allow SARB and the BoE to change monetary policy, improving the credit process because household indebtedness would be reduced (Maradza, 2018). If the economy is resilient, employment wages will be increased, contributing to more consumer credit consumption (Maradza, 2018). These factors are fundamental in reviewing the credit levels within SA and the UK.

The total credit granted by banks is reviewed for SA and the UK to evaluate credit consumption. Total credit granted by banks in SA for the fourth quarter of 2020 experienced a quarter-on-quarter increase of 20.32% and a yearly increase of 10.40% from R115.93 billion to R127.99 billion

(National Credit Regulator, 2020b). Banks held 82.89% of the total credit granted for the fourth quarter of 2020. The number of mortgage agreements and secured credit increased from the fourth quarter of 2019 to the fourth quarter of 2020 by 43.28% and 2.86%, respectively. Credit facilities, unsecured credit, and short-term credit decreased by 16.72%, 24.50%, and 14.56%. Vehicles dominated the secured credit portion by holding 92.18%. Total mortgages accounted for 50.53% of the total gross debtor's book with a year-on-year increase of 3.78%, with most agreements granted over R700 000, holding 50.70%. Increased vehicle purchases and mortgages could result from lower interest rates, making it affordable for consumers to access credit with lower instalments resulting in huge savings.

However, the credit rejection rate in SA increased from 58.97% to 62.94% from 2019 to 2020 (National Credit Regulator, 2020b). The high credit rejection rate supports the concern that more consumers require credit and how numerous households are considered over-indebted. Consumer indebtedness is reflected by more than half of these applications being rejected. Household debt as a percentage of nominal disposable income has increased to 73.7% (South African Reserve Bank, 2020a). These statistics allow an understanding of how credit growth affects banks. Suppose specific consumers are granted credit but cannot maintain their agreements and keep up with payments; this leads to possible defaults (Berge & Boye, 2007). There is a concern that the gross debtor's book distribution is 82.91% for banks (National Credit Regulator, 2020b). The high distribution shows that most of the outstanding debt relates to the banking industry. The gross debtor's book for banks has increased by 3.30% for the year, and the quarter increase was only 1.74% (National Credit Regulator, 2020b). Banks maintain the bulk percentage of the debtor's book, so they bear the bulk of the risk when dealing with possible defaults.

Total gross lending in the UK for 2020 amounted to £484,151 million, of which £243,916 million was related to gross lending on secured dwellings and £240,235 million related to consumer credit such as credit cards and other related credit (Bank of England, 2020b). The mortgage market in the UK stayed strong in December 2020. Individuals borrowed an additional £5.6 billion secured on their homes because of the large volume of home approvals over the second half of 2020 (Bank of England, 2020c). The number was 103 400 in December, well over the February number of 73 400, which as per the BoE, is an indicator for future lending (Bank of England, 2020c). Also, since Covid-19 arrived, 12% of UK adults have applied for credit cards, personal loans, overdrafts,

or overdraft extensions (Hughes, 2020). Credit cards are the most popular form of credit at 8%. However, the credit rejections in the UK were caused by a lack of data rather than poor credit histories. According to the credit reference agency Aire, four in every five consumer applications were refused (Hughes, 2020).

SA and UK's individual economic environment impacts bank profitability and liquidity along with various internal factors which in turn influence credit growth. We have established that the period of study is impacted in 2020 by the global pandemic which has a ripple impact on economic activity such as drops in GDP and financial strain on household consumption. As well as the fact that SA in general experiences challenges such as higher unemployment. The pandemic, however, has pushed banks into advancing technology and improving processes and productivity. These internal and external factors are fundamental to the study.

Chapter 3: Research Method

Section 3.1 of the study outlines the research method adopted and the explanations of the independent and dependent variables required. Section 3.2 identifies the population and study sample size. Section 3.3 discusses the sources of data and instrumentation used. Section 3.4 discusses how the data were collected and managed. Section 3.5 concludes the chapter by discussing the validity and reliability of the above.

3.1 Overview of method

A quantitative approach using descriptive statistics and regression analysis is used in this study and secondary data are collected. Quantitative research is considered a numerical representation manipulation of observations to describe and explain the phenomena which those observations reflect (Sukamolson, 2007). This approach is appropriate because the study assesses the impact of credit growth on local bank profitability and liquidity. The study completes a comparative view of SA and the UK. Annual financial statements are sampled for eleven banks in SA and fifty-four banks in the UK over six years (2015 to 2020). The method replicates the study performed in Europe (Rossi et al., 2019). Since the study in Europe only addresses profitability, a study completed in Hungary is partially replicated to review liquidity (Vodová, 2013).

The research methodology used for this study is ex post facto[23] research (Leedy & Ormrod, 2016). The researcher does not have any direct control over the variables, and this type of research is formally used to test the researcher's hypothesis. No manipulation of the variables is possible because any determined differences are ex post facto, and they arise from differences in measurement results according to the geographical setting (SA and UK) and applicable banking industry regulations.

The effects of credit growth on local bank profitability and liquidity are examined using descriptive statistics. These include evaluating the mean, mode, median, standard deviation, and minimum and maximum of the variables selected. The impact of credit growth on bank profitability and liquidity is further analysed through panel regression. The panel regression looks at the percentage of credit growth per bank versus the percentage of credit growth in the country, including bank-specific and macroeconomic variables.

The regression analysis uses panel data combined with time series and cross-section data. Tests for multicollinearity which are relevant for the study are completed through EViews software. The data are in a panel format and the researcher needs to account for company differences. To determine whether the researcher should account for company effect/cross-section effect, the researcher fits a fixed-effect model and runs a diagnostic test (F-test) to see whether cross-sectional differences should be accounted for. The null hypothesis should be tested (comparing the pooled and fixed effects models). If the probability value is 0, the researcher rejects the null hypothesis and concludes that company differences/cross-section effects/FE should be accounted for. Next, the researcher needs to decide whether the Fixed Effects (FE) or Random Effects (RE) is the better model. The Hausman test determines which is the best model between the FE and the RE. The convention of interpreting this is that when the probability value is <0.05, the researcher will reject the null (then FE is the best model), and when it is >0.05 (the RE is the best model), the null hypothesis is accepted.

However, suppose the Hausman test probability is 1. In that case, this means that the RE is not valid and that FE is consistent (this is a particular case of interpreting the Hausman). This result

[23] An ex post facto study is where a researcher identifies events which have already occurred or conditions which already present themselves. It provides an alternate means by which the researcher can investigate the extent to which specific independent variable may possibly affect dependent variables of interest.

is probably a result of the correlation between the RE and the explanatory variables. Another reason is that the sample includes most of the population (banks). There is no random sample (one of the requirements for RE). The researcher would reject null in this case, and FE would be the best model.

There are two key variables used in the panel regression: bank-specific and macroeconomic data, including competitive condition figures. The macroeconomic data relate to real GDP growth, inflation, and interest rates. The measure of market concentration is the Herfindahl-Hirschman Index (HHI)[24] of total assets. The research conducted assesses the growth level in credit banks granted by analysing which factors influence this growth and the relevant consequences. The following section discusses each of the variables used in the regression analysis.

Bank Profitability

Bank specific variables

Dependent variables

Two dependent variables measure bank profitability: return on average assets (ROAA) and return on average equity (ROAE). The data are obtained from the bank's financial statements and these values are then captured into an Excel sheet in a specific format specified by a statistician with each bank's ROAA and ROAE in columns and the six years in rows. This method of preparing data for statistical analysis is used for each calculated variable. ROAA explains the bank's ability to generate profits from its managed assets and is considered the primary ratio for assessing a bank's profitability. ROAE illustrates how much profit the bank can generate with the shareholder's capital. The ROAA and ROAE are used as a ratio in the panel regression.

[24] The Herfindahl index is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them.

Explanatory variables

Explanatory variables include total assets, equity assets, loan assets, and cost income. The study subsequently considers different bank-specific features as explanatory variables. Total assets are included in the set of explanatory variables as it allows the researcher to account for bank size. The data is retrieved from each bank's financial statements and total assets are logged in the regression analysis. An increase in bank size may have two opposite effects, the chance to exploit scale and scope economies or the costs linked with government and complexity. Economies of scope are economies due to the joint production of output[25]. In contrast, economies of scale are production economies resulting from output expansion (Kim, 1986). Therefore, the expected sign is unidentified. Additional explanatory variables are discussed below.

The equity to total assets ratio measures the strength and is a calculated figure using total equity and total assets retrieved from each bank's financial statements: the lower the leverage, the lower the risk factor. The lower levels of riskiness will increase a bank's reliability and decrease funding costs which positively affects profitability (Dietrich & Wanzenried, 2014). Conversely, lower levels of riskiness are associated with lower profitability based on the traditional risk-return theory (Rossi et al., 2019). Because of the conflicting views about effects, the effect of a bank's capitalisation on profitability is not determined in theory.

The other variable used as a ratio is the net loans to total assets ratio; this measures the weight of loans on total assets. This variable reflects a bank's traditional approach to lending activities and its experience in granting credit (Rossi et al., 2019). It allows an understanding of the credit risk evaluation. It is expected that this variable will have a positive effect on profitability because loans are interest-paying, increasing net interest income (Abreu & Mendes, 2001; Demirgüç-Kunt & Huizinga, 2000)

The last bank-specific variable relates to cost income data, which is used to gauge bank efficiency, and it is calculated as a ratio between operating costs (administrative, staff, and property costs)

[25] Joint production is a pervasive problem that arises whenever the effect of a defensive behaviour on individual welfare does not operate exclusively through the influence of the behaviour on one home-produced output.

and gross revenues. This ratio is fundamental during distressing periods: if margins are put under pressure, a lower ratio level is likely to affect bank profitability positively (Rossi et al., 2019). The following section discusses the macroeconomic variables used in the study.

Macroeconomic Variables

Macroeconomic variables in SA and the UK are used in this study. These include GDP, CPI, and HHI. The strength of competition in the banking sector affects the costs and revenues, the reliability of the economic situation, and other external factors. This affects the quality of a bank's assets and, its financial stability. GDP is one of the macroeconomic variables used to hone in on the variations in the economic cycle. GDP reflects the increases and decreases which result in business cycles; these movements are expected to impact banks' profitability directly (Gul et al., 2011).

Since only SA and the UK are being analysed, it allows for comparing the environment when dealing with monetary policy. The impact of differences in inflation and interest rates over the six years is evaluated to explore monetary policy further. The consumer price index (CPI) is used to measure inflation. Inflation influences different items on the bank's balance sheet like asset value, interest rates on loans, and funding costs. The increase in credit demand increases interest rates while more liquidity on the market reduces funding costs for banks (Rossi et al., 2019).

The last macroeconomic variable used is the HHI of total assets for each country which measures market concentration. Competition is the key driver of strong and effective markets (Moyo, 2018); it drives productivity growth in any economy. A concentrated banking market can be the result of intense competition between intermediaries, leading to reduced bank profitability (Rossi et al., 2019).

The measurements used in the method are further validated by the replicated study in Europe (Rossi et al., 2019) and various other researchers (Alper & Anbar, 2011; Ani, Ugwunta, Ezeudu, & Ugwuanyi, 2012; Chronopoulos, Liu, McMillan, & Wilson, 2015; Javaid, Anwar, Zaman, & Gafoor, 2011; Petria et al., 2015). A statistician has been consulted regarding the regression

model and variables used. The statistician is satisfied with the model and measures and assisted the researcher in completing the statistical analysis required for this study.

The following panel model is used to review credit growth and bank profitability:

$$\prod it = \alpha \prod it - 1 + \beta_1 ACG_{it} + \sum_{j=1}^{J} \beta j X_{it}^{j} + \sum_{m=1}^{M} \beta m X_{it}^{m} + \beta_d + \varepsilon_{it}$$

Where

$\prod it$ = profitability of bank i in time t,

ε_{it} = the disturbance term,

X_{it}^{j} = explanatory variables are grouped into bank-specific

X_{it}^{m} = explanatory variables are grouped into macroeconomic

The equation above differs from the European study. It was adapted to suit the needs to perform the study in a South African and UK context. Loan loss provisions have not been included as a dependent variable because of the lack of available data per bank within the UK. It has been removed from the equation. The final specification of the profitability model is as follows.

Profitability model:

- Dependent variables: ROAA & ROAE, respectively
- Independent variables: Total assets; Equity assets; Loan Assets; Cost/Income ratio; Credit growth; GDP; CPI; HHI

Table 2: Definition of variables

Type	Variable	Description
Dependent variables	ROAA	Return on average assets
	ROAE	Return on average equity

	Credit Growth	Difference between bank's total credit growth and country's total credit growth
Bank-specific variables	Total assets	Natural Logarithm of total assets
	Equity assets	Equity over total assets
	Loans assets	Net bank credit (loans) over total assets
	Cost Income	Cost income ratio
Macroeconomic and	GDP growth rate	Annual real GDP growth
Competitive variables	CPI	Consumer price index
	HHI	Herfindahl Hirschman Index of Total Assets

The following section discusses the impact of credit growth on bank liquidity and the liquidity model.

Bank liquidity

Liquidity is the ability of the bank to fund increases in assets and meet obligations as they become due without incurring losses (Vodová, 2013). The methodology replicates the study performed in Hungary (Vodová, 2013). The variables used in the panel data regression analysis are credit growth, total assets, equity on total assets of the bank, returns on average equity, GDP growth rate, inflation rate (CPI), the interest rate on loans, the difference between the interest rate on loans and interest rate on deposits and the unemployment rate. The study only considers credit growth, three bank-specific variables, and five macroeconomic variables. The other variables are not used per the Hungary study because of no data being available to adapt the model to a South African and UK context. The variables excluded are the share of non-performing loans on the total volume of loans and the interest rate on interbank transactions (the researcher is not looking at the interbank market). The dummy variable for the financial crisis (1 in periods of crisis and 0 in periods of no crisis) was removed at the statistical analysis point as it had variability problems and it was not viable to add into the equation.

Because of the various changes in monetary policy, it is essential to assess the relationship between the interest rate on loans and bank liquidity. This relationship may signal that banks are more likely to focus on the interest margin. It may highlight that higher lending rates do not encourage banks to lend more (Vodová, 2013). As a result, this variable is used in the regression analysis as one of the explanatory variables X_{it}. Another explanatory variable used in the

regression is the difference between the interest rate on loans and the interest rate on deposits (IRM). An increase in the interest margin encourages banks to focus more on lending activities (Vodová, 2013). Consequently, liquid assets decrease. The remaining macroeconomic variables are discussed in the bank profitability section. The panel is unequal since some of the banks in the sample do not report over the entire period. The final specification of the liquidity model is as follows:

Liquidity:

- Dependent variable: liquidity ratio
- Independent variables: ROAE; Total assets; Equity assets; Credit growth; GDP; CPI; IRL; IRM; UNE

The liquidity ratio used is specified below:

L1 = $\frac{Liquid\ Assets}{Total\ Assets}.100(\%)$

For the liquidity ratio, the following equation is estimated:

$$L_{it} = \alpha + \beta'.X_{it} + \delta_i + \varepsilon_{it}$$

Where

L_{it} = liquidity ratio for bank i in time t, (L1)

X_{it} = vector of explanatory variables for bank i in time t,

α = constant,

β' = coefficient, which represents the slope of variables,

δ_i = fixed effects in bank i,

ε_i = error term.

Table 3: Definition of variables

Type	Variable	Description
Bank-specific variables	ROAE	Return on average equity
	Total assets	Natural Logarithm of total assets
	Equity Assets	Equity over total assets
Macroeconomic and	GDP growth rate	Annual real GDP growth
Competitive variables	CPI	Consumer price index
	IRL	Interest rate on loans
	IRM	Difference between the interest rate on loans and interest rate on deposits
	UNE	Unemployment rate

3.2 Population and study sample

The study uses a specific sample because the selection has been composed to suit the study relative to the local banking industry. The researcher sampled annual financial statements for each bank for six years (2015 to 2020) retrieved from the Banker database (The Banker, 2020). Where no financial statements were available, annual financial statements were collected from the relevant bank's site.

There are thirteen local banks in SA, and only eleven of the thirteen banks are included because of the availability of information, making up 84.62% of the sample. South African banks make up 82.89% of the total credit granted in SA (National Credit Regulator, 2020a). It is to be noted that Grindrod Bank's sample relates to Grindrod Limited (parent company) where part of the business belongs to the freight division. There are a variety of microfinance institutions within SA: this study only looks at South African local banks to obtain a standardised sample and avoid mixed results when looking at the impact of credit growth on the profitability and liquidity of banks. In contrast, there are eighty-seven local banks in the UK (Bank Info UK, 2020). The dataset consists of fifty-four UK banks: representing 62% of the sample because of the availability of information. The sample size for the UK is much larger than that of SA because the UK's local banking market comprises other facilities such as building societies.

3.3 Sources of data – instrumentation

Data were mainly collected from secondary sources. The list of SA banks is obtained from SARB (South African Reserve Bank, 2020c), and the list of UK banks is obtained from Bank Info (Bank Info UK, 2020). The total credit levels for SA are obtained from the latest NCR's consumer credit report (National Credit Regulator, 2019). The consumer credit report breaks down the total credit per industry and category, allowing the researcher to obtain relevant information. The total credit levels for the UK are obtained from the BoE bankstat tables (Bank of England, 2020b). The bank's annual financial statements are obtained from The Banker database (The Banker, 2020). Since the year-end financial period for all banks is not the same, specific years which fall within the sample period may not be available on The Banker database. It is then retrieved from the bank's official website. SARB and Statistics South Africa are used to retrieve data on macroeconomic and competitive conditions. The BoE and Trading Economics are used to retrieve the UK macroeconomic variables.

3.4 Data collection and data management

The dataset includes bank-level data obtained from the Statement of Financial Position and Statement of Comprehensive Income of the individual banks. Bank-level data calculate ROAA and ROAE, equity over total assets, and loans over total assets. The financial statements for the sampled SA and UK banks are downloaded from The Banker database in an Excel format. Financial statements for specific years which fall within the sample period but are not available on The Banker database are retrieved from the bank's official website. These financial statements are available in a PDF format and are converted to Excel using a PDF converter when needed.

The bank-specific variables are captured into Excel in a specific format required for the statistical software (EViews) used to run the descriptive statistics and regression analysis. Consultations with a statistician revealed that the naming convention of the data is fundamental, and as such, the datasets are described as the name of the relevant bank, an underscore, and the specific variable for that bank - "bank_variable." The naming convention is essential for EViews to recognise cross-sections: the dates are entered into rows, and the variables are entered in columns. Bank-specific and macroeconomic variables which require a calculation first are

completed and captured in Excel as specified. These relate to variables IRM and HHI. All other variables which do not require a computation are captured into Excel in that required format.

Macroeconomic data such as interest rates, unemployment rates, consumer price index, and GDP growth are downloaded in an Excel format from SARB (South African Reserve Bank, n.d.), Statistics South Africa (Statistics South Africa, 2020a), and Trading Economics (Trading Economics, 2022).

3.5 Validity and reliability

The study uses a representative sample; the SA and UK bank sample are listed as locally controlled banks. Obtaining a representative sample is one of the strategies used to enhance external validity (Leedy & Ormrod, 2016). There are thirteen banks in SA (South African Reserve Bank, 2020b) and eighty-seven banks in the UK (Bank Info UK, 2020). There is no value in sampling the entire population for smaller populations of a hundred or less (Leedy & Ormrod, 2016). The sample size is considered sufficient as the study only looks at the local banking industry. The SA sample of eleven banks makes up 84.62%, and the UK bank sample makes up 62.07%. The method is motivated by literature as it replicates the study done in Europe (Rossi et al., 2019) and Hungary (Vodová, 2013), enhancing validity. These studies have similar sampling as they both use non-probability sampling[26] and sample bank-level and macroeconomic data. Replication allows generalisability to other settings, populations, and conditions. The study also reviews a sample from one specific industry, the banking industry. One industry ensures minimal disruption to the cause-and-effect relationship from possible factors which may arise from varying industries.

The validity of a measurement instrument can take different forms, namely, face validity, content validity, and construct validity (Leedy & Ormrod, 2016). As face validity is more subjective, it is often considered the weakest form of validity (DeVon, Block, Moyle-Wright, Ernst, Hayden, Lazzara, Savoy, & Kostas-Polston, 2007). The tests performed using descriptive statistics and regression analysis reviews the relationship between credit growth and bank profitability and

[26] Non-probability sampling involves non-random selection based on convenience or other criteria, allowing the researcher to easily collect data.

liquidity. Considering this study is a replication of a current study, it is considered to have face validity. Relative to content validity, it looks at whether the instrument adequately covers all required content with respect to the variable (Heale & Twycross, 2015). The data obtained for a study should not be outdated to cover all aspects of the concept being measured to ensure validity. The secondary data obtained for this study are not older than six years, making the data relevant for the researcher's purpose. Internal and external factors are considered in the study representing the construct. The variables used in this study represent those influences which would affect the hypothesis. The choice to select a sample from one country allows the researcher to have a homogenous environment concerning monetary policy which enhances construct validity. The sample only consists of local banks within SA and the UK which is suitable for the study's purpose. The measure of profitability and liquidity with credit growth is used to answer the research questions. As a result, the statistical analysis measures how credit growth impacts bank profitability and liquidity. The construct in this study is the relationship between credit growth, bank profitability, and liquidity. It is being measured by observing all the internal and external variables.

A study is reliable if it can be repeated; it proves the consistency of the method across different researchers (Creswell, 2009). The study uses secondary data which are readily available; so, a different individual can use the same data and method and acquire the same results. The data include published annual financial statements of local banks, which will be considered reliable and verifiable as they would have been audited. The macroeconomic and competition data are reliable because it is obtained from SARB, the owner of implementing and changing monetary policy rates. Macroeconomic data from Trading Economics are reliable because they specifically release accurate economic data for all countries. The information obtained from Statistics SA is reliable as professional statisticians prepare it, and Stats SA is a data-driven organisation. The panel regression analysis completes all other diagnostics like serial correlation and multicollinearity.

Chapter 4: Research Findings

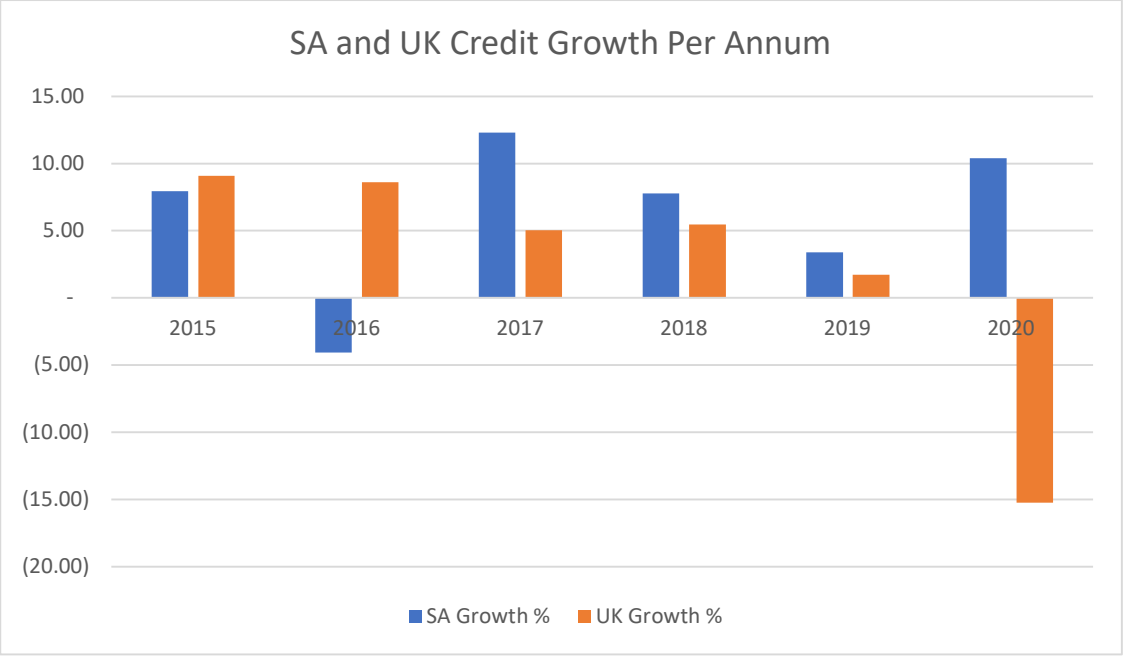
This section discusses the study results, including a credit growth analysis in SA and the UK, descriptive statistics and panel regression results, and tests for multicollinearity, which are relevant for the study, completed through EViews software. Section 4.1 presents the credit growth

analysis in SA and the UK and discusses the results of the descriptive statistics. Section 4.2 discusses the impact of credit growth on local bank profitability in SA and the UK. Section 4.3 discusses the impact of credit growth on local bank liquidity in SA and the UK. Section 4.4 concludes by discussing whether a higher cost-to-income ratio decreases bank profitability.

4.1 Credit growth analysis in SA and the UK

Credit growth's impact on the profitability and liquidity of SA and the UK local banks has been evaluated, and a comparative view is discussed in sections 4.2 and 4.3. However, it is important to look at the overall credit growth which was reviewed annually; refer to Figure 2 for the credit growth per annum for SA and the UK from 2015 to 2020.

Figure 2: SA and UK credit growth per annum



SA has seen its highest credit growth increase in 2017 at 12%. In contrast, the UK has seen its highest credit growth increase in 2015 at 9%. Notably, the UK credit growth is only related to lending to households and their lending categories are far more extensive than in SA. The 15%

decline in credit growth in 2020 for the UK is mainly caused by the impact of Covid-19. The local and national restrictions have led to significant falls in UK households and business consumption expenditure (Office for National Statistics, 2021a).

On the other hand, SA is seeing an increase in consumer consumption by 10% in 2020. SA mortgages increased to their highest at 43.28% compared to 2019 (National Credit Regulator, 2020b). SA Commercial banks report record levels in home loan disbursements (Mahlaka, 2021). SARB's decision to cut interest rates by 3% made it more affordable for existing homeowners to pay off home loans and made homeownership costs cheaper than at the start of 2020 (Mahlaka, 2021). This decision was made to mitigate the economic impact of Covid-19. SARB's MPC opted to cut rates before the full force of the shock appeared to provide maximum support to the economy early on (Stoddard, 2020). The easing of lockdown rules also further allowed consumers to move from or into their homes.

Table 4 outlays the sample composition; the UK's sample is more significant because of many local banks, including building societies[27]. Refer to appendix A for the list of South African banks and appendix B for UK banks.

Table 4: Sample composition

Country	No. of Observations	No. of Banks
South Africa	65[28]	11
United Kingdom	321[29]	54

Tables 5 and 6 summarise the descriptive statistics of the variables used in the panel regression for SA (Table 5 on page 51) and the UK (Table 6 on page 52). The variables' descriptive statistics are prepared to check the normality of the variables. It aims to summarise a sample rather than

[27] A building society is a financial institution owned by its members as a mutual organization. Building societies offer banking and related financial services, especially savings and mortgage lending.
[28] No. of Observations: 6*11 = 66, the number of observations are 65 based on no information being available for African bank for 2014, therefore 2015 credit growth was captured as a blank in the statistical analysis.
[29] No. of Observations: 6*54 = 324, the number of observations are 321 based on no information being available for Marsden Building Society, and Virgin Money UK PLC for 2014, and Cheltenham & Gloucester PLC for 2018. Therefore, credit growth for 2015 and 2019 was captured as a blank in the statistical analysis.

use the data to study the population that the sample of data is believed to represent (Javed & Basheer, 2017). The skewness for SA's statistics exceeds -1 and +1 for ROAE, liquidity ratio (LR), loan assets, equity assets, GDP, and IRL, further showing that the data are skewed and not normally distributed. This means these variables' data points are not relatively similar, they do not occur within a small range of values, reflecting more outliers[30].

Variables such as loan assets, GDP, and IRL are expected to have outliers, specifically due to the economic decline further exacerbated by the pandemic. As seen in Figure 2, credit growth increased in SA in 2020 because of the pandemic, which led to reduced GDP and interest rates. The rest of the parameters (ROAA, total assets, cost-to-income, credit growth, CPI, HHI, IRM, and UNE) lie between -1 to +1, indicating normal distribution. It indicates that the variables are normally distributed; in other words, it lies on the bell curve – so there is a peak in the middle and two tails.

Skewness tells us about the direction of the outliers. The skewness of the UK's statistics shows that only ROAA, ROAE, LR, equity assets, cost-to-income, credit growth, GDP, and IRM are not normally distributed. The rest of the parameters are normally distributed (total assets, loan assets, CPI, HHI, IRL, and UNE). On the other hand, the standard deviation measures the dispersion of data about the mean (Bordeleau & Graham, 2010). The HHI standard deviation for SA and the UK ranges between 0.11 and 0.21, indicating that the data set observations are closer to the mean. This means that all banks apply a relatively consistent HHI. This overall calculation for the HHI reflects that SA and UK's samples have had relatively consistent amounts of total assets year on year. Therefore, it can be concluded that a relatively consistent HHI was applied. Refer to appendices C and D for the HHI calculation for SA and the UK.

The highest standard deviation in SA is ROAE at 31.40, this shows that values are generally far from the mean, the ROAE mean is 8.70. The variability further proves the skewness of the data. African Bank specifically reflected high negative values for ROAE, likely because African Bank

[30] An outlier is an observation which lies an abnormal distance from other values in a random sample from a population.

was placed under curatorship[31] in 2014, resulting in negative equity values in 2015. The highest standard deviation for the UK is cost income at 81.14. This is because the UK sample consists of local banks and building societies, and these cost structures differ, resulting in a variation in cost income. Overall, there is greater variation in the data set in both SA and the UK because of the size difference of banks used in the study, which will be discussed in more detail in the following paragraph.

The mean and median are measures of central tendency. The mean is influenced by extreme outliers and will not be the best measure for skewed data. However, the median is resistant to the influence of outliers, and it will be a better measure of the centre with skewed data. Based on this, the mean and median are discussed as appropriate. The results show that ROAA, ROAE, and LR have a positive median ranging from 0.25 to 12.62 for both SA and the UK, showing that the sample includes banks with very different sizes and business mixes[32], the size is determined by total assets logged. The net loans to total assets ratio measure the percentage of assets tied up in loans. The results show that SA's median for net loans to total assets is 58.53, whereas the mean for the UK is 62.66. UK's sample is larger than SA's (11 banks versus 54), and therefore, the mean is slightly higher. The higher the ratio, the less liquid the bank is.

However, even though the ratio is high in the UK, the UK's prudential framework is calibrated to ensure that banks have sufficient liquidity to continue their activities through severe stresses (Bank of England, 2022). In SA, SARB creates a liquidity requirement in the money market, which banks refinance at the repo rate - a fixed policy interest rate determined by the MPC (South African Reserve Bank, 2021). Through this refinancing system, SARB provides liquidity to commercial banks. The extreme issues of unemployment and economic decline in SA compared to the UK are observable by the mean for unemployment, 27.17 for SA, and only 4.42 for the UK. SA is a developing country, so it is likely to take longer to recover from negative economic impacts, coupled with the fact that SA faces a high level of inequality. Berge and Boye (2007) and Bordeleau and Graham (2010) confirm that unemployment is an essential contributor to bank profitability and liquidity.

[31] Curatorship is triggered by concerns about the management or financial viability of the bank. For example, if the board or executive management are found guilty of fraud, the central bank can remove them and appoint a curator to manage the bank until new management is put in place.
[32] Business mix is the range of products, services, or customers a business has.

The general economic environment impacted the financial stability of banks within SA and the UK, represented by the negative values for profitability (ROAA and ROAE). The economic environment impact can be seen by the minimum values in GDP in both SA (-6.96) and the UK (-9.79), further showing a decline in the general economy. These GDP values are negative in 2020, resulting from the impact of Covid-19. These impacts have a knock-on effect on credit growth as consumers attempt to borrow more to aid in financial hardships.

The descriptive statistics minimum values further show that the UK has seen the most significant drop in credit growth compared to SA. However, the UK has also seen the highest credit growth, as reflected by the maximum values. The minimum values reflect that the UK has seen a higher decline in credit growth in 2020 than SA because of the pandemic (Office for National Statistics, 2021a). However, maximum values show that, regardless of the extreme decline in credit growth in the UK in 2020, the economic environment in the UK is much stronger than it is in SA, with overall lower unemployment, interest, and inflation rates (mean of 4.42, 1.45 and 1.50 respectively).

The UK being a developed country, showed maximum inflation (CPI) at 2.56, whereas SA reached 6.59 over the six years. UK's maximum inflation rate still being lower than SA's minimum inflation rate (3.22), which reinforces the fact that the UK's economic environment is more stable than that of SA. Interest rates affect the cost of loans and, as a result, can speed up or slow down the economy. SA's lowest and highest IRL was 7.71 and 10.46 in comparison to UK, 1.10 and 1.70, respectively. This implies that although the impact of Covid allowed SA and UK local banks to reduce interest rates, it was not excessive in comparison to when their highest rate was offered. However, the results reflect that SA rates are considerably higher than that in the UK, and the overall economic environment in the UK allows UK banks to set lower interest rates. Lower interest rates contribute to higher credit growth (Foos et al., 2010). The minimum and maximum values for both SA and the UK show that the variables have considerable variability[33].

[33] Variability, almost by definition, is the extent to which data point in a statistical distribution or data set diverge—vary—from the average value, as well as the extent to which these data points differ from each other.

Table 5: Descriptive statistics – South Africa

	?ROAA	?ROAE	?LR	LOG(?TA)	?LOANA	?EQUITYA	?COSTINCOME	?CREDITGROW	SA_GDP	SA_CPI	SA_HHI	SA_IRL	SA_IRM	SA_UNE
Mean	1.571692	8.697385	0.255269	18.46413	53.11815	13.61246	59.60815	0.034308	-0.529385	4.689385	0.210765	9.700923	3.116154	27.17231
Median	1.080000	12.62000	0.210000	18.25766	58.53000	9.620000	59.62000	0.020000	0.400000	4.500000	0.211700	10.13000	3.120000	27.04000
Maximum	6.440000	29.47000	0.800000	21.37899	74.51000	34.46000	108.2600	0.380000	1.410000	6.590000	0.213300	10.46000	3.290000	28.74000
Minimum	-3.850000	-230.8400	0.060000	15.27473	9.530000	6.400000	33.18000	-0.200000	-6.960000	3.220000	0.207700	7.710000	2.830000	25.15000
Std. Dev.	1.882057	31.40408	0.166536	2.213114	18.31881	8.179620	13.14891	0.123021	2.956836	1.048928	0.002074	0.963452	0.150869	1.197673
Skewness	0.577320	-6.968657	1.731269	-0.041085	-1.043351	1.226647	0.652851	0.605218	-1.679080	0.542502	-0.467870	-1.361143	-0.782634	-0.176826
Kurtosis	4.245387	53.74166	5.847415	1.288744	2.901411	3.124599	5.009346	3.264892	3.964799	2.577701	1.603909	3.305594	2.698614	2.057010
Jarque-Bera	7.811323	7499.279	54.42923	7.949364	11.81929	16.34255	15.55215	4.158170	33.06352	3.671341	7.650175	20.32396	6.881598	2.747062
Probability	0.020128	0.000000	0.000000	0.018785	0.002713	0.000283	0.000420	0.125045	0.000000	0.159507	0.021817	0.000039	0.032039	0.253211
Sum	102.1600	565.3300	16.59248	1200.169	3452.680	884.8100	3874.530	2.230000	-34.41000	304.8100	13.69970	630.5600	202.5500	1766.200
Sum Sq. Dev.	226.6969	63117.85	1.774988	313.4639	21477.03	4281.995	11065.21	0.968594	559.5442	70.41598	0.000275	59.40734	1.456738	91.80295
Observations	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Cross sections	11	11	11	11	11	11	11	11	11	11	11	11	11	11

Table 6: Descriptive statistics – United Kingdom

	?ROAA	?ROAE	?LR	LOG(?TA)	?LOANA	?EQUITYA	?COSTINCOME	?CREDITGROW	UK_GDP	UK_CPI	UK_HHI	UK_IRL	UK_IRM	UK_UNE
Mean	0.521826	5.225081	0.221744	15.29599	62.65534	9.930473	77.78170	0.347197	-0.244594	1.498682	0.127225	1.448910	1.240187	4.416636
Median	0.358607	5.314660	0.178425	14.65506	69.31023	7.551109	70.87912	0.020000	1.370815	1.738105	0.116324	1.500000	1.200000	4.330000
Maximum	13.01568	106.8996	0.669669	20.91715	91.89900	95.53121	1448.955	85.49000	2.363070	2.557756	0.143913	1.700000	1.500000	5.300000
Minimum	-6.815079	-60.09803	0.003588	10.12178	0.000000	3.430279	24.77876	-0.640000	-9.790240	0.368047	0.110242	1.100000	1.100000	3.740000
Std. Dev.	1.535168	10.17160	0.139590	2.616171	21.41532	9.931136	81.14150	4.785567	4.313884	0.772815	0.013614	0.230096	0.122940	0.510191
Skewness	4.059416	3.025602	1.183617	0.495715	-0.977799	5.119924	15.18604	17.63299	-1.746974	0.022178	0.055368	-0.364432	1.268035	0.441856
Kurtosis	36.34289	43.55015	4.065270	2.379964	3.110448	34.59229	255.8346	314.1053	4.100713	1.593443	1.212571	1.603235	3.543384	2.114334
Jarque-Bera	15751.25	22482.46	90.12878	18.28866	51.31398	14751.65	867339.4	1311154.	179.4823	26.48746	42.89583	33.19936	89.97258	20.93657
Probability	0.000000	0.000000	0.000000	0.000107	0.000000	0.000000	0.000000	0.000000	0.000000	0.000002	0.000000	0.000000	0.000000	0.000028
Sum	167.5061	1677.251	71.17968	4910.013	20112.36	3187.682	24967.93	111.4504	-78.51474	481.0770	40.83932	465.1000	398.1000	1417.740
Sum Sq. Dev.	754.1573	33107.66	6.235305	2190.192	146757.1	31560.79	2106862.	7328.528	5955.069	191.1176	0.059309	16.94212	4.836589	83.29437
Observations	321	321	321	321	321	321	321	321	321	321	321	321	321	321
Cross sections	54	54	54	54	54	54	54	54	54	54	54	54	54	54

4.2 Credit growth's impact on SA and the UK's local bank profitability

A panel regression analysis was completed to evaluate the impact of credit growth on local bank profitability and liquidity in SA and the UK. This section discusses the results related to local bank profitability and the panel data regression analysis. The analysis involves different models and tests for multicollinearity needed when to arrive at the acceptable model for the regression.

Credit growth's impact on SA's local bank profitability

Appendix E represents the pooled regression for SA. Two models were applied FE and RE (refer to appendices F and G. After a diagnostic test (F-test) was completed (refer to tables 7 and 9), it was concluded that the FE models are best for all equations; cross-section dependence (correlation) was corrected where present. Tables 7 and 9 represent the cross-section dependence test for ROAA and ROAE in SA. Tables 8 and 10 present the results of the panel regression analysis for ROAA and ROAE, representing bank profitability in SA.

Table 7: SA: Residual cross-section dependence test – ROAA

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation)
Pool: POOL_SA_ROA
Periods included: 6
Cross-sections included: 11
Total panel (unbalanced) observations: 65
Test employs centered correlations computed from pairwise samples

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	69.03165	55	0.0967
Pesaran scaled LM	1.337865		0.1809
Bias-corrected scaled LM	0.237865		0.8120
Pesaran CD	-0.047925		0.9618

The null hypothesis[34] is accepted for ROAA (p-value >0.05); there is no correlation problem to be corrected. The final FE model is below.

[34] A null hypothesis is a type of statistical hypothesis which proposes that no statistical significance exists in a set of given observations.

Table 8: SA – Fixed effects – ROAA

Dependent Variable: ?ROAA
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-28.12777	27.29357	-1.030564	0.3081
LOG(?TOTALASSETS)	1.730673	0.723541	2.391949	0.0209
?LOANASSETS	-0.021365	0.017796	-1.200544	0.2361
?EQUITYASSETS	0.300486	0.058181	5.164666	0.0000
?COSTINCOMERATIO	-0.069554	0.016176	-4.299925	0.0001
?CREDITGROWTH	-0.214402	0.965184	-0.222136	0.8252
SA_GDP	0.137827	0.034653	3.977379	0.0002
SA_CPI	-0.065171	0.212498	-0.306689	0.7605
SA_HHI	-3.223971	82.11525	-0.039262	0.9689
Fixed Effects (Cross)				
ABSA_--C	-2.416296			
FNB_--C	-2.847954			
AFRICANBANK_--C	-4.729515			
BIDVEST_--C	1.298616			
CAPITEC_--C	0.527020			
GRINDROD_--C	3.945553			
INVESTEC_--C	-1.861260			
NEDBANK_--C	-2.205737			
SASFIN_--C	4.496646			
SBSA_--C	-2.756605			
UBANK_--C	5.761279			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.934427	Mean dependent var	1.571692
Adjusted R-squared	0.908767	S.D. dependent var	1.882057
S.E. of regression	0.568470	Akaike info criterion	1.947134
Sum squared resid	14.86529	Schwarz criterion	2.582724
Log likelihood	-44.28186	Hannan-Quinn criter.	2.197915
F-statistic	36.41688	Durbin-Watson stat	2.357780
Prob(F-statistic)	0.000000		

Redundant fixed effects tests
Pool: POOL_SA_ROA
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	27.770182	(10,46)	0.0000

Cross-section Chi-square	126.826790	10	0.0000

Table 9: SA: Residual cross-section dependence test – ROAE

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation)
Pool: POOL_SA_ROE
Periods included: 6
Cross-sections included: 11
Total panel (unbalanced) observations: 65
Test employs centered correlations computed from pairwise samples

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	113.1311	55	0.0000
Pesaran scaled LM	5.542586		0.0000
Bias-corrected scaled LM	4.442586		0.0000
Pesaran CD	2.585602		0.0097

For ROAE, we had a problem with correlation since the p-values are <0.05. It indicates strong evidence against the null hypothesis as there is less than a 5% probability that the null is correct (and the results are random). We rejected the null hypothesis of no cross-section[35] dependence. Problems with correlation prevent us from establishing whether there is a pattern in the data; so, it needs to be corrected. The most appropriate test to look at is the Pesaran CD since we had a low N (cross-sections). We corrected the FE model for ROAE with the cross-section seeming unrelated regressions[36] (correcting for heteroscedasticity[37] and correlation). Table 10 lists the final model for ROAE.

[35] Cross-sectional data refer to observations of many different individuals (subjects, objects) at a given time.
[36] Seemingly unrelated regressions (SUR) are a class of multivariate regression (multiple regression) models, normally belonging to the sub-class of linear regression models.
[37] Heteroscedasticity refers to the circumstance in which the variability of a variable is unequal across the range of values of a second variable that predicts it.

Table 10: SA - Fixed effects - ROAE

Dependent Variable: ?ROAE
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-209.0111	1103.301	-0.189442	0.8506
LOG(?TOTALASSETS)	14.30217	33.34918	0.428861	0.6700
?LOANASSETS	0.435764	0.479649	0.908505	0.3683
?EQUITYASSETS	4.135823	2.356795	1.754850	0.0859
?COSTINCOMERATIO	-1.989058	0.892935	-2.227551	0.0308
?CREDITGROWTH	-63.63818	51.65071	-1.232087	0.2242
SA_GDP	0.403067	1.237829	0.325624	0.7462
SA_CPI	-4.102385	8.696468	-0.471730	0.6393
SA_HHI	68.24662	2948.520	0.023146	0.9816
Fixed Effects (Cross)				
ABSA_--C	-3.433322			
FNB_--C	-25.18205			
AFRICANBANK_--C	-116.2225			
BIDVEST_--C	-1.207536			
CAPITEC_--C	-53.23987			
GRINDROD_--C	47.22286			
INVESTEC_--C	-6.313419			
NEDBANK_--C	-12.31029			
SASFIN_--C	48.32658			
SBSA_--C	-5.084425			
UBANK_--C	108.0736			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.568358	Mean dependent var	8.697385
Adjusted R-squared	0.399454	S.D. dependent var	31.40408
S.E. of regression	24.33656	Akaike info criterion	9.460706
Sum squared resid	27244.33	Schwarz criterion	10.09630
Log likelihood	-288.4729	Hannan-Quinn criter.	9.711487
F-statistic	3.364986	Durbin-Watson stat	1.763199
Prob(F-statistic)	0.000459		

Bordeleau and Graham (2010) confirm that the contribution of each predictor variable to the outcome of the dependent variable can be ascertained by looking at its significance. To determine the relationship between two variables, the study looks at the significance of each correlation. The SA significance of coefficients (t-stats; p-values) for bank profitability, represented by ROAA

and ROAE, are evaluated. If the significance p-value is >0.05, it can be concluded that the two variables are not correlated. If the significance p-value is ≤ 0.05, we can go on to interpret the strength of the correlation. Total assets, cost-to-income, and GDP are statistically significant on a 95% confidence level[38] (p-value <0.05). Equity assets are statistically significant on a 90-95% confidence level since the p-value is <0.1.

The final determinants for the final models for profitability in SA banks are equity assets, total assets, cost-to-income, and GDP. The significant relationships are further assessed by looking at the coefficient's signage which shows whether there is a negative or positive relationship with bank profitability. Total assets, equity assets, and GDP positively correlate with profitability, while the cost-to-income ratio negatively affects profitability. The total assets expected sign was unidentified. An increase in bank size may reflect the chance to exploit scale and scope economies or the costs linked with government and complexity. However, the results show that total assets show a positive relationship with profitability which means bank profitability increases as assets increase. The SA sample is relatively small with five banks dominating the sample (total assets), suggesting that there may be collusive behaviour among banks. In this way, increasing profits (Yuanita, 2019). Accordingly, the relationship between assets and profitability aligns with the sample size impact.

We find significant coefficients on equity assets; equity assets positively impact profitability. Greater regulatory capital levels appear to play a role in promoting profitability as found in the European study (Rossi et al., 2019). SA's ongoing implementation of Basel III[39] and global regulatory reforms highlight the fact that equity assets will increase profitability. The framework addresses both bank-specific and broader systemic risks by raising the quality of capital with a focus on common equity and the quantity of capital to ensure banks are better able to absorb losses (South African Reserve Bank, n.d.). Notably, in the banking sector, equity is an undesirable means of controlling risk because of the high costs of raising equity (Calomiris, Heider, & Hoerova, 2015).

[38] The 95% confidence interval is a range of values that the researcher can be 95% confident contains the true mean of the population. Because of natural sampling variability, the sample mean (centre of the CI) will vary from sample to sample.

[39] Basel III is the third Basel Accord, a framework which sets international standards for bank capital adequacy, stress testing, and liquidity requirements.

SA has experienced an economic decline as reflected by declining GDP rates and increasing unemployment rates. A decline of 8.15 in GDP from 2015 to 2020 and an increase of 3.59 in unemployment. Despite the economic decline, GDP in SA has a positive impact on profitability; this is most likely because when the economy stabilises, banks can allow flexible credit standards and boost profitability caused by improved household income. A positive relationship was expected in a European study, but the results found a negative relationship based on a crisis period. For this study, only one out of the six years was in crisis. The cost-to-income relationship is discussed in section 4.4.

Loan assets, CPI, HHI, and credit growth are insignificant and have no relationship with bank profitability. In such a case, the interpretation cannot go further because it is not statistically significant (Stockemer, Stockemer, & Glaeser, 2019). The implications of the insignificant relationship between credit growth and bank profitability result from the contrast between this study and previous literature. This study specifically focuses on the local banking sector, reducing the sample size. Notably

There are 65 registered banks and representative offices in SA (South African Reserve Bank, 2020c), and this study only focuses on the locally controlled banks, which represent 17% of the total bank population. Loan losses are excluded from the study because of a lack of information in the UK sector, so no loan losses were included for the SA sample either to keep the data comparable. The HHI insignificance may relate to the fact that the SA sample is small and the total assets per year for the eleven banks do not significantly vary; as a result, a relatively consistent HHI is applied. It is also expected that HHI will have a negative and significant coefficient in the regression, this is likely to be true in distressed periods where rivalries are fiercer (Rossi et al., 2019). However, in this study only 2020 has been impacted by the pandemic therefore it was not viable to include a dummy variable for periods in and out of crisis.

Credit growth's impact on the UK's local bank profitability

Tables 11 and 13 represent the cross-section dependence test for ROAA and ROAE in the UK. Tables 12 and 14 present the results of the panel regression analysis for ROAA and ROAE, representing bank profitability in the UK. The same statistical procedure followed for SA applies

to the UK, with pooled regression, FE, and RE listed in appendices G, H, and I. Because of N (sample size) being significant for the UK, we needed to correct the correlation since most statistics find a correlation. The final models are listed below.

Table 11: UK: Residual cross-section dependence test – ROAA

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation)
Pool: POOL_UK_ROA
Periods included: 6
Cross-sections included: 54
Total panel (unbalanced) observations: 321
Test employs centered correlations computed from pairwise samples

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	2273.145	1431	0.0000
Pesaran scaled LM	15.74172		0.0000
Bias-corrected scaled LM	10.34172		0.0000
Pesaran CD	11.08961		0.0000

Table 12: UK – Fixed effects – ROAA

Dependent Variable: ?ROAA
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.415961	2.612091	1.307750	0.1921
LOG(?TOTALASSETS)	-0.357280	0.152945	-2.336004	0.0203
?LOANASSETS	0.040301	0.013442	2.998104	0.0030
?EQUITYASSETS	-0.117281	0.076558	-1.531918	0.1268
?COSTINCOMERATIO	-0.002108	0.000467	-4.512272	0.0000
?CREDITGROWTH	0.014699	0.011552	1.272397	0.2044
UK_GDP	0.010289	0.016533	0.622321	0.5343
UK_CPI	0.008098	0.074926	0.108082	0.9140
UK_HHI	10.68663	5.219792	2.047330	0.0416
Fixed Effects (Cross)				
AHLIUNITED_--C	0.897566			
ALRAYAN_--C	1.431269			
ALLIEDIRISH_--C	1.784130			
ARBUTHNOT_--C	1.802595			
NEGARA_--C	-0.006164			
BANKOFSCOTLAND_--C	0.162264			

BARCLAYS_--C	2.659997
CHOARECO_--C	0.931759
THECHARITY_--C	-2.480890
THEROYALBANKOFSCOTLAND_--C	0.368547
CHORLEYANDDISTRICT_--C	-1.864156
COVENTRY_--C	-0.912420
COUTTSCO_--C	0.804132
CUMBERLAND_--C	-1.376160
CAPITALONE_--C	4.929339
EARLSHILTON_--C	-2.116787
ECOLOGY_--C	-1.981556
EUROPEARAB_--C	0.475267
CHELTENHAMGLOUCESTER_--C	11.39984
HARPENDEN_--C	-1.500391
ICBC_--C	1.976966
ICICI_--C	-0.669270
JULIANHODGE_--C	-0.320592
KINGDOM_--C	-1.904215
CLYDESDALE_--C	-1.043986
LEEDS_--C	-0.957037
LLOYDS_--C	1.060918
MARSDEN_--C	-2.033711
METRO_--C	-0.818883
NATIONALBANKOFKUWAIT_--C	0.868989
NATIONALCOUNTIES_--C	-1.326739
NATIONALWESTMINSTER_--C	0.721792
NATIONWIDE_--C	-0.224468
NORTHERN_--C	0.563832
PROGRESSIVE_--C	-1.623104
PUNJABNATIONALBANK_--C	-1.171097
HAMPSHIRETRUST_--C	-1.094649
RELIANCE_--C	-0.597329
SAFFRON_--C	-2.130656
SAINSBURYS_--C	-0.506820
SANTANDER_--C	0.486324
HINKLEYANDRUGBY_--C	-2.372701
SCOTTISH_--C	-1.799542
SECURETRUST_--C	1.317135
SHAWBROOK_--C	0.000599
SKIPTON_--C	-0.427788
STANDARDCHARTERED_--C	1.931239
TESCOPERSONALFINANCE_--C	0.791467
HSBC_--C	2.229104
MELTONMOWBRAY_--C	-1.891481
MONMOUTHSHIRE_--C	-1.909283
UNITYTRUST_--C	0.221595

VIRGINMONEY_--C	-0.634289
WEATHERBYS_--C	-0.665192

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.363987	Mean dependent var	0.521826
Adjusted R-squared	0.214192	S.D. dependent var	1.535168
S.E. of regression	1.360863	Akaike info criterion	3.625794
Sum squared resid	479.6542	Schwarz criterion	4.354235
Log likelihood	-519.9400	Hannan-Quinn criter.	3.916643
F-statistic	2.429903	Durbin-Watson stat	2.157679
Prob(F-statistic)	0.000001		

Table 13: UK: Residual cross-section dependence test – ROAE

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation)
Pool: POOL_UK_ROE
Periods included: 6
Cross-sections included: 54
Total panel (unbalanced) observations: 321
Test employs centered correlations computed from pairwise samples

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	1955.936	1431	0.0000
Pesaran scaled LM	9.812315		0.0000
Bias-corrected scaled LM	4.412315		0.0000
Pesaran CD	3.994014		0.0001

Table 14: UK – Fixed effects – ROAE

Dependent Variable: ?ROAE
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.74236	13.23656	-0.887115	0.3758
LOG(?TOTALASSETS)	-0.964291	0.970146	-0.993964	0.3212
?LOANASSETS	0.329924	0.116334	2.836006	0.0049
?EQUITYASSETS	0.203950	0.270392	0.754275	0.4514
?COSTINCOMERATIO	-0.018017	0.003899	-4.621090	0.0000
?CREDITGROWTH	0.057683	0.048730	1.183729	0.2376

UK_GDP	0.277455	0.134647	2.060614	0.0403
UK_CPI	0.095943	0.695944	0.137860	0.8905
UK_HHI	81.16179	43.84820	1.850972	0.0653
Fixed Effects (Cross)				
AHLIUNITED_--C	9.370377			
ALRAYAN_--C	16.52440			
ALLIEDIRISH_--C	2.904535			
ARBUTHNOT_--C	14.78174			
NEGARA_--C	0.949218			
BANKOFSCOTLAND_--C	6.134021			
BARCLAYS_--C	16.67420			
CHOARECO_--C	13.36088			
THECHARITY_--C	-15.85713			
THEROYALBANKOFSCOTLAND_--C	9.674112			
CHORLEYANDDISTRICT_--C	-5.346258			
COVENTRY_--C	-1.665521			
COUTTSCO_--C	16.31221			
CUMBERLAND_--C	-3.877831			
CAPITALONE_--C	-16.63453			
EARLSHILTON_--C	-7.570788			
ECOLOGY_--C	-0.894310			
EUROPEARAB_--C	5.245803			
CHELTENHAMGLOUCESTER_--C	8.937015			
HARPENDEN_--C	-4.760885			
ICBC_--C	7.727755			
ICICI_--C	-9.106588			
JULIANHODGE_--C	-3.631290			
KINGDOM_--C	-8.304429			
CLYDESDALE_--C	-14.17065			
LEEDS_--C	-1.534829			
LLOYDS_--C	4.421589			
MARSDEN_--C	-9.027948			
METRO_--C	-9.346128			
NATIONALBANKOFKUWAIT_--C	2.999973			
NATIONALCOUNTIES_--C	-4.758255			
NATIONALWESTMINSTER_--C	3.674476			
NATIONWIDE_--C	-1.251085			
NORTHERN_--C	4.331639			
PROGRESSIVE_--C	-4.679827			
PUNJABNATIONALBANK_--C	-16.04225			
HAMPSHIRETRUST_--C	-10.78492			
RELIANCE_--C	5.286138			
SAFFRON_--C	-8.051959			
SAINSBURYS_--C	-8.209418			
SANTANDER_--C	3.424732			
HINKLEYANDRUGBY_--C	-11.32103			
SCOTTISH_--C	-7.126470			
SECURETRUST_--C	8.264700			
SHAWBROOK_--C	2.275561			

SKIPTON_--C	0.639568
STANDARDCHARTERED_--C	8.929508
TESCOPERSONALFINANCE_--C	-1.298790
HSBC_--C	13.71938
MELTONMOWBRAY_--C	-9.355413
MONMOUTHSHIRE_--C	-5.516554
UNITYTRUST_--C	10.74013
VIRGINMONEY_--C	-8.515195
WEATHERBYS_--C	9.902261

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.425869	Mean dependent var	5.225081
Adjusted R-squared	0.290649	S.D. dependent var	10.17160
S.E. of regression	8.566822	Akaike info criterion	7.305350
Sum squared resid	19008.12	Schwarz criterion	8.033791
Log likelihood	-1110.509	Hannan-Quinn criter.	7.596199
F-statistic	3.149455	Durbin-Watson stat	2.332821
Prob(F-statistic)	0.000000		

Once more, the correlation between variables is assessed by reviewing the significance of coefficients (t-stats; p-values) for bank profitability (ROAA and ROAE). Total assets, loan assets, GDP, and cost-to-income are statistically significant on a 95% confidence level[40] (p-value <0.05). HHI is statistically significant on a 90% confidence level since the p-value <0.1. As a result, the final models show that the UK's determinants of profitability are loan assets, total assets, cost-to-income, GDP, and HHI. All other determinants are not significant (equity assets, credit growth, and CPI). Loan assets, HHI, and GDP have a positive relationship with profitability. In contrast, total assets and the cost-to-income ratio have a negative relationship with profitability.

The results show that loan assets have a positive impact on profitability: it appears that UK banks have a better knowledge of the credit sector and this can result in improved profitability (Rossi et al., 2019). The positive relationship also indicates that the UK has a deeper sense of credit risk evaluation and specialises in granting credit, improving profitability (Abreu & Mendes, 2001; Demirgüç-Kunt & Huizinga, 2000). The results align with the expected signage as loans are

[40] The 95% confidence interval is a range of values that the researcher can be 95% confident contains the true mean of the population. Because of natural sampling variability, the sample mean (centre of the CI) will vary from sample to sample.

considered interest-bearing and increases profitability. A high ratio means that banks may be putting themselves at risk of defaulting on loans if interest rates rise suddenly. This seems acceptable for the UK because of the stable economy and the relative CPI and IRL rates. CPI increased by 0.62 from 2015 to 2020, and IRL showed a decrease of 0.4.

HHI also shows a positive relationship with UK local bank profitability. Because of the diversification and high concentration of the UK sample, banks will have a higher market power to set prices above marginal costs[41], in this way, increasing profitability (Yuanita, 2019). The findings further validate the expected positive signage of the GDP relationship with profitability; Staikouras and Wood (2004) substantiate that higher GDP growth indicates lower corporate and individual default probabilities and easier access to credit. The economic environment in the UK has proven to be more stable than that in SA, as discussed in section 4.1, validated by the lower values in inflation (2020: 0.99 in the UK versus 3.22 in SA), interest (2020: 1.1 in the UK versus 7.7) and unemployment rates (2020: 4.34 in the UK versus 28.74 in SA) in the UK.

Total assets showed a positive relationship in SA compared to a negative relationship in the UK. The primary reason for the negative relationship between bank size and profitability in the UK is that large banks face considerable losses because of numerous irrecoverable loans (Dietrich & Wanzenried, 2011). Banks can save costs by increasing their size but they may face scale inefficiencies[42] (Berger & Humphrey, 1991). The UK's bank sample is also more extensive than SA's; the increased diversification leads to lower risk and lower required returns (Staikouras & Wood, 2004). The relationship between cost-to-income and bank profitability is discussed in section 4.4.

The results do not show any robust findings regarding the impact of credit growth on SA and UK local bank profitability. It is not a significant determinant of profitability based on statistical results. This addresses research questions one and three: does credit growth increase profitability in the local banking industry in South Africa and the United Kingdom? Based on the findings, we reject H1 for research questions one and three and conclude that credit growth will not increase

[41] The term 'marginal cost of funds' refers to the increase in financing costs for a business entity because of adding one more rand/pound of new funding to its portfolio.
[42] These are the cost disadvantages which economic actors accrue through an increase in organisational size or in output, resulting in production of goods and services at increased per-unit costs.

profitability in the local banking industry in SA and the UK. The insignificant relationship may be because the main issue is not credit growth per se but the combination of high credit growth, low provisioning, and looser lending (Rossi et al., 2019). Table 15 displays a comparative view of the findings on credit growth's impact on SA and the UK's local bank profitability which are discussed above.

Table 15: SA and UK relationship between explanatory variables and profitability

Profitability Relationship				
	SA	UK	SA	UK
Variable	**Significance**	**Significance**	**Relationship**	**Relationship**
Total assets	95%	95%	Positive	Negative
Loan assets	0%	95%	Insignificant	Positive
Equity assets	95%	0%	Positive	Insignificant
Cost-to-income ratio	95%	95%	Negative	Negative
Credit growth	0%	0%	Insignificant	Insignificant
GDP	95%	95%	Positive	Positive
CPI	0%	0%	Insignificant	Insignificant
HHI	0%	95%	Insignificant	Positive

4.3 Credit growth's impact on SA and the UK's local bank liquidity

This section discusses credit growth's impact on SA and UK local bank liquidity. The exact process for the panel regression analysis is followed for LR.

Credit growth's impact on SA's local bank liquidity

Table 16 shows the residual cross-section dependence test for LR, and table 17 presents the final model for SA.

Table 16: SA: Residual cross-section dependence test – LR

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation)
Pool: POOL_SA_LR
Periods included: 6
Cross-sections included: 11
Total panel (unbalanced) observations: 65
Test employs centered correlations computed from pairwise samples

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	95.45068	55	0.0006
Pesaran scaled LM	3.856821		0.0001
Bias-corrected scaled LM	2.756821		0.0058
Pesaran CD	1.121596		0.2620

The null hypothesis is accepted for LR (p-value >0.05); there is no correlation problem to be corrected. The final FE model is below.

Table 17: SA – Fixed effects – LR

Dependent Variable: ?LIQUIDITYRATIO
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
?ROAE	0.000526	0.000628	0.837363	0.4068
LOG(?TOTALASSETS)	0.136471	0.207450	0.657851	0.5140
?EQUITYASSETS	-0.024466	0.013255	-1.845875	0.0715
?CREDITGROWTH	0.083348	0.203132	0.410315	0.6835
SA_GDP	0.060441	0.091947	0.657339	0.5143
SA_CPI	0.084921	0.109394	0.776280	0.4416
SA_IRL	-0.178501	0.278160	-0.641720	0.5243
SA_IRM	-0.165017	0.383164	-0.430668	0.6688
SA_UNE	0.017844	0.091836	0.194300	0.8468
C	-0.544185	4.170598	-0.130481	0.8968
Fixed Effects (Cross)				
ABSA_--C	-0.546032			
FNB_--C	-0.592615			
AFRICANBANK_--C	0.509393			
BIDVEST_--C	0.873502			
CAPITEC_--C	0.214630			
GRINDROD_--C	0.237644			
INVESTEC_--C	-0.294122			

NEDBANK_--C	-0.599298
SASFIN_--C	0.179889
SBSA_--C	-0.552970
UBANK_--C	0.654878

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.680545	Mean dependent var	0.255269
Adjusted R-squared	0.545664	S.D. dependent var	0.166536
S.E. of regression	0.112253	Akaike info criterion	-1.288470
Sum squared resid	0.567029	Schwarz criterion	-0.619428
Log likelihood	61.87528	Hannan-Quinn criter.	-1.024490
F-statistic	5.045516	Durbin-Watson stat	1.090474
Prob(F-statistic)	0.000004		

Redundant fixed effects tests
Pool: POOL_SA_LR
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.226112	(10,45)	0.0000
Cross-section Chi-square	50.097891	10	0.0000

In SA, the results show that equity assets are statistically significant on a 90% confidence level, p-value <0.1. This means that for SA, only equity assets have a relationship with equity. The other variables are insignificant and have no relationship (ROAE, total assets, credit growth, GDP, CPI, IRL, IRM, and unemployment). Adjusted R-squared[43] shows that the independent variables explain 54% of the variation of the dependent variable. The adjusted R-squared explains to what extent the variance of one variable explains the variance of the second variable. The adjusted R-squared is a modified version of R-squared which adjusts for predictors which are not significant in a regression model. Compared to a model with additional input variables, a lower adjusted R-squared indicates that the additional input variables are not adding value to the model. Therefore, the insignificant variables will not be interpreted further.

The signage shows a positive relationship between equity assets and liquidity. The implementation of Basel III and global regulatory reforms in SA also plays a role in improving

[43] R-squared measures the goodness of fit of a regression model. So, a higher R-squared indicates the model is a good fit while a lower R-squared indicates the model is not a good fit.

liquidity. It introduced the monitoring of proposed minimum liquidity standards to improve banks' resilience to acute short-term stress and to improve longer-term funding (South African Reserve Bank, n.d.). The higher the equity-to-asset ratio, the less leveraged[44] the company is, meaning that the company and its investors own a larger percentage of its assets.

That does not mean that a lower ratio is necessarily a cause for concern. Bank size represented by total assets in the ratio is found to decrease liquidity. SA banks sample is smaller than that of the UK banks and consists of smaller banks in size of total assets. The total assets for the eleven banks over the six years did not increase excessively, so it is consistent with the positive relationship between equity assets and liquidity because it should have a minimal impact on the ratio. Credit growth is insignificant and therefore does not increase or decrease liquidity. As discussed, the SA sample size for local banks only represents 17% of the total bank population, and the study was restricted to six years. These are differences compared to previous studies which possibly impact the insignificance of the variables, especially credit growth.

Credit growth's impact on the UK's local bank liquidity

Table 18 shows the residual cross-section dependence test for LR, and table 19 presents the final model for the UK.

Table 18: UK: Residual cross-section dependence test – LR

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation)
Pool: POOL_UK_LR
Periods included: 6
Cross-sections included: 54
Total panel (unbalanced) observations: 321
Test employs centered correlations computed from pairwise samples

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	2447.411	1431	0.0000
Pesaran scaled LM	18.99916		0.0000
Bias-corrected scaled LM	13.59916		0.0000
Pesaran CD	-1.570317		0.1163

[44] Use borrowed capital for (an investment), expecting the profits made to be greater than the interest payable.

Table 19: UK fixed effects – LR

Dependent Variable: ?LIQUIDITYRATIO
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.595646	0.133982	11.90939	0.0000
?ROAE	-0.001168	0.000487	-2.396008	0.0173
LOG(?TOTALASSETS)	-0.081994	0.007076	-11.58835	0.0000
?EQUITYASSETS	-0.001205	0.002116	-0.569571	0.5695
?CREDITGROWTH	-0.000816	0.000585	-1.396049	0.1639
UK_GDP	-0.002622	0.000500	-5.241019	0.0000
UK_CPI	0.002890	0.001517	1.905266	0.0579
UK_IRL	0.020711	0.014493	1.429014	0.1542
UK_IRM	-0.062812	0.029900	-2.100736	0.0366
UK_UNE	-0.013236	0.009986	-1.325437	0.1862
Fixed Effects (Cross)				
AHLIUNITED_--C	-0.009754			
ALRAYAN_--C	-0.203159			
ALLIEDIRISH_--C	0.221939			
ARBUTHNOT_--C	-0.056176			
NEGARA_--C	-0.474705			
BANKOFSCOTLAND_--C	0.316083			
BARCLAYS_--C	0.655285			
CHOARECO_--C	0.087492			
THECHARITY_--C	-0.387247			
THEROYALBANKOFSCOTLAND_--C	0.355395			
CHORLEYANDDISTRICT_--C	-0.225821			
COVENTRY_--C	0.079966			
COUTTSCO_--C	0.241582			
CUMBERLAND_--C	-0.123279			
CAPITALONE_--C	-0.162092			
EARLSHILTON_--C	-0.305109			
ECOLOGY_--C	-0.223389			
EUROPEARAB_--C	0.186970			
CHELTENHAMGLOUCESTER_--C	-0.179766			
HARPENDEN_--C	-0.220511			
ICBC_--C	0.223821			
ICICI_--C	-0.121114			
JULIANHODGE_--C	-0.145371			
KINGDOM_--C	-0.321287			
CLYDESDALE_--C	0.134599			
LEEDS_--C	0.017430			
LLOYDS_--C	0.364368			

MARSDEN_--C	-0.248391
METRO_--C	-0.023041
NATIONALBANKOFKUWAIT_--C	0.171572
NATIONALCOUNTIES_--C	-0.148989
NATIONALWESTMINSTER_--C	0.390974
NATIONWIDE_--C	0.181433
NORTHERN_--C	0.102777
PROGRESSIVE_--C	-0.151270
PUNJABNATIONALBANK_--C	0.022363
HAMPSHIRETRUST_--C	-0.211021
RELIANCE_--C	-0.105314
SAFFRON_--C	-0.241303
SAINSBURYS_--C	-0.064466
SANTANDER_--C	0.320700
HINKLEYANDRUGBY_--C	-0.223059
SCOTTISH_--C	-0.257978
SECURETRUST_--C	-0.158520
SHAWBROOK_--C	-0.057679
SKIPTON_--C	0.060401
STANDARDCHARTERED_--C	0.522831
TESCOPERSONALFINANCE_--C	-0.024201
HSBC_--C	0.588224
MELTONMOWBRAY_--C	-0.265870
MONMOUTHSHIRE_--C	-0.197439
UNITYTRUST_--C	0.152188
VIRGINMONEY_--C	0.141604
WEATHERBYS_--C	-0.050434

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.751185	Mean dependent var	0.221744
Adjusted R-squared	0.691392	S.D. dependent var	0.139590
S.E. of regression	0.077546	Akaike info criterion	-2.101857
Sum squared resid	1.551441	Schwarz criterion	-1.361667
Log likelihood	400.3480	Hannan-Quinn criter.	-1.806317
F-statistic	12.56311	Durbin-Watson stat	1.075629
Prob(F-statistic)	0.000000		

ROAE, total assets, GDP, CPI, and IRM are statistically significant for liquidity. All other determinants are not significant (equity assets, credit growth, IRL and IRM). Adjusted R-squared shows that the independent variables explain 69% of the variation of the dependent variable.

Regarding the UK liquidity findings, CPI has a positive relationship with liquidity, and ROAE, total assets, GDP, and IRM negatively impact liquidity. Higher inflation decreases the real rate of return and, as a result, discourages banks from granting more loans and encourages more liquid assets to be held (El-Chaarani, 2019). The UK has an overall lower CPI rate than does SA and this means if inflation were to increase significantly in the UK, liquidity would also increase. Liquidity was found to be a contributing factor to bank profitability.

ROAE is used in this study as a measure of bank profitability. The negative relationship between ROAE and liquidity indicates that banks in the UK use a part of the increased equity to increase assets and provide more loans which ultimately reduce liquidity. It allows banks to provide more loans without being covered by cash deposits. This further shows that liquidity would decrease, and bank profitability would increase, validated by the negative relationship between ROAE and liquidity. The UK bank's total assets are much more extensive than SA, and their loan offering is complex.

GDP growth is representative of banks facing credit expansion as household income frees up, allowing consumers to spend more on loans. Vodová (2013) validates our results, showing that the negative relationship represents that UK banks will want to satisfy this growing demand and hold a lower share of liquid assets. During an economic downturn, banks store more liquidity because of a lack of lending opportunities. As GDP growth increases, the liquidity of banks decreases, and as GDP growth falls, liquidity increases (Singh & Sharma, 2016). This is consistent with the results showing a negative relationship. However, the data presented in Figure 2 show that from 2017 to 2020, UK credit growth was lower than that in SA. The general economic environment plays a role in credit expansion.

With the UK’s economy experiencing lower unemployment, inflation, and interest rates, households are less likely to borrow large amounts on credit. The IRM is expected to have a negative relationship with liquidity because it leads to a higher lending activity of banks reducing liquidity; the findings correspond with this expectation in the UK. Finally, total assets were not a determinant in SA’s results but showed a negative relationship in the UK; the results are because

of the larger sample size in which the UK consists of larger banks than that in the SA sample. Larger banks need less liquidity (Cucinelli, 2013).

This section addresses research question two and four: does credit growth decrease liquidity in the local banking industry in South Africa and the United Kingdom? We reject H1 for research question two and four and conclude that credit growth does not decrease local bank liquidity in SA and the UK based on the findings. Future research will help in reconciling the differences. Table 20 summarises the findings of credit growth's impact on SA and on the UK's local bank liquidity.

Table 20: SA and UK relationship between explanatory variables and liquidity

Liquidity Relationship				
	SA	UK	SA	UK
Variable	**Significance**	**Significance**	**Relationship**	**Relationship**
ROAE	0%	95%	Insignificant	Negative
Total assets	0%	95%	Insignificant	Negative
Equity assets	90%	0%	Negative	Insignificant
Cost-to-income	95%	95%	Insignificant	Negative
Credit growth	0%	0%	Insignificant	Insignificant
GDP	0%	95%	Insignificant	Negative
CPI	0%	90%	Insignificant	Positive
IRL	0%	0%	Insignificant	Insignificant
IRM	0%	95%	Insignificant	Negative
UNE	0%	0%	Insignificant	Insignificant

4.4 The relationship between a higher cost-to-income ratio and bank profitability

The results show that the cost-to-income for ROAA and ROAE in both SA and the UK is statistically significant on a 95% confidence level (p-value <0.05). This means that there is a relationship between the cost-to-income ratio and bank profitability. The coefficient of the cost-to-income ratio was expected to be negative and is proved in the results for both SA and the UK, refer to table 15. The relationship between the cost-to-income ratio and profitability is consistent in both countries, cost-to-income is negatively correlated to bank profitability, meaning when costs increase, bank profitability decreases.

The consistency of a negative correlation with bank profitability is consistent with the view that the higher the cost-to-income ratio, the lower the profitability. This addresses research question five: does a higher cost-to-income ratio decrease profitability for banks? Therefore, we reject H0 and conclude that a higher cost-to-income ratio does decrease bank profitability. The high statistical significance of all the coefficients across different econometric estimations suggests the relevance of cost-income in explaining bank profitability. The relevance of cost-to-income in explaining bank profitability, especially during an economic decline, is high. Regulators advise the banking sector to reduce its level of operating costs.

This can also be seen by the wave of digitisation where banks cut back on staff. Costs reduce the bottom line and are expected to decrease profitability (Staikouras & Wood, 2004). Bank profits can be improved by using advanced technologies to improve banking operations' efficiency (Almazari, 2014). The results reveal that local banks in SA and the UK are keen on cutting their costs to improve or maintain their profitability by making giant strides in technological advancements which was further pushed by the pandemic. Digitisation is the main aspect banks have been improving.

Digitisation has been on the rise since before the pandemic but with the national lockdowns, more customers have made the switch to online banking, reducing costs for the banking sector. In SA, it was found that mobile-optimised services played a significant role in digital banking and general digital business model formulation (Louw & Nieuwenhuizen, 2020). FNB reported an increase in average eCommerce spend on its merchant devices through the first half of 2020 of 30% year-

on-year, and Standard Bank also reported growth in online shopping and eCommerce (Businesstech, 2021).

These two banks represented the highest portion of the sample size selected. FNB's total assets in 2020 make up 28% of the eleven banks' total assets, and Standard Bank makes up 25%. Cooper (2021) discussed that at the end of 2020, over 17 million consumers registered for mobile payments, which was a rise of more than three quarters over 2019. Digital collaborations[45] infused with humanity[46] and personalisation can help banks grow, gain consumer trust, and increase efficiency. Therefore, the changes in consumer tastes and implementation and acceptance of eCommerce channels are ways the banking sector reduces costs, boosting profitability.

Chapter 5: Conclusion

The final section is structured as follows. Section 5.1 discusses the key findings of the study and concluding remarks. Section 5.2 highlights recommendations for future research.

5.1 Key findings and concluding remarks

This study set out to examine the impact of credit growth on local bank profitability and liquidity in SA and the UK. The period used in the study is from 2015 to 2020; a quantitative method was used. The study's outcome is positioning that credit growth does not influence profitability and liquidity. Therefore, the results do not show any robust findings concerning the impact on local bank profitability and liquidity because the relationship is insignificant in both SA and the UK. This is because of the contrast between this study’s purpose and previous literature, as discussed in chapter 4.

Loan loss provisions were not available for all banks included in the sample; therefore, the exclusion of this variable has resulted in limited findings. Credit expansion may result in higher loan losses which in turn produces adverse effects on bank profitability. The period of study is

[45] Digital collaboration is using digital technologies for collaboration. Dramatically different from traditional collaboration, it connects a broader network of participants who can accomplish much more than they would on their own.
[46] Human beings collectively.

also impacted by one year exposure to the pandemic, the economic decline post Covid-19 is evident from the GDP drops. Although the pandemic only impacted 2020 in the period of study, it is essential to discuss the influence. There is a twofold effect resulting from the pandemic. One being the economic decline and financial strain on households, as seen from credit rejection and unemployment rates and the second being a reduction in interest rates and relaxation of lending policies which made credit more affordable for consumers. As is seen in section figure 2, SA responded better to the impact of Covid as their credit growth went from 3.40% in 2019 to 10.40% in 2020, the second highest it's been for the period. Whereas the UK's credit growth significantly decreased from 1.74% to -15.24%. The restrictions in the UK led to lower consumer expenditure while the decreases in interest rates in SA made it more affordable for consumers to get credit. More research may be needed in SA and the UK to reconcile the differences as they differ across countries.

The findings of the study do, however, find a significant negative relationship between cost-to-income and bank profitability. The cost-to-income relationship is the same in both SA and the UK and concludes that a higher cost-to-income ratio does decrease bank profitability. Literature has extensively explored this relationship. This is consistent with the study's outcome in the context of SA and the UK.

In addition to addressing the aim of the study, the comparative analysis shows that additional variables also play a role in bank profitability and liquidity, these are secondary data and findings. Total assets, equity assets, the cost-to-income ratio, and GDP are significant determinants of the banking sector profitability in SA. The only significant determinant of the banking sector liquidity in SA is equity assets. Secondary data also played a role in the UK local banking sector. The significant determinants of bank profitability in the UK are total assets, loan assets, the cost-to-income ratio, GDP, and HHI. While ROAE, total assets, GDP, CPI, and IRM are determinants of the banking sector liquidity in the UK. These findings were not the study's goal but are relevant to the profitability and liquidity within these local banking sectors in SA and the UK.

The results imply that bank profitability and liquidity determinants differ across countries. Differences may be explained by several factors, such as differences in financial sector development, the nature of banking systems, and regulation. The SA banking sector has a higher

concentration than that of the UK, and policies should be formed to reduce the dominance of banks in the financial sector. There are possible factors contributing to the differences, but this was not the aim of the study and can be further explored for future research.

5.2 Recommendation for future research

The period used in this study is for six years only (2015 to 2020) in SA and the UK; future research can be done by extending the study period and the number of countries selected. Additionally, the purpose of the study was to assess the impact of credit growth on local bank profitability and liquidity; future research can aim to assess the impact on the entire banking sector to broaden the sample.

Moreover, numerous factors can impact bank profitability and liquidity. Further studies can be conducted by including other important variables such as loan loss provisions because credit expansion typically leads to higher loan loss provisions (Rossi et al., 2019). Additionally, credit growth in the study is represented as the difference between bank credit growth and country credit growth. Both positive and negative differences were accounted for in the data analysis for this study. Future research can only rely on positive differences to represent “real growth.”

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Appendix

Appendix A: List of South African local banks

1	**ABSA Bank Ltd**
2	African Bank Ltd
3	Bidvest Bank Limited
4	Capitec Bank Ltd
5	FirstRand Bank Ltd
6	Grindrod Bank
7	Investec Bank Ltd
8	Nedbank Group Limited
9	Sasfin Bank Ltd
10	Standard Bank of South Africa Ltd
11	Ubank Limited

Appendix B: List of United Kingdom local banks

1	**Ahli United Bank (UK) PLC**
2	Al Rayan Bank PLC
3	Allied Irish Banks PLC
4	Arbuthnot Banking Group PLC
5	Bank of Scotland PLC
6	Barclays Bank PLC
7	C.Hoare & Co

8	Capital One (Europe) PLC
9	Cheltenham & Gloucester PLC
10	Chorley and District Building Society
11	Clydesdale Bank PLC
12	Coutts & Co
13	Coventry Building Society
14	Cumberland Building Society
15	Earl Shilton Building Society
16	Ecology Building Society
17	Europe Arab Bank PLC
18	Hampshire Trust Bank PLC
19	Harpenden Building Society
20	Hinkley and Rugby Building Society
21	HSBC Bank PLC
22	ICBC (London) PLC
23	ICICI Bank UK PLC
24	Julian Hodge Bank Limited
25	Kingdom Bank Ltd
26	Leeds Building Society
27	Lloyds Bank PLC
28	Marsden Building Society
29	Melton Mowbray Building Society
30	Metro Bank PLC
31	Monmouthshire Building Society

32	National Bank of Kuwait (International) PLC
33	National Counties Building Society
34	National Westminster Bank PLC
35	Nationwide Building Society
36	Northern Bank Limited
37	Progressive Building Society
38	PT Bank Negara Indonesia (Persero) Tbk (Indonesia)
39	Punjab National Bank (International) Limited
40	Reliance Bank Limited
41	Saffron Building Society
42	Sainsbury's Bank PLC
43	Santander UK PLC
44	Scottish Building Society
45	Secure Trust Bank PLC
46	Shawbrook Bank Limited
47	Skipton Building Society
48	Standard Chartered PLC
49	Tesco Personal Finance PLC
50	The Charity Bank Ltd
51	The Royal Bank of Scotland PLC
52	Unity Trust Bank PLC
53	Virgin Money UK PLC
54	Weatherbys Bank Limited

Appendix C: SA HHI calculation

Name of Institution	2015			2016			2017			2018			2019			2020		
	Total Assets Bn	Share in Total Assets	Squared Shares	Total Assets Bn	Share in Total Assets	Squared Shares	Total Assets Bn	Share in Total Assets	Squared Shares	Total Assets Bn	Share in Total Assets	Squared Shares	Total Assets Bn	Share in Total Assets	Squared Shares	Total Assets Bn	Share in Total Assets	Squared Shares
ABSA Bank Ltd	936 141	0.20	0.04	918 311	0.19	0.04	988 358	0.20	0.04	1 079 679	0.19	0.04	1 159 825	0.19	0.04	1 286 275	0.19	0.04
African Bank Ltd	50 679	0.01	0.00	37 691	0.01	0.00	32 324	0.01	0.00	30 279	0.01	0.00	28 411	0.00	0.00	25 622	0.00	0.00
Bidvest Bank Limited	6 201	0.00	0.00	6 903	0.00	0.00	7 812	0.00	0.00	9 219	0.00	0.00	10 263	0.00	0.00	11 309	0.00	0.00
Capitec Bank Ltd	53 916	0.01	0.00	62 946	0.01	0.00	73 358	0.01	0.00	84 957	0.02	0.00	100 428	0.02	0.00	134 568	0.02	0.00
FirstRand Bank Ltd	1 059 266	0.23	0.05	1 149 277	0.24	0.06	1 217 707	0.24	0.06	1 532 289	0.28	0.08	1 669 062	0.28	0.08	1 926 539	0.28	0.08
Grindrod Bank	11 231	0.00	0.00	15 157	0.00	0.00	16 680	0.00	0.00	14 282	0.00	0.00	15 342	0.00	0.00	11 719	0.00	0.00
Investec Bank Ltd	332 706	0.07	0.01	411 980	0.09	0.01	425 687	0.09	0.01	444 072	0.08	0.01	475 603	0.08	0.01	535 970	0.08	0.01
Nedbank Group Limited	860 733	0.19	0.04	900 061	0.19	0.04	910 068	0.18	0.03	971 623	0.18	0.03	1 068 310	0.18	0.03	1 152 358	0.17	0.03
Sasfin Bank Ltd	8 429	0.00	0.00	9 024	0.00	0.00	10 796	0.00	0.00	12 366	0.00	0.00	12 767	0.00	0.00	12 542	0.00	0.00
Standard Bank of South Africa Ltd	1 276 953	0.28	0.08	1 285 621	0.27	0.07	1 308 800	0.26	0.07	1 360 262	0.25	0.06	1 480 746	0.25	0.06	1 659 467	0.25	0.06
Ubank Limited	4 303	0.00	0.00	4 684	0.00	0.00	4 681	0.00	0.00	5 588	0.00	0.00	5 649	0.00	0.00	5 664	0.00	0.00
Total	**4 600 558**	**1.00**	**0.21**	**4 801 654**	**1.00**	**0.21**	**4 996 270**	**1.00**	**0.21**	**5 544 616**	**1.00**	**0.21**	**6 026 405**	**1.00**	**0.21**	**6 762 034**	**1.00**	**0.21**

Appendix D: UK HHI calculation

Name of Institution	2015			2016			2017			2018			2019			2020		
.	Total Assets Bn	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares
Ahli United Bank (UK) PLC	1 838	0.00	0.00	2 098	0.00	0.00	2 061	0.00	0.00	2 292	0.00	0.00	2 447	0.00	0.00	2 107	0.00	0.00
Al Rayan Bank PLC	1 004	0.00	0.00	1 436	0.00	0.00	1 806	0.00	0.00	1 966	0.00	0.00	2 247	0.00	0.00	2 340	0.00	0.00
Allied Irish Banks PLC	75 760	0.02	0.00	81 934	0.02	0.00	79 939	0.02	0.00	82 560	0.02	0.00	84 395	0.02	0.00	100 952	0.02	0.00
Arbuthnot Banking Group PLC	2 232	0.00	0.00	1 265	0.00	0.00	1 853	0.00	0.00	2 175	0.00	0.00	2 595	0.00	0.00	2 854	0.00	0.00
Bank of Scotland PLC	341 333	0.08	0.01	348 685	0.07	0.01	370 072	0.08	0.01	338 748	0.08	0.01	375 774	0.08	0.01	310 328	0.06	0.00
Barclays Bank PLC	1 120 727	0.25	0.06	1 213 955	0.25	0.06	1 129 343	0.23	0.05	877 700	0.21	0.04	876 672	0.20	0.04	1 059 731	0.22	0.05
C.Hoare & Co	3 328	0.00	0.00	4 257	0.00	0.00	4 409	0.00	0.00	4 573	0.00	0.00	4 863	0.00	0.00	5 234	0.00	0.00
Capital One (Europe) PLC	2 431	0.00	0.00	2 467	0.00	0.00	2 534	0.00	0.00	2 553	0.00	0.00	2 555	0.00	0.00	2 074	0.00	0.00
Cheltenham & Gloucester PLC	266	0.00	0.00	326	0.00	0.00	263	0.00	0.00	199	0.00	0.00	207	0.00	0.00	170	0.00	0.00
Chorley and District Building Society	226	0.00	0.00	215	0.00	0.00	221	0.00	0.00	233	0.00	0.00	238	0.00	0.00	266	0.00	0.00
Clydesdale Bank PLC	38 701	0.01	0.00	39 963	0.01	0.00	43 314	0.01	0.00	43 583	0.01	0.00	91 101	0.02	0.00	90 307	0.02	0.00
Coutts & Co.	25 373	0.01	0.00	29 729	0.01	0.00	31 217	0.01	0.00	34 280	0.01	0.00	34 037	0.01	0.00	38 434	0.01	0.00
Coventry Building Society	34 114	0.01	0.00	38 296	0.01	0.00	42 573	0.01	0.00	46 071	0.01	0.00	49 531	0.01	0.00	51 498	0.01	0.00

Name of Institution	2015			2016			2017			2018			2019			2020		
.	Total Assets Bn	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares	Total Assets	Share in Total Assets	Squared Shares
Cumberland Building Society	1 914	0.00	0.00	2 130	0.00	0.00	2 242	0.00	0.00	2 520	0.00	0.00	2 577	0.00	0.00	2 664	0.00	0.00
Earl Shilton Building Society	121	0.00	0.00	124	0.00	0.00	128	0.00	0.00	137	0.00	0.00	137	0.00	0.00	142	0.00	0.00
Ecology Building Society	146	0.00	0.00	173	0.00	0.00	179	0.00	0.00	178	0.00	0.00	198	0.00	0.00	226	0.00	0.00
Europe Arab Bank PLC	2 628	0.00	0.00	3 256	0.00	0.00	2 957	0.00	0.00	2 934	0.00	0.00	2 614	0.00	0.00	2 154	0.00	0.00
Hampshire Trust Bank PLC	243	0.00	0.00	607	0.00	0.00	742	0.00	0.00	1 024	0.00	0.00	1 284	0.00	0.00	1 522	0.00	0.00
Harpenden Building Society	307	0.00	0.00	317	0.00	0.00	315	0.00	0.00	307	0.00	0.00	297	0.00	0.00	302	0.00	0.00
Hinkley and Rugby Building Society	571	0.00	0.00	637	0.00	0.00	740	0.00	0.00	799	0.00	0.00	835	0.00	0.00	814	0.00	0.00
HSBC Bank PLC	727 941	0.16	0.03	816 829	0.17	0.03	818 868	0.17	0.03	604 958	0.14	0.02	636 491	0.14	0.02	681 150	0.14	0.02
ICBC (London) PLC	2 168	0.00	0.00	2 213	0.00	0.00	1 799	0.00	0.00	1 870	0.00	0.00	1 718	0.00	0.00	1 489	0.00	0.00
ICICI Bank UK PLC	2 790	0.00	0.00	3 196	0.00	0.00	2 794	0.00	0.00	2 762	0.00	0.00	2 930	0.00	0.00	2 865	0.00	0.00
Julian Hodge Bank Limited	1 109	0.00	0.00	1 324	0.00	0.00	1 267	0.00	0.00	1 363	0.00	0.00	1 379	0.00	0.00	1 409	0.00	0.00
Kingdom Bank Ltd	50	0.00	0.00	51	0.00	0.00	56	0.00	0.00	54	0.00	0.00	59	0.00	0.00	70	0.00	0.00
Leeds Building Society	13 507	0.00	0.00	15 930	0.00	0.00	18 484	0.00	0.00	19 390	0.00	0.00	20 808	0.00	0.00	20 640	0.00	0.00
Lloyds Bank PLC	818 489	0.18	0.03	830 927	0.17	0.03	823 030	0.17	0.03	593 486	0.14	0.02	581 368	0.13	0.02	599 939	0.12	0.02
Marsden Building Society	404	0.00	0.00	416	0.00	0.00	473	0.00	0.00	514	0.00	0.00	575	0.00	0.00	639	0.00	0.00
Melton Mowbray Building Society	389	0.00	0.00	419	0.00	0.00	452	0.00	0.00	469	0.00	0.00	480	0.00	0.00	584	0.00	0.00
Metro Bank PLC	6 148	0.00	0.00	10 057	0.00	0.00	16 355	0.00	0.00	21 647	0.01	0.00	21 400	0.00	0.00	22 579	0.00	0.00
Monmouthshire Building Society	1 048	0.00	0.00	1 073	0.00	0.00	1 054	0.00	0.00	1 059	0.00	0.00	1 109	0.00	0.00	1 247	0.00	0.00
National Bank of Kuwait (International) PLC	2 315	0.00	0.00	2 315	0.00	0.00	3 025	0.00	0.00	2 557	0.00	0.00	2 648	0.00	0.00	2 609	0.00	0.00
National Counties Building Society	1 569	0.00	0.00	1 865	0.00	0.00	2 022	0.00	0.00	2 166	0.00	0.00	2 379	0.00	0.00	2 439	0.00	0.00
National Westminster Bank PLC	302 430	0.07	0.00	316 476	0.06	0.00	340 843	0.07	0.00	309 938	0.07	0.01	318 493	0.07	0.01	389 539	0.08	0.01
Nationwide Building Society	195 580	0.04	0.00	208 939	0.04	0.00	221 670	0.05	0.00	229 098	0.05	0.00	238 301	0.05	0.00	248 041	0.05	0.00
Northern Bank Limited	7 832	0.00	0.00	8 213	0.00	0.00	8 656	0.00	0.00	9 457	0.00	0.00	9 980	0.00	0.00	12 250	0.00	0.00
Progressive Building Society	1 737	0.00	0.00	1 795	0.00	0.00	1 788	0.00	0.00	1 839	0.00	0.00	1 838	0.00	0.00	1 816	0.00	0.00
PT Bank Negara Indonesia (Persero) Tbk (Indonesia)	25	0.00	0.00	36	0.00	0.00	39	0.00	0.00	44	0.00	0.00	46	0.00	0.00	47	0.00	0.00
Punjab National Bank (International) Limited	1 283	0.00	0.00	1 258	0.00	0.00	1 169	0.00	0.00	855	0.00	0.00	810	0.00	0.00	790	0.00	0.00
Reliance Bank Limited	256	0.00	0.00	254	0.00	0.00	227	0.00	0.00	209	0.00	0.00	184	0.00	0.00	198	0.00	0.00
Saffron Building Society	1 133	0.00	0.00	1 115	0.00	0.00	1 017	0.00	0.00	1 034	0.00	0.00	1 070	0.00	0.00	1 207	0.00	0.00
Sainsbury's Bank PLC	4 237	0.00	0.00	4 499	0.00	0.00	5 794	0.00	0.00	7 765	0.00	0.00	8 837	0.00	0.00	9 402	0.00	0.00
Santander UK PLC	281 406	0.06	0.00	303 142	0.06	0.00	314 765	0.06	0.00	283 372	0.07	0.00	281 702	0.06	0.00	292 332	0.06	0.00
Scottish Building Society	377	0.00	0.00	388	0.00	0.00	409	0.00	0.00	420	0.00	0.00	425	0.00	0.00	431	0.00	0.00
Secure Trust Bank PLC	1 247	0.00	0.00	1 510	0.00	0.00	1 892	0.00	0.00	2 444	0.00	0.00	2 683	0.00	0.00	2 664	0.00	0.00
Shawbrook Bank Limited	3 993	0.00	0.00	4 640	0.00	0.00	5 752	0.00	0.00	6 819	0.00	0.00	8 217	0.00	0.00	8 932	0.00	0.00
Skipton Building Society	17 511	0.00	0.00	19 020	0.00	0.00	21 024	0.00	0.00	23 192	0.01	0.00	25 489	0.01	0.00	28 263	0.01	0.00
Standard Chartered PLC	432 204	0.10	0.01	525 680	0.11	0.01	491 064	0.10	0.01	542 525	0.13	0.02	549 021	0.12	0.02	587 965	0.12	0.02
Tesco Personal Finance PLC	10 060	0.00	0.00	10 999	0.00	0.00	12 579	0.00	0.00	14 606	0.00	0.00	15 658	0.00	0.00	11 644	0.00	0.00
The Charity Bank Ltd	105	0.00	0.00	121	0.00	0.00	159	0.00	0.00	194	0.00	0.00	249	0.00	0.00	273	0.00	0.00
The Royal Bank of Scotland PLC	1 941	0.00	0.00	2 071	0.00	0.00	2 232	0.00	0.00	94 497	0.02	0.00	90 602	0.02	0.00	99 242	0.02	0.00
Unity Trust Bank PLC	883	0.00	0.00	921	0.00	0.00	1 012	0.00	0.00	1 077	0.00	0.00	1 122	0.00	0.00	1 432	0.00	0.00
Virgin Money UK PLC	38 705	0.01	0.00	39 929	0.01	0.00	43 231	0.01	0.00	43 456	0.01	0.00	90 999	0.02	0.00	90 259	0.02	0.00
Weatherbys Bank Limited	527	0.00	0.00	635	0.00	0.00	759	0.00	0.00	878	0.00	0.00	967	0.00	0.00	1 156	0.00	0.00
Total	**4 534 664**	**1.00**	**0.14**	**4 910 127**	**1.00**	**0.14**	**4 882 667**	**1.00**	**0.14**	**4 270 849**	**1.00**	**0.12**	**4 454 642**	**1.00**	**0.11**	**4 799 661**	**1.00**	**0.12**

Appendix E: SA - pooled regression

Dependent Variable: ?ROAA
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	22.45748	38.81383	0.578595	0.5652
LOG(?TOTALASSETS)	0.191900	0.122995	1.560224	0.1243
?LOANASSETS	-0.059276	0.014558	-4.071697	0.0001
?EQUITYASSETS	0.037757	0.030019	1.257740	0.2137
?COSTINCOMERATIO	-0.091315	0.018722	-4.877332	0.0000
?CREDITGROWTH	1.454933	1.933226	0.752594	0.4548
SA_GDP	0.154097	0.076138	2.023903	0.0478
SA_CPI	-0.456893	0.412623	-1.107289	0.2729
SA_HHI	-67.26486	176.2166	-0.381717	0.7041

R-squared	0.538560	Mean dependent var	1.571692
Adjusted R-squared	0.472640	S.D. dependent var	1.882057
S.E. of regression	1.366741	Akaike info criterion	3.590623
Sum squared resid	104.6070	Schwarz criterion	3.891692
Log likelihood	-107.6953	Hannan-Quinn criter.	3.709414
F-statistic	8.169908	Durbin-Watson stat	0.527275
Prob(F-statistic)	0.000000		

Dependent Variable: ?ROAE
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	135.7898	859.9076	0.157912	0.8751
LOG(?TOTALASSETS)	0.773615	2.724918	0.283904	0.7775
?LOANASSETS	-0.455608	0.322532	-1.412599	0.1633
?EQUITYASSETS	-0.997624	0.665071	-1.500027	0.1392
?COSTINCOMERATIO	-1.012200	0.414785	-2.440300	0.0179
?CREDITGROWTH	-49.87841	42.82999	-1.164567	0.2491
SA_GDP	2.026560	1.686822	1.201407	0.2346
SA_CPI	-6.743285	9.141519	-0.737655	0.4638
SA_HHI	-42.00942	3904.021	-0.010761	0.9915

R-squared	0.186535	Mean dependent var	8.697385
Adjusted R-squared	0.070325	S.D. dependent var	31.40408
S.E. of regression	30.27970	Akaike info criterion	9.786720
Sum squared resid	51344.19	Schwarz criterion	10.08779
Log likelihood	-309.0684	Hannan-Quinn criter.	9.905511

F-statistic	1.605160	Durbin-Watson stat	1.171815
Prob(F-statistic)	0.144153		

Dependent Variable: ?LIQUIDITYRATIO
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
?ROAE	-0.000219	0.000625	-0.350821	0.7271
LOG(?TOTALASSETS)	-0.041588	0.010302	-4.036956	0.0002
?EQUITYASSETS	-0.002811	0.002889	-0.972973	0.3348
?CREDITGROWTH	-0.091110	0.208496	-0.436987	0.6638
SA_GDP	0.004708	0.119481	0.039408	0.9687
SA_CPI	0.026912	0.142199	0.189255	0.8506
SA_IRL	-0.012606	0.360838	-0.034935	0.9723
SA_IRM	-0.060079	0.470276	-0.127752	0.8988
SA_UNE	-0.019085	0.120203	-0.158772	0.8744
C	1.770826	1.758759	1.006861	0.3184

R-squared	0.309543	Mean dependent var	0.255269
Adjusted R-squared	0.196559	S.D. dependent var	0.166536
S.E. of regression	0.149274	Akaike info criterion	-0.825426
Sum squared resid	1.225553	Schwarz criterion	-0.490904
Log likelihood	36.82633	Hannan-Quinn criter.	-0.693436
F-statistic	2.739707	Durbin-Watson stat	0.625131
Prob(F-statistic)	0.010207		

Appendix F: SA - random effects

Dependent Variable: ?ROAA
Method: Pooled EGLS (Cross-section random effects)
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	20.54368	16.29170	1.260990	0.2125
LOG(?TOTALASSETS)	0.185210	0.066309	2.793136	0.0071
?LOANASSETS	-0.052579	0.007304	-7.198924	0.0000
?EQUITYASSETS	0.048783	0.015645	3.118173	0.0029
?COSTINCOMERATIO	-0.086645	0.009257	-9.359840	0.0000
?CREDITGROWTH	0.954422	0.828772	1.151609	0.2544
SA_GDP	0.146453	0.031880	4.593851	0.0000
SA_CPI	-0.393216	0.173828	-2.262102	0.0276

SA_HHI	-62.75761	73.66204	-0.851967	0.3979
Random Effects (Cross)				
ABSA_--C	0.049996			
FNB_--C	0.145687			
AFRICANBANK_--C	-1.150097			
BIDVEST_--C	0.310692			
CAPITEC_--C	0.674799			
GRINDROD_--C	-0.171567			
INVESTEC_--C	-0.439424			
NEDBANK_--C	0.171176			
SASFIN_--C	0.426600			
SBSA_--C	0.001897			
UBANK_--C	-0.019758			

Effects Specification	S.D.	Rho
Cross-section random	0.199334	0.1095
Idiosyncratic random	0.568470	0.8905

Weighted Statistics			
R-squared	0.524046	Mean dependent var	1.190736
Adjusted R-squared	0.456052	S.D. dependent var	1.550791
S.E. of regression	1.146655	Sum squared resid	73.62985
F-statistic	7.707288	Durbin-Watson stat	0.710749
Prob(F-statistic)	0.000001		

Unweighted Statistics			
R-squared	0.535622	Mean dependent var	1.571692
Sum squared resid	105.2731	Durbin-Watson stat	0.497110

Correlated Random Effects - Hausman Test
Pool: POOL_SA_ROA
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	8	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Dependent Variable: ?ROAE
Method: Pooled EGLS (Cross-section random effects)
Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	135.7898	691.1293	0.196475	0.8449
LOG(?TOTALASSETS)	0.773615	2.190085	0.353235	0.7252
?LOANASSETS	-0.455608	0.259227	-1.757564	0.0843
?EQUITYASSETS	-0.997624	0.534534	-1.866343	0.0672
?COSTINCOMERATIO	-1.012200	0.333373	-3.036237	0.0036
?CREDITGROWTH	-49.87841	34.42353	-1.448962	0.1529
SA_GDP	2.026560	1.355741	1.494798	0.1406
SA_CPI	-6.743285	7.347268	-0.917795	0.3627
SA_HHI	-42.00942	3137.760	-0.013388	0.9894
Random Effects (Cross)				
ABSA_--C	0.000000			
FNB_--C	0.000000			
AFRICANBANK_--C	0.000000			
BIDVEST_--C	0.000000			
CAPITEC_--C	0.000000			
GRINDROD_--C	0.000000			
INVESTEC_--C	0.000000			
NEDBANK_--C	0.000000			
SASFIN_--C	0.000000			
SBSA_--C	0.000000			
UBANK_--C	0.000000			

Effects Specification	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	24.33656	1.0000

Weighted Statistics			
R-squared	0.186535	Mean dependent var	8.697385
Adjusted R-squared	0.070325	S.D. dependent var	31.40408
S.E. of regression	30.27970	Sum squared resid	51344.19
F-statistic	1.605160	Durbin-Watson stat	1.171815
Prob(F-statistic)	0.144153		

Unweighted Statistics			
R-squared	0.186535	Mean dependent var	8.697385
Sum squared resid	51344.19	Durbin-Watson stat	1.171815

Correlated Random Effects - Hausman Test
Pool: POOL_SA_ROE
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	40.216614	8	0.0000

Dependent Variable: ?LIQUIDITYRATIO
Method: Pooled EGLS (Cross-section random effects)

Sample: 2015 2020
Included observations: 6
Cross-sections included: 11
Total pool (unbalanced) observations: 65
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.612093	1.379158	1.893976	0.0635
?ROAE	-0.000287	0.000539	-0.532982	0.5962
LOG(?TOTALASSETS)	-0.049045	0.016073	-3.051441	0.0035
?EQUITYASSETS	-0.008031	0.004024	-1.995950	0.0509
?CREDITGROWTH	0.098826	0.177915	0.555471	0.5808
SA_GDP	0.044148	0.091236	0.483890	0.6304
SA_CPI	0.062484	0.108052	0.578277	0.5654
SA_IRL	-0.118034	0.275079	-0.429092	0.6695
SA_IRM	-0.264858	0.362004	-0.731645	0.4675
SA_UNE	0.013173	0.091278	0.144320	0.8858
Random Effects (Cross)				
ABSA_--C	-0.012217			
FNB_--C	-0.018568			
AFRICANBANK_--C	0.001267			
BIDVEST_--C	0.105599			
CAPITEC_--C	0.042972			
GRINDROD_--C	-0.059196			
INVESTEC_--C	0.045994			
NEDBANK_--C	-0.064175			
SASFIN_--C	-0.169656			
SBSA_--C	0.028411			
UBANK_--C	0.099568			

Effects Specification	S.D.	Rho
Cross-section random	0.086155	0.3707
Idiosyncratic random	0.112253	0.6293

Weighted Statistics

R-squared	0.218626	Mean dependent var	0.120444
Adjusted R-squared	0.090765	S.D. dependent var	0.128054
S.E. of regression	0.122179	Sum squared resid	0.821029
F-statistic	1.709869	Durbin-Watson stat	0.882929
Prob(F-statistic)	0.108767		

Unweighted Statistics

R-squared	0.265382	Mean dependent var	0.255269
Sum squared resid	1.303938	Durbin-Watson stat	0.555939

Correlated Random Effects - Hausman Test
Pool: POOL_SA_LR
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	9	1.0000

Appendix G: UK - pooled regression

Dependent Variable: ?ROAA
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.696195	1.354405	-0.514022	0.6076
LOG(?TOTALASSETS)	-0.019553	0.032747	-0.597083	0.5509
?LOANASSETS	0.002265	0.003951	0.573253	0.5669
?EQUITYASSETS	0.037174	0.008747	4.249776	0.0000
?COSTINCOMERATIO	-0.002569	0.001017	-2.524791	0.0121
?CREDITGROWTH	0.010213	0.017243	0.592272	0.5541
UK_GDP	0.029033	0.024201	1.199656	0.2312
UK_CPI	-0.075057	0.133422	-0.562558	0.5741
UK_HHI	10.39002	8.152481	1.274462	0.2034

R-squared	0.105241	Mean dependent var	0.521826
Adjusted R-squared	0.082298	S.D. dependent var	1.535168
S.E. of regression	1.470641	Akaike info criterion	3.636911
Sum squared resid	674.7891	Schwarz criterion	3.742652
Log likelihood	-574.7242	Hannan-Quinn criter.	3.679131
F-statistic	4.587154	Durbin-Watson stat	1.453144
Prob(F-statistic)	0.000026		

Dependent Variable: ?ROAE
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.217002	9.066258	-0.244533	0.8070
LOG(?TOTALASSETS)	-0.067989	0.219203	-0.310166	0.7566
?LOANASSETS	0.042673	0.026447	1.613529	0.1076
?EQUITYASSETS	0.041767	0.058554	0.713310	0.4762
?COSTINCOMERATIO	-0.024605	0.006810	-3.612868	0.0004
?CREDITGROWTH	0.132359	0.115426	1.146699	0.2524
UK_GDP	0.313568	0.161997	1.935638	0.0538
UK_CPI	-0.148768	0.893111	-0.166573	0.8678
UK_HHI	59.43111	54.57194	1.089042	0.2770

R-squared	0.086731	Mean dependent var	5.225081
Adjusted R-squared	0.063314	S.D. dependent var	10.17160
S.E. of regression	9.844333	Akaike info criterion	7.439306
Sum squared resid	30236.20	Schwarz criterion	7.545047
Log likelihood	-1185.009	Hannan-Quinn criter.	7.481526
F-statistic	3.703733	Durbin-Watson stat	1.529307
Prob(F-statistic)	0.000376		

Dependent Variable: ?LIQUIDITYRATIO
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.205237	0.079567	2.579427	0.0104
?ROAE	-0.001391	0.000721	-1.929017	0.0546
LOG(?TOTALASSETS)	0.002564	0.001764	1.453250	0.1472
?EQUITYASSETS	-0.000870	0.000705	-1.234513	0.2179
?CREDITGROWTH	0.000138	0.003780	0.036501	0.9709
UK_GDP	-0.001270	0.000748	-1.698255	0.0905
UK_CPI	0.005556	0.001506	3.688887	0.0003
UK_IRL	0.012820	0.046151	0.277777	0.7814
UK_IRM	-0.046297	0.082033	-0.564370	0.5729
UK_UNE	0.005288	0.023304	0.226937	0.8206

R-squared	0.023899	Mean dependent var	0.221744
Adjusted R-squared	-0.004348	S.D. dependent var	0.139590
S.E. of regression	0.139893	Akaike info criterion	-1.065221
Sum squared resid	6.086285	Schwarz criterion	-0.947731
Log likelihood	180.9680	Hannan-Quinn criter.	-1.018310
F-statistic	0.846081	Durbin-Watson stat	0.299357
Prob(F-statistic)	0.574158		

Appendix H: UK - fixed effects with correlation

Dependent Variable: ?ROAA
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.415961	4.781422	0.714424	0.4756
LOG(?TOTALASSETS)	-0.357280	0.298565	-1.196654	0.2325

?LOANASSETS	0.040301	0.017705	2.276223	0.0236
?EQUITYASSETS	-0.117281	0.026724	-4.388597	0.0000
?COSTINCOMERATIO	-0.002108	0.001058	-1.992293	0.0474
?CREDITGROWTH	0.014699	0.019004	0.773484	0.4399
UK_GDP	0.010289	0.023051	0.446360	0.6557
UK_CPI	0.008098	0.125279	0.064641	0.9485
UK_HHI	10.68663	7.836868	1.363636	0.1739
Fixed Effects (Cross)				
AHLIUNITED_--C	0.897566			
ALRAYAN_--C	1.431269			
ALLIEDIRISH_--C	1.784130			
ARBUTHNOT_--C	1.802595			
NEGARA_--C	-0.006164			
BANKOFSCOTLAND_--C	0.162264			
BARCLAYS_--C	2.659997			
CHOARECO_--C	0.931759			
THECHARITY_--C	-2.480890			
THEROYALBANKOFSCOTLAND_--C	0.368547			
CHORLEYANDDISTRICT_--C	-1.864156			
COVENTRY_--C	-0.912420			
COUTTSCO_--C	0.804132			
CUMBERLAND_--C	-1.376160			
CAPITALONE_--C	4.929339			
EARLSHILTON_--C	-2.116787			
ECOLOGY_--C	-1.981556			
EUROPEARAB_--C	0.475267			
CHELTENHAMGLOUCESTER_--C	11.39984			
HARPENDEN_--C	-1.500391			
ICBC_--C	1.976966			
ICICI_--C	-0.669270			
JULIANHODGE_--C	-0.320592			
KINGDOM_--C	-1.904215			
CLYDESDALE_--C	-1.043986			
LEEDS_--C	-0.957037			
LLOYDS_--C	1.060918			
MARSDEN_--C	-2.033711			
METRO_--C	-0.818883			
NATIONALBANKOFKUWAIT_--C	0.868989			
NATIONALCOUNTIES_--C	-1.326739			
NATIONALWESTMINSTER_--C	0.721792			
NATIONWIDE_--C	-0.224468			
NORTHERN_--C	0.563832			
PROGRESSIVE_--C	-1.623104			
PUNJABNATIONALBANK_--C	-1.171097			
HAMPSHIRETRUST_--C	-1.094649			
RELIANCE_--C	-0.597329			
SAFFRON_--C	-2.130656			
SAINSBURYS_--C	-0.506820			
SANTANDER_--C	0.486324			

HINKLEYANDRUGBY_--C	-2.372701
SCOTTISH_--C	-1.799542
SECURETRUST_--C	1.317135
SHAWBROOK_--C	0.000599
SKIPTON_--C	-0.427788
STANDARDCHARTERED_--C	1.931239
TESCOPERSONALFINANCE_--C	0.791467
HSBC_--C	2.229104
MELTONMOWBRAY_--C	-1.891481
MONMOUTHSHIRE_--C	-1.909283
UNITYTRUST_--C	0.221595
VIRGINMONEY_--C	-0.634289
WEATHERBYS_--C	-0.665192

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.363987	Mean dependent var	0.521826
Adjusted R-squared	0.214192	S.D. dependent var	1.535168
S.E. of regression	1.360863	Akaike info criterion	3.625794
Sum squared resid	479.6542	Schwarz criterion	4.354235
Log likelihood	-519.9400	Hannan-Quinn criter.	3.916643
F-statistic	2.429903	Durbin-Watson stat	2.157679
Prob(F-statistic)	0.000001		

Redundant Fixed Effects Tests
Pool: POOL_UK_ROA
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.988064	(53,259)	0.0002
Cross-section Chi-square	109.568425	53	0.0000

Dependent Variable: ?ROAE
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.74236	30.09973	-0.390115	0.6968
LOG(?TOTALASSETS)	-0.964291	1.879511	-0.513054	0.6084
?LOANASSETS	0.329924	0.111456	2.960117	0.0034
?EQUITYASSETS	0.203950	0.168231	1.212317	0.2265
?COSTINCOMERATIO	-0.018017	0.006660	-2.705405	0.0073
?CREDITGROWTH	0.057683	0.119632	0.482170	0.6301

UK_GDP	0.277455	0.145107	1.912077	0.0570
UK_CPI	0.095943	0.788649	0.121654	0.9033
UK_HHI	81.16179	49.33419	1.645143	0.1012
Fixed Effects (Cross)				
AHLIUNITED_--C	9.370377			
ALRAYAN_--C	16.52440			
ALLIEDIRISH_--C	2.904535			
ARBUTHNOT_--C	14.78174			
NEGARA_--C	0.949218			
BANKOFSCOTLAND_--C	6.134021			
BARCLAYS_--C	16.67420			
CHOARECO_--C	13.36088			
THECHARITY_--C	-15.85713			
THEROYALBANKOFSCOTLAND_--C	9.674112			
CHORLEYANDDISTRICT_--C	-5.346258			
COVENTRY_--C	-1.665521			
COUTTSCO_--C	16.31221			
CUMBERLAND_--C	-3.877831			
CAPITALONE_--C	-16.63453			
EARLSHILTON_--C	-7.570788			
ECOLOGY_--C	-0.894310			
EUROPEARAB_--C	5.245803			
CHELTENHAMGLOUCESTER_--C	8.937015			
HARPENDEN_--C	-4.760885			
ICBC_--C	7.727755			
ICICI_--C	-9.106588			
JULIANHODGE_--C	-3.631290			
KINGDOM_--C	-8.304429			
CLYDESDALE_--C	-14.17065			
LEEDS_--C	-1.534829			
LLOYDS_--C	4.421589			
MARSDEN_--C	-9.027948			
METRO_--C	-9.346128			
NATIONALBANKOFKUWAIT_--C	2.999973			
NATIONALCOUNTIES_--C	-4.758255			
NATIONALWESTMINSTER_--C	3.674476			
NATIONWIDE_--C	-1.251085			
NORTHERN_--C	4.331639			
PROGRESSIVE_--C	-4.679827			
PUNJABNATIONALBANK_--C	-16.04225			
HAMPSHIRETRUST_--C	-10.78492			
RELIANCE_--C	5.286138			
SAFFRON_--C	-8.051959			
SAINSBURYS_--C	-8.209418			
SANTANDER_--C	3.424732			
HINKLEYANDRUGBY_--C	-11.32103			
SCOTTISH_--C	-7.126470			
SECURETRUST_--C	8.264700			
SHAWBROOK_--C	2.275561			

SKIPTON_--C	0.639568
STANDARDCHARTERED_--C	8.929508
TESCOPERSONALFINANCE_--C	-1.298790
HSBC_--C	13.71938
MELTONMOWBRAY_--C	-9.355413
MONMOUTHSHIRE_--C	-5.516554
UNITYTRUST_--C	10.74013
VIRGINMONEY_--C	-8.515195
WEATHERBYS_--C	9.902261

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.425869	Mean dependent var	5.225081
Adjusted R-squared	0.290649	S.D. dependent var	10.17160
S.E. of regression	8.566822	Akaike info criterion	7.305350
Sum squared resid	19008.12	Schwarz criterion	8.033791
Log likelihood	-1110.509	Hannan-Quinn criter.	7.596199
F-statistic	3.149455	Durbin-Watson stat	2.332821
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests
Pool: POOL_UK_ROE
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	2.886623	(53,259)	0.0000
Cross-section Chi-square	148.999687	53	0.0000

Dependent Variable: ?LIQUIDITYRATIO
Method: Pooled Least Squares
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.595646	0.323962	4.925415	0.0000
?ROAE	-0.001168	0.000549	-2.127085	0.0344
LOG(?TOTALASSETS)	-0.081994	0.016251	-5.045557	0.0000
?EQUITYASSETS	-0.001205	0.001524	-0.791169	0.4296
?CREDITGROWTH	-0.000816	0.001088	-0.750279	0.4538
UK_GDP	-0.002622	0.002121	-1.236121	0.2175
UK_CPI	0.002890	0.009710	0.297594	0.7663
UK_IRL	0.020711	0.100309	0.206470	0.8366
UK_IRM	-0.062812	0.190099	-0.330417	0.7414
UK_UNE	-0.013236	0.052681	-0.251242	0.8018

Fixed Effects (Cross)	
AHLIUNITED_--C	-0.009754
ALRAYAN_--C	-0.203159
ALLIEDIRISH_--C	0.221939
ARBUTHNOT_--C	-0.056176
NEGARA_--C	-0.474705
BANKOFSCOTLAND_--C	0.316083
BARCLAYS_--C	0.655285
CHOARECO_--C	0.087492
THECHARITY_--C	-0.387247
THEROYALBANKOFSCOTLAND_--C	0.355395
CHORLEYANDDISTRICT_--C	-0.225821
COVENTRY_--C	0.079966
COUTTSCO_--C	0.241582
CUMBERLAND_--C	-0.123279
CAPITALONE_--C	-0.162092
EARLSHILTON_--C	-0.305109
ECOLOGY_--C	-0.223389
EUROPEARAB_--C	0.186970
CHELTENHAMGLOUCESTER_--C	-0.179766
HARPENDEN_--C	-0.220511
ICBC_--C	0.223821
ICICI_--C	-0.121114
JULIANHODGE_--C	-0.145371
KINGDOM_--C	-0.321287
CLYDESDALE_--C	0.134599
LEEDS_--C	0.017430
LLOYDS_--C	0.364368
MARSDEN_--C	-0.248391
METRO_--C	-0.023041
NATIONALBANKOFKUWAIT_--C	0.171572
NATIONALCOUNTIES_--C	-0.148989
NATIONALWESTMINSTER_--C	0.390974
NATIONWIDE_--C	0.181433
NORTHERN_--C	0.102777
PROGRESSIVE_--C	-0.151270
PUNJABNATIONALBANK_--C	0.022363
HAMPSHIRETRUST_--C	-0.211021
RELIANCE_--C	-0.105314
SAFFRON_--C	-0.241303
SAINSBURYS_--C	-0.064466
SANTANDER_--C	0.320700
HINKLEYANDRUGBY_--C	-0.223059
SCOTTISH_--C	-0.257978
SECURETRUST_--C	-0.158520
SHAWBROOK_--C	-0.057679
SKIPTON_--C	0.060401
STANDARDCHARTERED_--C	0.522831

TESCOPERSONALFINANCE_--C	-0.024201
HSBC_--C	0.588224
MELTONMOWBRAY_--C	-0.265870
MONMOUTHSHIRE_--C	-0.197439
UNITYTRUST_--C	0.152188
VIRGINMONEY_--C	0.141604
WEATHERBYS_--C	-0.050434

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.751185	Mean dependent var	0.221744
Adjusted R-squared	0.691392	S.D. dependent var	0.139590
S.E. of regression	0.077546	Akaike info criterion	-2.101857
Sum squared resid	1.551441	Schwarz criterion	-1.361667
Log likelihood	400.3480	Hannan-Quinn criter.	-1.806317
F-statistic	12.56311	Durbin-Watson stat	1.075629
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests
Pool: POOL_UK_LR
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	14.228891	(53,258)	0.0000
Cross-section Chi-square	438.760117	53	0.0000

Appendix I: UK - random effects

Dependent Variable: ?ROAA
Method: Pooled EGLS (Cross-section random effects)
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.606956	1.304476	-0.465287	0.6421
LOG(?TOTALASSETS)	-0.022463	0.035123	-0.639543	0.5229
?LOANASSETS	0.002235	0.004206	0.531344	0.5956
?EQUITYASSETS	0.033049	0.009171	3.603739	0.0004
?COSTINCOMERATIO	-0.002504	0.000967	-2.588277	0.0101
?CREDITGROWTH	0.010196	0.016318	0.624786	0.5326
UK_GDP	0.028739	0.022401	1.282920	0.2005
UK_CPI	-0.073380	0.123507	-0.594140	0.5528

UK_HHI	10.32004	7.549734	1.366941	0.1726
Random Effects (Cross)				
AHLIUNITED_--C	0.160264			
ALRAYAN_--C	0.049870			
ALLIEDIRISH_--C	0.048760			
ARBUTHNOT_--C	0.479246			
NEGARA_--C	0.229274			
BANKOFSCOTLAND_--C	0.035645			
BARCLAYS_--C	-0.002695			
CHOARECO_--C	0.068008			
THECHARITY_--C	-0.304785			
THEROYALBANKOFSCOTLAND_--C	0.009083			
CHORLEYANDDISTRICT_--C	-0.018983			
COVENTRY_--C	-0.007941			
COUTTSCO_--C	0.050084			
CUMBERLAND_--C	0.013168			
CAPITALONE_--C	0.128111			
EARLSHILTON_--C	-0.041459			
ECOLOGY_--C	0.005801			
EUROPEARAB_--C	-0.076528			
CHELTENHAMGLOUCESTER_--C	0.327163			
HARPENDEN_--C	-0.043748			
ICBC_--C	0.016137			
ICICI_--C	-0.250645			
JULIANHODGE_--C	-0.089902			
KINGDOM_--C	-0.062735			
CLYDESDALE_--C	-0.246900			
LEEDS_--C	0.004652			
LLOYDS_--C	0.008345			
MARSDEN_--C	-0.037316			
METRO_--C	-0.216086			
NATIONALBANKOFKUWAIT_--C	-0.019302			
NATIONALCOUNTIES_--C	0.051942			
NATIONALWESTMINSTER_--C	-0.016983			
NATIONWIDE_--C	-0.004712			
NORTHERN_--C	0.080864			
PROGRESSIVE_--C	-0.021399			
PUNJABNATIONALBANK_--C	-0.491203			
HAMPSHIRETRUST_--C	-0.079389			
RELIANCE_--C	-0.097495			
SAFFRON_--C	-0.066571			
SAINSBURYS_--C	-0.166270			
SANTANDER_--C	0.002077			
HINKLEYANDRUGBY_--C	-0.094158			
SCOTTISH_--C	-0.053742			
SECURETRUST_--C	0.570886			
SHAWBROOK_--C	0.190453			
SKIPTON_--C	0.052328			

STANDARDCHARTERED_--C	-0.054419
TESCOPERSONALFINANCE_--C	0.128137
HSBC_--C	-0.018712
MELTONMOWBRAY_--C	-0.081397
MONMOUTHSHIRE_--C	-0.040254
UNITYTRUST_--C	0.013683
VIRGINMONEY_--C	-0.102119
WEATHERBYS_--C	0.083866

Effects Specification	S.D.	Rho
Cross-section random	0.330205	0.0556
Idiosyncratic random	1.360863	0.9444

Weighted Statistics

R-squared	0.086222	Mean dependent var	0.449748
Adjusted R-squared	0.062792	S.D. dependent var	1.481969
S.E. of regression	1.434474	Sum squared resid	642.0073
F-statistic	3.679952	Durbin-Watson stat	1.527835
Prob(F-statistic)	0.000404		

Unweighted Statistics

R-squared	0.104557	Mean dependent var	0.521826
Sum squared resid	675.3047	Durbin-Watson stat	1.452502

Correlated Random Effects - Hausman Test
Pool: POOL_UK_ROA
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	8	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Dependent Variable: ?ROAE
Method: Pooled EGLS (Cross-section random effects)
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.570903	9.391434	-0.593190	0.5535
LOG(?TOTALASSETS)	-0.019727	0.318543	-0.061929	0.9507

?LOANASSETS	0.065928	0.037089	1.777562	0.0764
?EQUITYASSETS	0.082308	0.077744	1.058707	0.2906
?COSTINCOMERATIO	-0.020520	0.006363	-3.224837	0.0014
?CREDITGROWTH	0.115887	0.106726	1.085832	0.2784
UK_GDP	0.312662	0.141153	2.215048	0.0275
UK_CPI	-0.116905	0.778171	-0.150231	0.8807
UK_HHI	62.43719	47.64104	1.310576	0.1910
Random Effects (Cross)				
AHLIUNITED_--C	4.526429			
ALRAYAN_--C	2.729581			
ALLIEDIRISH_--C	0.242606			
ARBUTHNOT_--C	9.684234			
NEGARA_--C	3.692060			
BANKOFSCOTLAND_--C	3.255574			
BARCLAYS_--C	0.493383			
CHOARECO_--C	3.716812			
THECHARITY_--C	-6.767310			
THEROYALBANKOFSCOTLAND_--C	1.636828			
CHORLEYANDDISTRICT_--C	0.292537			
COVENTRY_--C	0.943458			
COUTTSCO_--C	5.166638			
CUMBERLAND_--C	1.117275			
CAPITALONE_--C	-3.260917			
EARLSHILTON_--C	-0.550357			
ECOLOGY_--C	2.447971			
EUROPEARAB_--C	-1.034697			
CHELTENHAMGLOUCESTER_--C	1.375653			
HARPENDEN_--C	-0.504978			
ICBC_--C	0.991406			
ICICI_--C	-5.259610			
JULIANHODGE_--C	-2.096262			
KINGDOM_--C	-1.261732			
CLYDESDALE_--C	-8.551025			
LEEDS_--C	1.298910			
LLOYDS_--C	0.140100			
MARSDEN_--C	-1.197076			
METRO_--C	-7.413824			
NATIONALBANKOFKUWAIT_--C	-0.184273			
NATIONALCOUNTIES_--C	-0.126719			
NATIONALWESTMINSTER_--C	-0.675080			
NATIONWIDE_--C	0.115047			
NORTHERN_--C	1.903403			
PROGRESSIVE_--C	0.406950			
PUNJABNATIONALBANK_--C	-10.58076			
HAMPSHIRETRUST_--C	-2.081188			
RELIANCE_--C	-1.754210			
SAFFRON_--C	-1.910909			
SAINSBURYS_--C	-4.213392			
SANTANDER_--C	0.486404			

HINKLEYANDRUGBY_--C	-3.013750
SCOTTISH_--C	-1.064665
SECURETRUST_--C	9.898245
SHAWBROOK_--C	4.788015
SKIPTON_--C	2.152714
STANDARDCHARTERED_--C	-1.547057
TESCOPERSONALFINANCE_--C	1.322012
HSBC_--C	-0.924897
MELTONMOWBRAY_--C	-2.203582
MONMOUTHSHIRE_--C	-0.248161
UNITYTRUST_--C	2.350192
VIRGINMONEY_--C	-4.542978
WEATHERBYS_--C	5.794976

Effects Specification	S.D.	Rho
Cross-section random	4.797893	0.2388
Idiosyncratic random	8.566822	0.7612

Weighted Statistics			
R-squared	0.090038	Mean dependent var	3.083010
Adjusted R-squared	0.066706	S.D. dependent var	8.940843
S.E. of regression	8.638600	Sum squared resid	23283.13
F-statistic	3.858954	Durbin-Watson stat	1.958432
Prob(F-statistic)	0.000237		

Unweighted Statistics			
R-squared	0.082614	Mean dependent var	5.225081
Sum squared resid	30372.50	Durbin-Watson stat	1.501306

Correlated Random Effects - Hausman Test
Pool: POOL_UK_ROE
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	8	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Dependent Variable: ?LIQUIDITYRATIO
Method: Pooled EGLS (Cross-section random effects)
Sample: 2015 2020
Included observations: 6
Cross-sections included: 54
Total pool (unbalanced) observations: 321
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.339939	0.197990	1.716951	0.0870
?ROAE	-0.001249	0.000537	-2.325739	0.0207
LOG(?TOTALASSETS)	-0.007390	0.005940	-1.244117	0.2144
?EQUITYASSETS	-0.000240	0.001116	-0.215128	0.8298
?CREDITGROWTH	-0.002458	0.001007	-2.441164	0.0152
UK_GDP	-0.001693	0.002108	-0.802891	0.4227
UK_CPI	0.005185	0.009698	0.534672	0.5933
UK_IRL	0.036526	0.100232	0.364416	0.7158
UK_IRM	-0.090763	0.189958	-0.477803	0.6331
UK_UNE	0.012599	0.052392	0.240477	0.8101
Random Effects (Cross)				
AHLIUNITED_--C	0.041064			
ALRAYAN_--C	-0.121799			
ALLIEDIRISH_--C	-0.001794			
ARBUTHNOT_--C	-0.000401			
NEGARA_--C	-0.116384			
BANKOFSCOTLAND_--C	-0.003495			
BARCLAYS_--C	0.233072			
CHOARECO_--C	0.083661			
THECHARITY_--C	-0.136619			
THEROYALBANKOFSCOTLAND_--C	0.275239			
CHORLEYANDDISTRICT_--C	-0.004172			
COVENTRY_--C	-0.079214			
COUTTSCO_--C	0.092663			
CUMBERLAND_--C	-0.067562			
CAPITALONE_--C	-0.142912			
EARLSHILTON_--C	-0.038674			
ECOLOGY_--C	0.017294			
EUROPEARAB_--C	0.206549			
CHELTENHAMGLOUCESTER_--C	-0.017923			
HARPENDEN_--C	-0.019428			
ICBC_--C	0.260560			
ICICI_--C	-0.086807			
JULIANHODGE_--C	-0.052861			
KINGDOM_--C	0.002601			
CLYDESDALE_--C	-0.046918			
LEEDS_--C	-0.076969			
LLOYDS_--C	-0.009838			
MARSDEN_--C	-0.076320			
METRO_--C	-0.103229			
NATIONALBANKOFKUWAIT_--C	0.193267			
NATIONALCOUNTIES_--C	-0.082144			
NATIONALWESTMINSTER_--C	0.067995			
NATIONWIDE_--C	-0.099374			
NORTHERN_--C	0.044166			
PROGRESSIVE_--C	-0.075502			
PUNJABNATIONALBANK_--C	0.116323			

HAMPSHIRETRUST_--C	-0.077297
RELIANCE_--C	0.113217
SAFFRON_--C	-0.123508
SAINSBURYS_--C	-0.088361
SANTANDER_--C	0.010835
HINKLEYANDRUGBY_--C	-0.079079
SCOTTISH_--C	-0.073328
SECURETRUST_--C	-0.092336
SHAWBROOK_--C	-0.075482
SKIPTON_--C	-0.052562
STANDARDCHARTERED_--C	0.156772
TESCOPERSONALFINANCE_--C	-0.097436
HSBC_--C	0.198006
MELTONMOWBRAY_--C	-0.089664
MONMOUTHSHIRE_--C	-0.083264
UNITYTRUST_--C	0.243066
VIRGINMONEY_--C	-0.040375
WEATHERBYS_--C	0.076679

Effects Specification	S.D.	Rho
Cross-section random	0.113950	0.6835
Idiosyncratic random	0.077546	0.3165

Weighted Statistics			
R-squared	0.061181	Mean dependent var	0.059554
Adjusted R-squared	0.034013	S.D. dependent var	0.081991
S.E. of regression	0.080613	Sum squared resid	2.021005
F-statistic	2.251937	Durbin-Watson stat	0.825500
Prob(F-statistic)	0.018838		

Unweighted Statistics			
R-squared	-0.026672	Mean dependent var	0.221744
Sum squared resid	6.401614	Durbin-Watson stat	0.260612

Correlated Random Effects - Hausman Test
Pool: POOL_UK_LR
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	9	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.