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The Finance-Growth Nexus in South Africa

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Abstract

The finance-growth nexus remains a divisive topic within macroeconomic discourse. Despite the plethora of studies devoted to understanding the causal relationships, there is still vast disagreement. This study comprehensively examines the relationship between economic growth, financial development and financial structure within the South African context from 1980-2020. The parsimonious and theoretically-grounded Solow growth model specifications are estimated using the auto-regressive distributed lag (ARDL) approach to co-integration. Five alternative specifications that employ one measure of financial development or financial structure at a time are tested.

The results are ambiguous. When proxied by the liquid liabilities ratio, financial development is found to have positively contributed to long-run and short-run economic growth in the country. Conversely, when the private credit ratio is used, financial development becomes insignificant. South Africa's financial development certainly has no negative effects on the country's growth prospects – a conclusion that carries important policy implications. In terms of financial structure, both the stock market value traded ratio and the stock market capitalisation ratio, yield insignificant results, lending itself to the conclusion that financial structure does not matter. Lastly, a composite financial development indicator was used to see whether financial inclusion has bearing on the relationship. The result is insignificant but given the nature of the indicator, financial inclusion is not rendered irrelevant.

If pro-poor growth remains the objective of the South African government, the financial sector has an important role to play in promoting growth and reducing inequality. Furthermore, it remains imperative to strengthen financial institutions in ways that ameliorate current imbalances. As a final remark, there is no economic value in promoting one financial structure over the other and financial development can be growth-enhancing provided the sector is adequately regulated with consistent policy.

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To my friends, you have provided the emotional bank balance and social connection that I so desperately need as motivation to push for success. A special mention must be made to Sky Cope for his advice on the graphical representation of data in this paper.

Dedication

To my friend, Odour Ochieng.

Declaration

I declare that the work in this dissertation was carried out in accordance with the requirements of the University's Regulations and Code of Practice for Research Degree Programmes and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others, is indicated as such. Any views expressed in the dissertation are those of the author.

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1 Introduction

Finance is a quintessential cornerstone of the modern economy that underpins virtually every economic transaction. It is so central to modern economic functioning that to imagine a world without finance is a near-impossible task. Given its centrality, the proposition that finance is essential to economic growth may seem trivial. Indeed, Miller (1998), amongst many others, claim that the relationship is too obvious to warrant serious discussion. However, the seemingly straightforward proposition is far from obvious, evidenced clearly by the disjuncture and empirical disagreement between economists over the finance-growth nexus. This nexus, which spawned through the seminal work of Bagehot (1873) and Schumpeter (1911), and burgeoned through the pioneering contributions of Goldsmith (1969), Gurley and Shaw (1955), and McKinnon (1973), remains an important issue of debate.

Despite the wealth of attention afforded to the subject, there is still no clear consensus within the extant literature on whether finance spurs economic growth nor whether financial structure has a meaningful impact on this relationship. It is posited that the lack of empirical significance may likely stem from the different proxies used to define financial development or financial structure, the methodological approaches used in the estimations, and the sample groupings (Arestis et al., 2004; De Gregorio & Guidotti, 1995; Demetriades & Andrianova, 2004; Demirgüç-Kunt & Maksimovic, 2002; Luintel et al., 2008). Motivated by the empirical disjuncture, this paper aims to contribute to the well-established literature by testing the relationship using a variety of financial indices, the newest data available, and by focusing on a single country, South Africa. South Africa is an interesting case considering the country's well-developed and highly-sophisticated financial system but indelibly poor growth record. A primary objective of this paper is to investigate the importance of the financial sector vis-à-vis its overall economic performance and whether the particular financial structure matters. South Africa's size and relative importance as a hegemonic actor within the African macroeconomic environment further underscore the motivation behind the country

selection. As Fourie et al. (1992) notes, the country's economic performance is integral to the development of the sub-Saharan African region. Thus, establishing a significant relationship between finance and economic growth carries policy implications that have relevance at both domestic and regional levels.

The study employs the auto-regressive distributed lag approach (ARDL) to cointegration on South African time-series data over the period 1980-2020. This approach, advanced by Pesaran et al. (2001), Pesaran and Smith (1995), and Pesaran and Smith (1998), carries several advantages over other cointegration techniques (e.g., Engle and Granger (1987), Johansen (1991), and Johansen and Juselius (1990)). The intention is to establish and derive short-run and long-run relationships between financial development and economic growth as well as between financial structure and economic growth. The advantage of a time-series investigation is that it allows the researcher to capture certain idiosyncrasies that may otherwise confound the relationship. Furthermore, most studies use specific financial indices to serve as proxies over composite measures. Given this sparsity, a novel composite financial development indicator developed by the World Bank is used. This indicator, contained in the Global Financial Development Database (GFDD), incorporates financial inclusion into the overall financial development concept. Financial inclusion can be defined as the process by which a greater percentage of the population has access to and makes use of financial service provisions (Svirydzenka, 2016).

The paper is organised as follows: §2 surveys and critically examines the extant theoretical and empirical literature. §3 provides an overview of the South African financial sector and economic growth trends. §4 provides an analytical framework in which the data, methodology and model specifications are defined. §5 presents the estimation results. Lastly, §6 offers concluding remarks and policy implications.

2 Literature Review

2.1 Theoretical Literature

2.1.1 Financial Development Theory

"*The banker, therefore, is not so much primarily a middleman ... He authorizes people in the name of society ... to innovate*" (Schumpeter, 1911, p. 74). Bagehot (1873), Goldsmith (1969), Gurley and Shaw (1955), McKinnon (1973), and Schumpeter (1911) are oft-cited as the pioneers of the finance-growth nexus, whose seminal contributions have catalysed the rich line of inquiry and scholarly investigation. However, despite the attention and plethora of studies devoted to the subject, the finance-growth nexus is acutely characterised by contention. Many economists hold a seemingly heretical view that finance is an irrelevant and "*over-stressed*" determinant of economic growth (Lucas Jr, 1988, p. 6).

Other economists believe that finance plays a more passive role in the economic growth process. Joan Robinson famously quoted, "*where enterprise leads, finance follows*", implying that finance does not cause growth, but rather, finance responds to demands from the *real* sector (Robinson, 1952, p. 86). Under the demand-following hypothesis, economic growth generates additional and new demand for financial services, triggering a supply response marked by the expansion of the financial sector (Patrick, 1966). So, the creation of financial institutions is borne in response to a demand for these services (Patrick, 1966, p. 175).

Conversely, some academics hold the "[the view] *that the contribution of financial markets to economic growth is a proposition too obvious for serious discussion*" (Miller, 1998, p. 14). The supply-leading hypothesis postulates that the creation of financial institutions and the supply of financial services comes in advance of the demand for them (Patrick, 1966). Drawing a more retained conclusion, Levine (2005) notes that ignoring the finance-growth nexus would substantially limit our understanding of economic growth, necessitating further research on the subject.

There is a fair degree of variation in the theoretical channels of transmission postulated by economists (De Gregorio & Guidotti, 1995). The significant costs associated with the acquisition of information, contract creation and enforcement create a 'natural' impetus for the emergence of financial instruments, markets, and institutions (Levine, 2005). For example, banks improve access to information affecting credit allocation while financial contracts provide increased certainty to investors over the repayment of debt. Despite idiosyncrasies in size, structure and efficiency, financial systems function to facilitate the allocation of resources in uncertain environments in ways that ameliorate market frictions (Merton & Bodie, 1995). In arising to mitigate the effects of information and transaction costs, these arrangements profoundly alter the incentives and constraints facing economic agents (Levine, 2005; Merton & Bodie, 1995). Following Levine (2005), it is instructive to categorically state the functions of the financial system into:

1. Savings mobilisation
2. Risk management
3. Monitoring managers and exerting corporate control
4. Acquiring information and allocating resources
5. Facilitating exchange

Each of these functions and their complex mechanisms yield influence over savings rates, investment decisions, technological development, and hence long-run economic growth (Levine, 2005). Now that the theoretical link has been established, financial development can be defined as the process whereby a financial sector improves its ability to provide the functions and ameliorate market frictions (Levine, 2005, p. 870). The rest of this section describes each of these functions and how their provision may influence resource allocation, thereby affecting economic growth.

Savings mobilisation

The costly agglomeration of capital from separate savers is referred to as the 'mobilisation' or 'pooling' (Levine et al., 2003). Two primary barriers need to be overcome for the pooling process to be successful: (1) overcoming transaction costs and (2) overcoming information asymmetries. The former constraint is associated with the collection of savings from disparate individuals, while the latter constraint is associated with making savers feel at ease with relinquishing control over their surplus funds (Levine, 2005). Given the constraints, financial arrangements have been designed to ameliorate these frictions to facilitate the pooling process. As Levine (2005) notes, this may involve the formation of bilateral contracts between productive units raising capital, and agents with surplus resources. Furthermore, mobilisation can also occur through financial intermediaries, which involves surplus agents entrusting a third party to channel their funds for productive purposes (Sirri & Tufano, 1995). Boyd and Smith (1992) and Lamoreaux (1996) note that this requires the intermediary to demonstrate soundness of their investment practice.

In well-developed financial systems that are more effective at pooling the savings of individuals, the greater the volume of savings available to fund investment opportunities and ultimately stimulate economic growth (Levine, 1997). This is considered as the direct effect that mobilisation can have on capital accumulation. However, there is an indirect effect that can also spur economic growth. Production processes would be constrained to economically inefficient scales in the absence of pooled surplus funds (Sirri & Tufano, 1995). Corroborating this, Levine (2005) states that many investment opportunities require an injection of capital that far exceeds the means of an individual investor. Furthermore, the pooling of funds and the diversification of risk by financial systems reduce the overall idiosyncratic risk faced by investors (Levine, 1997). This facilitates the reallocation of investment towards high yielding projects, which positively impacts economic growth (Acemoglu & Zilibotti, 1997).

Risk management

Financial arrangements can allow for better risk diversification, which carries implications for resource allocation and economic growth. There are three noteworthy elements to this function of the financial system: (1) cross-sectional risk diversification; (2) intertemporal risk sharing; and (3) liquidity risk (Levine, 1997). Each of these elements provide the link between financial systems, risk mitigation and long-run economic growth.

Cross-sectional risk diversification

The financial system can mitigate cross-sectional risk, altering resource allocation and spurring economic growth. Surplus economic agents are typically risk averse; they share a proclivity for investment opportunities that are 'low-risk, low return'. (Greenwood & Jovanovic, 1990). In the absence of a financial system that allows for investors to hold diversified portfolios, economic agents will avoid higher risk projects because they are required to invest disproportionately into riskier endeavours (Acemoglu & Zilibotti, 1997). Financial arrangements can induce a portfolio shift to projects with higher returns by allowing investors to diversify their risk (Devereux & Smith, 1994; Gurley & Shaw, 1955; Obstfeld, 1992; Patrick, 1966; Saint-Paul, 1992). Moreover, allowing agents to hold diversified investment portfolios, of which many are high risk, fosters the reallocation of savings that yields positive implications for economic growth (Acemoglu & Zilibotti, 1997).

Intertemporal risk sharing

Financial systems improve intertemporal risk sharing through the role that intermediaries play in facilitating intertemporal risk 'smoothing' (Allen & Gale, 1997). For example, some risks, such as macroeconomic shocks, cannot be diversified at a particular point in time and require diversification across generations (Levine, 2005). Intermediaries provide the instruments necessary for this kind of diversification. Specifically, they facilitate intergenerational

risk sharing by fostering returns that are low in boom times and high in slack times (Levine et al., 2003; Levine, 2005).

Liquidity risk

Liquidity refers to "*the cost and speed with which agents can convert financial instruments into purchasing power at agreed prices*" (Levine, 2005, p. 876). Converting assets into a medium of exchange carries liquidity risk due to the uncertainties surrounding this conversion. Information and transaction costs impede liquidity and increase risk, which necessitate the creation of instruments that augment liquidity (Bencivenga & Smith, 1991). Some investment projects have a long investment horizon, which require the long commitment of capital. However, savers do not like tying up their surplus funds for extended periods. Thus, capital markets emerged to augment liquidity, allowing savers to hold liquid assets while simultaneously transforming financial instruments into long-term capital investments (Bencivenga et al., 1995; Hicks, 1969). Financial intermediaries may also enhance liquidity and reduce liquidity risk. For instance, through their provision of demand deposits and mixture of liquid and illiquid investments, banks provide insurance against liquidity risk while facilitating long-run investment activity (Diamond, 1991; Jacklin, 1987).

Exerting corporate control

Through a corporate governance lens, financial systems exert *ex post* control and governance over an investment, which helps limit the scope for moral hazard and the wasteful use of resources. Stiglitz and Weiss (1983) note that without financial arrangements geared towards enhancing corporate governance, the mobilisation of savings may inhibit the flow of capital to profitable investments. If shareholders and creditors can effectively monitor managers, this will enhance efficiency of resource allocation, which can spur innovation, investment, and economic growth (Levine, 2005). Jensen and Meckling (1976) also trumpets the role of the stock market in exerting control and fostering good governance. Aligning

stock performance with manager compensation mitigates the risk of poor management since the manager's interests are intrinsically tied to performance (Diamond & Verrecchia, 1982; Jensen & Murphy, 1990). Relatedly, Scharfstein (1988) and Stein (1988) argue that takeover threats also help align managerial incentives with those of the owners, promoting better corporate control. Furthermore, financial intermediaries can boost corporate governance in ways that positively influence economic growth (Bencivenga & Smith, 1993; Diamond, 1984). Through the 'economisation' of monitoring costs that reduces credit rationing, financial intermediaries can stimulate productivity, boost capital accumulation and spur economic growth (Bencivenga & Smith, 1993; De la Fuente & Marin, 1996).

Information acquisition and resource allocation

Individual economic agents do not have the time nor perhaps the expertise to collect, synthesise and produce information on possible investments (Levine, 1997, 2005). By virtue of this, savers are reluctant to invest in activities about which they do not have reliable information (Levine, 2005). Consequently, the high information costs associated with investing inhibit capital from flowing to where it is needed (Bagehot, 1873). Faced with this problem, financial intermediaries provide an important remedy – they reduce the costs of acquiring and disseminating information, thereby improving resource allocation (Boyd & Prescott, 1986). Allen (1990), Bhattacharya and Pfleiderer (1985), and Ramakrishnan and Thakor (1984) argue that intermediaries economise on information acquisition costs and improve the *ex-ante* assessment of investment opportunities (Levine, 2005, p. 871). The production of more reliable information, which is solicited by economic agents, can foster a better allocation of scarce capital resources, accelerating economic growth (Greenwood & Jovanovic, 1990). Additionally, financial intermediaries can drive the rate of technological innovation (Acemoglu et al., 2006; Blackburn & Hung, 1998; Galetovic, 1996; King & Levine, 1993b; Morales, 2003).

Facilitating exchange

The financial system, through its various arrangements, helps reduce transaction costs, easing exchange. This encourages specialisation, innovation, and overall economic growth (Greenwood & Smith, 1997). The presence of information costs motivates for a recognisable medium of exchange (King & Plosser, 1986; Williamson & Wright, 1994). However, Levine (2005) notes that these costs continue to fall with financial innovation. According to Greenwood and Smith (1997), financial arrangements that reduce transaction costs facilitate specialisation and innovation, leading to higher productivity gains.

2.1.2 Financial Structure Theory

The relative importance of bank-based and market-based financial systems has also been a contested subject (Boot & Thakor, 1997; Demirguc-Kunt & Levine, 2001; Demirgüç-Kunt & Levine, 2004; Goldsmith, 1969; Ndikumana et al., 2000). There is an absence of a sufficiently rigorous understanding of how financial structure affects economic growth (Levine, 1997). Motivated by this void and the fact that it has received substantially less attention than its financial development counterpart, this paper also aims to evaluate the relevance of financial structure – the degree to which the financial sector is bank-based or market-based – on economic growth.

Banks and stock markets, both inherent features of a financial system, provide critically important services such as pooling liquidity risk, reducing transaction costs, and increasing efficiency of savings and investment (Levine, 2002, 2005). However, they differ in their provision of these services. Market-based financial systems typically share risk cross-sectionally compared to bank-based financial systems that provide inter-temporal risk sharing (Boot & Thakor, 1997). Given these differences, economists have been interested in whether financial structure matters for economic growth. Framed differently, the question they seek to answer is whether a bank-based or market-based financial system is better equipped to spur

growth. Theoretically, no consensus has been established (Luintel et al., 2008). From the extant literature, there are four established theories that provide arguments for the relative importance of each (Arestis et al., 2004; Levine, 2002; Luintel et al., 2008). These theories are the *bank-based* theory, *market-based* theory, *financial services* theory and the *law and finance* theory. For the purposes of this investigation, it is instructive to delineate each of the theoretical approaches.

Bank-based Theory

The 'bank-based' theory is premised on the positive role that banks serve in mobilizing scarce resources, managing risk and monitoring managers (Beck, Demirgüç-Kunt, et al., 2000; Levine, 1997; Levine et al., 2000). A key aspect of this view is that the merits of a bank-dominated system are dynamic and evolve as countries develop their economies (Arestis et al., 2004). In the early stages of development, banks may outperform markets because they are better equipped to handle agency problems caused by asymmetric information (Chakraborty & Ray, 2006). Proponents of this view also argue that in market-based systems, information is revealed to the public relatively quickly. This systematically reduces the incentive for individual investors to acquire such information, thereby impeding efficient resource allocation (Beck, Demirgüç-Kunt, et al., 2000; Boot et al., 1993; Stiglitz, 1985). Contrastingly, within bank-based systems, the focus is on forming long-term relationships with economic agents. This focus guides their engagement and results in better resource allocation (Allen et al., 2008; Levine, 2002, 2005). Furthermore, in liquid market-based systems, investors can sell shares inexpensively, resulting in the creation of a myopic investor climate (Bhide, 1999). As a consequence, there are fewer incentives for investors to monitor financial managers, and so greater market development may in fact stymie national productivity and hinder corporate control (Beck, Demirgüç-Kunt, et al., 2000). From an overarching perspective, the bank-based theory finds strength in the comparative short-comings of market-based systems (Beck, Demirgüç-Kunt, et al., 2000).

Market-based Theory

The 'market-based' theory advocates for the positive role that markets can play in promoting strong economic performance through the facilitation of risk diversification and customised risk management devices (Beck, Levine, & Loayza, 2000). According to Arestis et al. (2001), market-based systems encourage specicialistion and the acquisition of information. Through doing so, the cost of mobilising savings is reduced and this positively impacts investment (Beck, Demirgüç-Kunt, et al., 2000; Beck, Levine, & Loayza, 2000). The market-based theory also points to several inefficiencies of a bank-based system. Through the acquisition of expensive information, banks are able to extract large rents from firms and other economic agents, reducing the incentive for firms to undertake riskier projects (Rajan, 1992). There is also an inherent bias toward 'low-risk, low-return' projects since the banks underwrite the loans. From this theoretical standpoint, it is argued that bank-based systems can therefore retard economic growth (Morck & Nakamura, 1999; Weinstein & Yafeh, 1998).

Furthermore, there is the potential for banks to collude with firm managers against other creditors and investors, which hinders competition, corporate governance and economic growth (Hellwig, 1991; Levine, 2002). Given these deficiencies with the bank-based system, proponents of this view contend that markets reduce the inefficiencies, primarily through the mitigation of principal-agent problems, fostering a better economic environment that spurs innovation and growth (Arestis et al., 2001). For example, managers are unable to divert funds for private gains and must work to ensure profitability (Tadesse, 2002). Lastly, Boot and Thakor (1997) note that there is a virtuous feedback loop created by the pricing system. Prices provide information which is used to affect future market prices, which equates to a form of market governance (Boot & Thakor, 1997).

Financial Services Theory

The 'financial services' theory postulates that financial structure is largely irrelevant to the process of development but rather what matters is the availability and efficient provision of financial services (Arestis et al., 2004; Levine, 2002). Equivalently, the view stresses that financial systems, regardless of their structure, are integral to firm creation, industrial expansion, and economic growth due to the services they provide (Beck, Demirgüç-Kunt, et al., 2000, p. 4). If banks or markets are inefficient, then the positive contribution of finance to economic growth cannot be guaranteed (Peia & Roszbach, 2015). Proponents of the financial services theory also contend that the debate around financial structure misses the mark and has created a false dichotomy. This is to suggest that banks and financial markets are not in competition with one another but rather that they do different things. For instance, long-term financing is typically better accessed from large securities markets while short-term financing is associated with banks (Arestis et al., 2004).

Law and Finances Theory

Lastly, the 'law and finances' theory – a subset of the financial services theory – promulgates the position that the legal and regulatory framework is the primary determinant of a financial system's ability to facilitate innovation and growth (Beck, Demirgüç-Kunt, et al., 2000; La Porta et al., 1999; La Porta et al., 2000). If the rights of financial agents are adequately protected, financial transactions can be better supported regardless of whether they are provided by banks or markets. With an efficient legal system that protects property rights, a country's financial system benefits and develops (La Porta et al., 1998; Rajan & Zingales, 1998). Similarly, proponents typically regard the debate between markets and banks as non-sensical and argue instead that finance is likely to benefit an economy if the legal system protects the players in the financial system (Beck, Demirgüç-Kunt, et al., 2000; La Porta et al., 1998; Levine, 2002).

2.2 Empirical Literature

2.2.1 Financial Development Evidence

Before explicating upon the existing plethora of empirical research concerned with the finance-growth nexus, it is important to recognise the significance of the subject. Resolving the debate has theoretical implications, particularly over the use of various models and how these are distinguished from one another. Perhaps more importantly, the research has practical implications for economists and policymakers, who are responsible for identifying and constructing financial sector reforms (Levine et al., 2003).

For a while, the empirical results were fairly robust and consistent indicating the importance of financial development (Arcand et al., 2015; Levine, 2018). However, recent studies have challenged this narrative, highlighting the weakening of the relationship (e.g., Berkes et al. (2012) and Rousseau and Wachtel (2011)) or non-linearities where the impact of finance turns negative once financial development reaches a certain threshold level (e.g., Arcand et al. (2014) and Samargandi et al. (2015)). Different econometric methodologies and data sets have been employed within the rich body of literature. Therefore, it is instructive to separate the various classes of empirical studies according to their respective methodological approach.

Cross-country Regressions

Using a sample of 77 countries for the period 1960-1989, King and Levine (1993a) examine the relationship between financial development and economic growth. In the cross-country growth regressions, a variety of indicators are used to proxy financial development. This influential study, which built on the earlier work of Goldsmith (1969), revealed important insights and sparked scholarly interest in the subject. Firstly, King and Levine (1993a) find that *Depth* – defined as the ratio of liquid liabilities to GDP – is positive and highly significant. After replacing the indicator by its level in 1960 in an attempt to isolate the causal

influence, the effect of financial development remains positive and significant, allowing for the conclusion that financial development stimulates long-run growth. Albeit a powerful conclusion, Demetriades and Andrianova (2004) note numerous issues with the interpretation, some of which Levine et al. (2003) himself acknowledges. One evident problem is the difficulty of measuring financial development and establishing causality with the cross-sectional approach. An additional drawback with this approach is that King and Levine (1993a) are using the average effects of financial development, which may fail to accurately capture the relationship if it varies considerably across countries (Demetriades & Andrianova, 2004).

Pure cross-country growth regressions suffer from methodological drawbacks, motivating scholars to use panel techniques (Demetriades & Andrianova, 2004). The panel approach has several key advantages over the cross-country approaches. Panel techniques allow the researcher to exploit time-series and cross-sectional variation in the data (Levine et al., 2003, p. 38). Secondly, in pure cross-country regressions, the unobserved country-specific effect lies in the error term, which means that correlation between this effect and the set of explanatory variables results in biased estimates (Levine et al., 2003). Thirdly, instrumental variables used in pure cross-sectional studies do not control for potential endogeneity of the regressors, which can lead to inappropriate inferences (Arellano & Bond, 1991; Levine et al., 2003). By comparison, the panel estimator considers the endogeniety concern by using instruments based on previous realisations of the regressors (Levine et al., 2003, p. 38).

Panel Estimations

Levine et al. (2000) use a generalized method-of-moments (GMM) estimator developed for panel data by Arellano and Bond (1991) and Arellano and Bover (1995) to assess the relationship between financial intermediary development and economic growth. The regression coefficients suggest an economically large impact of financial development on economic growth. This result is supported by Ndikumana (2000) who finds that financial development spurs investment growth and efficient resource allocation in 30 sub-Saharan African coun-

tries over the period 1970-1995. Beck, Levine, and Loayza (2000) examine the relationship between financial development and the sources of growth. Like Levine et al. (2000), Beck, Levine, and Loayza (2000) use a GMM dynamic panel estimator to assess the relationship between three measures of financial intermediation and economic growth. Their results are remarkably consistent. Specifically, they show a robust positive link between the 'exogenous' component of financial development and economic growth, implying that the direction of causality flows from financial intermediation (Beck, Levine, & Loayza, 2000). In terms of the magnitude, the scholars highlight the following: "the estimated coefficients suggest that if Argentina had enjoyed the level of financial intermediary development of the average developing country during the 1960-1995 period, it would have experienced about one percentage point faster real per capita GDP growth per annum over this period" (Beck, Levine, & Loayza, 2000, p. 35). Similarly, Ductor and Grechyna (2015) shows that financial development enhances capital accumulation and economic growth in a panel of 101 countries. They also note the importance of balanced *real* sector growth, which maximises the positive influence of financial sector development.

While panel data studies allow the researchers to exploit variations in the data and make 'generalisable' inferences, they suffer from several limitations. Demetriades and Andrianova (2004) note that failure to remove business cycle fluctuations from the data can confound the underlying long-run relationships. In some cases, the estimations become biased due to dynamic heterogeneity within the panel (Pesaran & Smith, 1995). Moreover, panel studies fail to account for idiosyncratic features of countries that may significantly alter the causal relationship (Demetriades & Andrianova, 2004).

Time-series Evidence

Given the aforementioned limitations, many scholars have opted for time-series investigations wherein the focus is on a singular country. These scholars are able to capture idiosyncratic features of countries, allowing for more robust estimations.

Using the ARDL approach to cointegration, Khan (2008) investigates the finance-growth nexus in Pakistan over the period 1961-2005. His study reveals that domestic credit to GDP and the real interest rate both enhance economic growth in both the short-run and long-run. Khan (2008) also notes that the growth enhancing effects are transmitted through the availability of funds in the market. Puatwoe and Piabuo (2017), who use the same modelling technique, find that all of their selected indicators (proxies) of financial development have positive and significant impact on economic growth in Cameroon over the period 1980-2014.

Using data for 16 countries over the period 1960-1990, Demetriades and Hussein (1996) find evidence of a stable long-run relationship between financial development, proxied by several indicators, and real GDP per capita. Specifically, they find a significant causal relationship in 14 of the 16 countries. However, their study reveals bi-directional causality and evidence of reverse causality in six countries (Demetriades & Andrianova, 2004). Critically, South Africa – the country of this paper's analysis – was one of the six countries where growth was found to be causing financial development (Demetriades & Hussein, 1996).

De Gregorio and Guidotti (1995) report that in twelve Latin American countries over the period 1950-1985, the ratio between bank credit to the private sector and GDP is positively correlated with growth. However, the impact changes across countries and disturbingly is negative in a panel for Latin America. The authors attribute the negative relationship to the financial liberalisation that took place within a poor regulatory environment. From a theoretical standpoint, De Gregorio and Guidotti (1995) show that the main channel of transmission is the efficiency of investment rather than the volume of investment.

Arestis et al. (2001) utilise time-series data to examine the causality between stock markets, banks, and real GDP. Given certain data limitations, the scholars focus on five advanced economies, namely, the United Kingdom (UK), United States (US), Germany, France, and Japan. They find that the relationship between financial development and growth is statistically weak in the UK and the US.

2.2.2 Financial Structure Evidence

In his seminal paper, Goldsmith (1969) asked two questions: (1) whether financial development influenced economic growth and (2) whether financial structure matters for economic growth. While scholars have predominantly focused on the former question, the latter question has also garnered attention. As Levine (2002, 2005) notes, most of the empirical work conducted on financial structure has focused around the comparison between Japan and Germany – paragons of bank-based financial systems – and the United Kingdom and United States – archetypal market-based financial systems. While these comparisons have yielded valuable insights, it would be naïve to infer broad conclusions about the long-run relationship between financial structure and economic growth based on only these studies (Allen & Gale, 2001; Demirguc-Kunt & Levine, 2001; Stulz, 2001). Recent empirical work on the bank-based versus market-based debate has thus broadened the analysis to include a wider array of national experiences (Demetriades & Andrianova, 2004; Levine, 2005).

Cross-country Regressions

Cross-sectional studies tend to show that financial structure does not matter for economic growth (Luintel et al., 2008). After controlling for the level of financial development in a sample of 48 countries, Levine (2002) finds that financial structure does not help in explaining differences in financial development. Moreover, after accounting for a country's relative economic standing, legal systems and institutions, Levine (2002) also finds no evidence to suggest that financial structure has a first-order effect on economic growth. Tadesse (2002) challenges this narrative by arguing that bank-based systems are more beneficial to countries with underdeveloped financial sectors and that market-based systems will outperform bank-based systems only once financial sectors reach a maturity stage. Pinno and Serletis (2007) lend credence to this point. Using the same dataset and variables as defined by Levine (2002), they find that market-based systems are better suited to advanced economies while

bank-based systems are more beneficial to developing countries. Pinno and Serletis (2007) account for cross-country heterogeneity by employing Bayesian classification while Levine (2002) had assumed an equality of parameters across countries.

Industry-level Studies

Using industry-level data, Beck and Levine (2002) confirm the lack of significance found in cross-sectional studies. In a sample of 42 countries and 36 industries, they find that financial structure has no statistically significant bearing on industry growth patterns over the period 1980-1989. However, their study did reveal an important insight, that industries heavily dependent on external finance grew more rapidly in well-developed financial systems, regardless of whether these were bank-based or market-based (Beck & Levine, 2002). Greater financial development was found to accelerate the growth of financially dependent industries (Levine, 2005). Similarly, Demirgüç-Kunt and Maksimovic (2002) contend that financial structure does not explain the excess growth of firms across countries but rather the growth achieved by firms is positively associated with financial development.

Tadesse (2002) once again challenges these findings. Using industry-level data for a panel of advanced and developing economies, the author finds that financial structure is important for economic growth insofar as it depends on the level of financial development. Thus, a financial system will prove growth-enhancing if it is performing the functions it has been mandated to perform. Tadesse (2002) therefore argues that financial structure matters but the degree to which it matters depends on the level of financial development. This means that banks will have comparative advantages in some countries and in others not (Levine, 2005). Furthermore, the study also shows that banks outperform markets when the sector is typically underdeveloped and dominated by small firms (Tadesse, 2002).

Panel Studies

Exploiting cross-sectional and time-series variation in the data using panel data techniques, Beck and Levine (2002) examine the role of stock markets on economic growth in a panel of 40 countries for the period 1975-1988. Their findings are noteworthy. Fore-mostly, they find a positive relationship between stock market liquidity – the total value of shares traded relative to market capitalisation – and economic growth. After controlling for banking sector development, the regression coefficients reveal however that both banks and stock markets yield considerable influence over growth with the bank-effect more pronounced (Beck & Levine, 2002). However, as Demetriades and Andrianova (2004) note, their technique suffers from methodological drawbacks which may confound the relationships. In particular, the use of averages is unlikely to remove the influence of business cycle fluctuations on the data (Demetriades & Andrianova, 2004). Consequently, their estimations may be biased due to dynamic heterogeneity (Pesaran & Smith, 1995).

Using a dynamic heterogeneous panel approach, Luintel et al. (2008) find significance of financial structure, affirming the findings of Tadesse (2002). Their methodology offers a more robust treatment of the heterogeneity in the data, thereby improving on earlier studies. Estimating the within-dimension parameter estimates yield the following result: market-based systems are more important for growth than bank-based systems. Luintel et al. (2008) believe the observed differences across studies such as Beck and Levine (2002) and Levine (2002) can be put down to methodological differences and the treatment of cross-country heterogeneity.

Time-series Evidence

Acknowledging the drawbacks of previous methodological approaches, several scholars have employed time-series techniques allowing the researcher to focus on individual countries and their idiosyncratic features. From the extant literature, the time series studies on financial

structure have shown that structure significantly impacts economic growth (Arestis et al., 2001; Arestis et al., 2004; Demetriades & Andrianova, 2004; Peia & Roszbach, 2015).

Proxied by the log of domestic credit to GDP, Arestis et al. (2001) study the effects of financial structure in five advanced economies from which several key insights emerge. The first is that bank-based systems have a disproportionately larger or more powerful impact on economic growth than stock markets. While this finding is supported by Beck and Levine (2004) among others, it is strongly juxtaposed to Tadesse (2002) who found stock markets to have greater influence in the advanced economy context. Rationalising this finding, Arestis et al. (2001) argue that cross-country growth regressions exaggerate the effect of stock markets and believe that panel methodological approaches can only provide a partial view of the relation, which is likely to vary across countries.

Turning attention to developing economies, Arestis et al. (2004) find that financial structure matters for economic growth in a sample of six developing countries. Specifically, they find that market-based systems in Greece, Taiwan, South Korea and India have positively contributed to growth in these countries. Conversely, and interestingly, a bank-based system in South Africa, was more beneficial to growth. Finally, in the specific case of the Philippines, they found an insignificant result.

3 South Africa's Financial Sector and Economic Growth

3.1 Economic Growth Trend

South Africa's economic growth has been indisputably poor and markedly erratic. For the period 1980-2020, per capita growth ranges from -7.16% to 4.28%, illuminating the unpredictable performance. Negative growth has been experienced several times, with notable low points during the troublesome 1980s, the global financial crisis (GFC) in 2008, and recently the coronavirus pandemic in 2020.

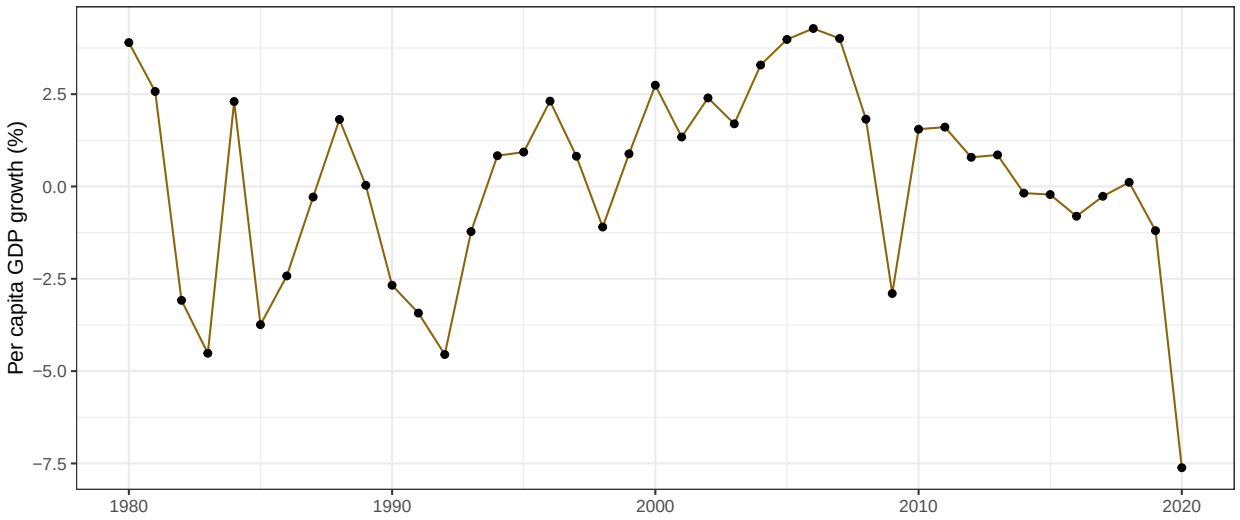


Figure 1: Per capita GDP growth, 1980-2000

Figure 1 depicts the poor per capita growth record over the period of the study. Decomposing the trend is inherently complex given the multitude of factors that have affected the growth fundamentals. Du Plessis and Smit (2006) and Faulkner and Loewald (2008) note several contributing factors such as labour productivity, macroeconomic management, market structures, trading partners, and political dispensations as well as the racially exclusive systems of colonialism and apartheid. During apartheid, growth in the country was heavily conditioned by a 'low-cost, low employment' approach to production and which relied on changes in commodity prices (Fourie et al., 1992; Saungweme, 2019).

In the early 1980s, South Africa struggled to fund new state projects due to the intensification of international political, economic, and financial sanctions (Clark, 1994). Apart from fostering higher levels of political uncertainty and discontent, the imposition of sanctions inhibited investment in the country, resulting in a sustained period of stagnation (Nattrass & Seekings, 2010a). The stagnant growth experienced between 1980 and 1982 had severe distributional consequences, particularly for those working in the informal sector (Fedderke, 2005; Nattrass & Seekings, 2010a).

The travails of apartheid continued into the early 1990s. Between 1988 and 1993, South

Africa experienced its longest recessionary period in its history, caused primarily from the high political instability and low investment (Fedderke, 2005; Fedderke et al., 2001). Despite the gold boom, the ten year period between 1984 and 1993 marks the country's worst growth performance since the second World War (Du Plessis & Smit, 2006).

The advent of democracy in 1994 marked a turning point, which saw economic growth improve significantly. The new political dispensation brought with it a renewed sense of optimism coupled with policy reform. Most economists believed that the democratic transition and removal of economic constraints would transform the economy (Du Plessis & Smit, 2006). Alongside these changes, inefficient subsidies were removed and in 1996, the South African government launched the Growth, Employment and Redistribution (GEAR) macroeconomic and fiscal programme (Nattrass & Seekings, 2010b). This programme aimed to bring inflation under control and reduce the budget deficit that had reached 7.4% (Faulkner & Loewald, 2008).

At the turn of the millennium, the South African Reserve Bank (SARB) implemented the now oft-cited inflation targeting framework, which evidently helped anchor inflation and increase the credibility of South African institutions (Saungweme, 2019). Between 2003 and 2005, growth improved considerably, attributable to the rising commodity prices and improvements in the terms of trade (Faulkner & Loewald, 2008; Nattrass & Seekings, 2010b). Macroeconomic policy centred around garnering benefits from the country's increased integration into an increasingly globalised world. However, the 2007/2008 GFC highlighted the fragility of the economic system, resulting in a deep recessionary period for the country. During this period, GDP per capita growth contracted and reached a low of -2.89% in 2009.

The novel coronavirus which struck South Africa's shores in March 2020 also resulted in a sharp deterioration of economic activity. Under the auspice of 'developmental state' principles, the government's overly-militant response to Covid-19 was harsh by international standards – characterised by inconsistent policy, a lack of coordination and misguided micro-regulation (Seekings & Nattrass, 2020). Competing ideologies and factional divisions within

the government limited the state's capacity for swift and decisive action to stem the pandemic (Seekings & Nattrass, 2020). Along with the ban on alcohol and the imposition of curfews, the response had disastrous results, dis-empowering and impoverishing many individuals (Seekings & Nattrass, 2020). Consequently, from a macroeconomic point-of-view, per capita GDP growth fell to its lowest point in history, reaching -7.16% at the close of 2020.

Overall, the weak economic performance can be traced to the legacy of apartheid and its insidious effects as well as poor macro-prudential management and governance (Moss & Obery, 1987). The future does not bode well for South Africa given its historical record. The rising debt levels, poor investment rates, low domestic savings, coupled with the country's ineptitude to provide a stable energy supply are crippling the economy, entrenching an impoverished outlook on the country's growth trajectory.

3.2 Financial Sector Developments

South Africa, judging by international standards, has a well-developed and highly sophisticated financial sector. The country's banking sector is highly concentrated with the five largest commercial banks controlling 89.4% of the banking sector's assets (SARB, 2020). Presiding over the sector is the South African Reserve Bank (SARB) whose mandate, espoused through the inflation-targeting framework, is to protect the value of the Rand and to control inflation. The Johannesburg Stock Exchange (JSE) is considered one of the most advanced and largest stock markets in the world by market capitalisation. Given the size of the stock market and the strength of the banking sector, it is difficult to say anatomically whether South Africa is strictly bank-based or market-based.

Over the 10-year period from 1980-1990, South Africa experienced high levels of inflation, which saw monetary authorities intervene in the banking sector (Gondo, 2009). The intervention saw a tightening of liquid asset requirements and an increase in credit ceilings and

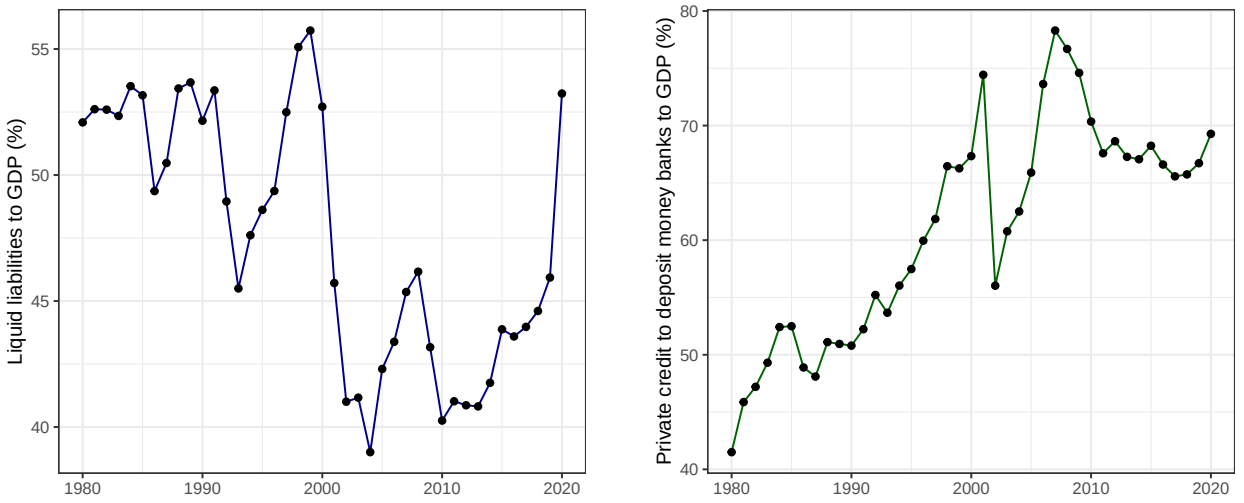
cash reserves. Liquid liabilities as a share of GDP declined over the same period, averaging 52.31%, highlighted by figure 2a. Fourie et al. (1992) notes that this decline can be explained by savers shifting their deposits from banks and contractual savings institutions to less-liquid 'inflation-proof' saving instruments. In the 1990s, the liquid liabilities ratio began to improve in response to banking deregulation and greater financial intermediation (Du Plessis & Smit, 2006).

3.2.1 Banking Sector Developments

In 1991, four of the leading banks (Allied Bank; United Bank; Volkskas and Sage Banks) merged to form the Amalgamated Banks of South Africa (ABSA), becoming the largest banking group in the country. Further reorganisation was undertaken in the mid-1990s after the end of apartheid and the need to meet demand for banking services from marginalised communities (Verhoef, 1994). Greater financial intermediation and reorganisation within the banking sector saw credit extension to the private sector improve significantly, contributing to the financial development (Gondo, 2009). However, the ratio began to decline in 2000, reaching a trough of 39% in 2004. Although it recovered slightly in following years, the global financial crisis saw the ratio decrease again and did not surpass the 50% margin until 2020. This suggests that financial development, proxied by liquid liabilities, has stagnated.

Banking sector development in South Africa has been steady. The private credit by deposit-taking money banks to GDP ratio has averaged 61.01% over the 40-year period. This ratio provides an indication of financial depth and the degree to which the banking sector yields influence over the South African economy. Between 1980-2000, the ratio increased significantly as shown by figure 2b, with a notable rise after the transition to democracy. However, after the 2001 currency crisis in which the Rand sharply depreciated against other currencies, the ratio contracted by 25% but rebounded in the following year. Notably, the global financial crisis had a pronounced effect on banking sector development. Up until the crisis, the private credit ratio was stable and showing signs of a long-run upward trend.

However, in the aftermath of crisis and the ensuing financial regulation, the private credit ratio declined and has since stagnated around the 68% margin.



(a) Liquid liabilities to GDP (%) (b) Private credit to money banks to GDP (%)

Figure 2: LLY and PCR, 1980-2000

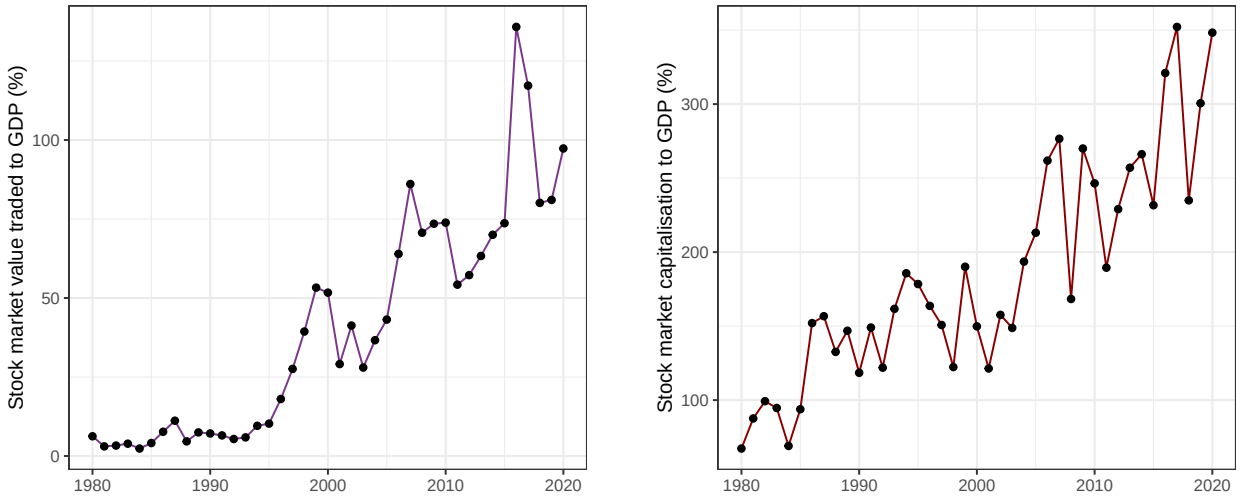
3.2.2 Stock Market Developments

In 1887, South Africa became the first African nation to formally create a stock market, namely, the Johannesburg Stock Exchange (JSE) (Moss & Obery, 1987). Initially, the JSE was created to fund mining operation in the resource-rich Witwatersrand region but has since developed into the largest and very respectable stock market in Africa.

Stock market activity, measured by the ratio of stock market value traded to GDP, has been exceptional in the country, averaging 40.61% over the period 1980-2020. Figure 3a provides a graphical depiction of the ratio across 1980-2020. Comparatively speaking, South Africa vastly outperforms the majority of Africa, where the ratio of stock market value traded to GDP lies below 10%. Crucially, and quite evidently displayed on figure 3a, is that the South Africa's stock market is highly active and that this activity has been increasing exponentially, but not without a fair degree of volatility.

The size of the stock market can also be captured through the stock market capitalisation to

GDP ratio, which is graphically displayed by figure 3b. Over the 40-year period, stock market capitalisation averaged 171.72%. Although it is clear there are major short-run fluctuations, figure 3b indicates that there has been a long-run growth of stock market capitalisation. The upward trend suggests that the stock market is gaining importance and becoming more integral to the South African economy and from a comparative perspective, the market is exceptionally well-capitalised.



(a) Stock market value traded to GDP (%)

(b) Stock market capitalisation to GDP (%)

Figure 3: SML and MCAP, 1980-2000

4 Analytical Framework

4.1 Model Specification

To empirically examine the relationship between financial development and structure, and economic growth, an augmented Solow growth model is adopted, consistent with Levine (2002). This standard parsimonious growth model establishes a behavioural relationship among the variables of interest, from which a production function can be derived. It is assumed that this production function takes the form of a Cobb-Douglas function, which uses

capital (K) and labour (L) in the production of output (Y). The Cobb-Douglas production function can be expressed as:

$$Y = F(AK^{\alpha}L^{1-\alpha}) \tag{1}$$

A is a measure of technological efficiency. To identify the effect of financial development and financial structure, equation 1 is augmented with relevant financial indicators that serve as appropriate proxies. Expressing equation 1 in logarithmic form and augmenting it with a given financial indicator allows the baseline estimation equation to be specified.

$$y_t = \beta_0 + \beta_1 \mathbf{FI}_t + \beta_2 \mathbf{X}_t + _{it} \tag{2}$$

where $t = 1, 2...., T$; FI_{it} represents the chosen financial variable; X_t is the conditioning set of other growth variables; and ε_t is the error term with the usual assumption, $\varepsilon_t \sim iid(0, \sigma^2)$. Contained within equation 2 is the coefficient of interest, denoted as β_1. Given that this represents the key indicator variable, the interest is in both the sign and the magnitude of the coefficient. A statistically significant β_1 coefficient implies that finance matters for economic growth. Interpretation will vary according to the specific financial indicator used. For example, some indicators are more apt to explaining the role of financial structure in growth outcomes while others capture the effect of financial development. Some indicators allow for conclusions to be drawn on both financial development and structure simultaneously.

When the model is augmented with financial structure variables, a positive and significant coefficient will imply that a market-based financial system is more favourable than a bank-based system. Conversely, a negative and significant sign will imply the opposite, that a bank-based system is more important (Levine, 2002; Luintel et al., 2008). The expectation in this study is that the coefficient could be negative or positive given the sophistication of the JSE and the strong banking sector in South Africa. However, the coefficient may likely be insignificant, indicating that financial structure does not matter.

When the model is augmented with financial development indicators, a positive and significant sign implies that financial development spurs economic growth whereas a negative and significant sign implies that it stymies growth. The *a priori* expectation is that the coefficient should be positive and significant, derived from the sizable sectoral contribution of the financial sector in South Africa.

Given that a standard growth model has been adopted, inferences on the production function are acceptable. Therefore, the expectation is that the coefficient on labour, proxied by population growth, should be negative and insignificant. Concerning capital, proxied by gross fixed capital formation, the expectation is that this coefficient should be positive and significant.

4.2 Data Sources

Annual time-series data spanning the period 1980-2020 is used in this study. This time period, comprising 40 years, is adequate for a time-series estimation to be conducted (Pesaran et al., 1999). It is helpful to separate the data into economic data and financial data (Mathenge & Nikolaidou, 2018). The economic data for the control variables, comprising the proxies for capital and labour, is obtained from the World Bank's World Development Indicators (WDI) database. Data on economic growth – the dependent variable in the study – is sourced from the Penn World Table (PWT) Version 10.0, compiled by the Centre for International Comparisons of Production, Income and Prices at the University of Pennsylvania. Financial data for the various financial indicators used in the study is sourced from the Global Financial Development Database (GFDD), compiled by the World Bank.

4.3 Variable Definitions

Drawing from the spectrum of extant empirical literature, several financial indicators have been promulgated to serve as proxies of financial development and financial structure. There

is however a lack of consensus around the best measures of financial development and structure, which necessitates a reliance of indicators that approximate aspects of these two channels (Gambacorta et al., 2014). Table 1 provides a concise summary of the various financial indicators used in the study.

Table 1: Financial Indicators

Indicator	**Description**	**Proxy for**
LLY	Liquid liabilities ratio	Financial development
PCR	Private credit ratio	Financial development and structure
SML	Stock market value traded ratio	Financial structure
MCAP	Stock market capitalisation ratio	Financial structure
CI	Composite financial development index	Financial development and inclusion

From a theoretical standpoint, financial depth is necessarily defined by the size of financial intermediaries (Arcand et al., 2014; Gambacorta et al., 2014). To quantify the size of financial intermediaries, the ratio of liquid liabilities to nominal gross domestic product, denoted as LLY, can be used. LLY, consisting of currency as well as demand and interest-bearing liabilities of banks and other intermediaries, is the broadest measure of financial deepening. (Beck, Demirgüç-Kunt, et al., 2000).

The second variable is defined as the ratio of private credit to deposit by deposit money banks to GDP, denoted as PCR. This is the most commonly used indicator from the banking sector and serves as a sufficient proxy for financial depth (Beck & Levine, 2002). Specifically, the index provides an indication of the level of activity in the savings-investment channel performed by the banking sector (Gondo, 2009). Theoretically, financial development should increase access to credit by the private sector, which stimulates private investment and spurs growth (Gondo, 2009; Gurley & Shaw, 1955; King & Levine, 1993a).

Thirdly, the ratio of stock market traded value to GDP, denoted as SML, is used to proxy financial structure and development. The SML index measures the liquidity of the stock

market or the ability of firms to issue equity (Baltagi et al., 2009). For short-term investors who prefer greater liquidity, the securities market has the power to mobilise their savings (Fourie et al., 1992). Furthermore, the securities market can also channel funds to finance longer-term investments in capital goods (Fourie et al., 1992). The SML index can be used to proxy both financial development and structure but is more apt at capturing the latter.

While the SML ratio captures the level of stock market activity, the size of the stock market is adequately captured by the stock market capitalisation to GDP (%) ratio, denoted as MCAP. The greater the market capitalisation, the greater the ability of investors to obtain funding from the stock market (Levine, 2002).

In recent times, there has been an effort to account for financial inclusion and its interplay with both financial development and economic growth. This paper contributes to the scant literature on financial inclusion by including a composite index, denoted as CI. This variable is a relative ranking of countries on the depth, access and efficiency of their financial institutions and markets (Sahay et al., 2015). Importantly, it is the aggregate of two indices created by the World Bank: the financial institutions index and financial markets index (Svirydzenka, 2016). The CI variable captures information on bank branches per 100,000 adults, ATMs per 100,000 adults, return on assets, return of equity and several other traditional financial development aggregates. For a more detailed breakdown of the index, please refer to Svirydzenka (2016).

4.4 Econometric Approach

All models are estimated using the auto-regressive distributed lag (ARDL) approach to cointegration, originally proposed by Pesaran and Smith (1995) and later extended by Pesaran et al. (2001). The ARDL approach to cointegration possesses several merits over other cointegration techniques that make its use in this analysis advantageous. Unlike other cointegration techniques, such as those advanced by Engle and Granger (1987) and Johansen

and Juselius (1990), the ARDL approach does not impose the restrictive assumption that all variables must be integrated of the same order. Thus, it can be applied regardless of whether regressors are integrated of order 0 [I(0)], order 1 [I(1)] or fractionally integrated (Pesaran et al., 2001). The approach corrects for residual serial correlation and allows both short-run and long-run dynamics to be captured simultaneously. This is acheived through the derivation of the dynamic error correction model (ECM) that integrates short-run dynamics with the long-run equilibria (Pesaran & Smith, 1995; Pesaran & Smith, 1998). Further advantages include its suitability in the presence of small sample sizes, its ability to determine the number of optimal lags to be included in the relevant model on the basis of standard information criterion, and its ability to provide robust and generally unbiased estimates even when some of the regressors are endogenous (Harris & Sollis, 2003; Pesaran et al., 2001; Pesaran & Smith, 1995).

4.4.1 ARDL and Error Correction Model (ECM) Specifications

The ARDL model and its error correction component can be specified. For the sake of brevity, the paper only defines a generic model. The financial indicator term, denoted as FI, will be independently replaced with alternative proxies as specified in the previous section.

ARDL specification

$$\Delta lnY_t = \alpha_0 + \sum_{t-i}^{n} \alpha_1 \Delta lnY_{t-i} + \sum_{t-i}^{n} \alpha_2 \Delta ln\mathbf{FI} + \sum_{t-i}^{n} \alpha_3 \Delta lnK + \sum_{t-i}^{n} \alpha_4 \Delta lnL + \alpha_5 lnY_{t-1} + \alpha_6 ln\mathbf{FI}_{t-1} + \alpha_7 lnK_{t-1} + \alpha_8 lnL_{t-1} + \mu_{1t} \quad (3)$$

ECM specification

$$\Delta lnY_t = \lambda_0 + \sum_{i=0}^{n} \lambda_1 \Delta lnY_{i=0} + \sum_{i=0}^{n} \lambda_2 \Delta ln\mathbf{FI} + \sum_{i=0}^{n} \lambda_3 \Delta lnK + \sum_{i=0}^{n} \lambda_4 \Delta lnL + \omega_1 ECM_{t-1} + \epsilon_{1t} \tag{4}$$

Where $\alpha_1 - \alpha_8$; $\lambda_1 - \lambda_8$ are regression coefficients; n are lag lengths; Δ is a first difference operator; lnY_t is the log of per capita GDP, which serves as the proxy for economic growth; ECM_{t-1} is the error correction term lagged once. If the coefficient on this term, denoted as ω_t, is negative and significant, then it implies that any short term disequilibrium between the dependent and independent variables will converge to the long-run equilibrium. Thus, a negative and significant ω coefficient confirms a long-run relationship among the variables.

4.5 Unit Root Testing

The order of integration of macroeconomic variables has consequences for appropriate modelling of time series data (Waheed et al., 2006). Although, strictly-speaking, the ARDL approach to cointegration can be employed without unit root testing, the approach is susceptible to variables that are integrated of order 2 [I(2)] (Harris & Sollis, 2003). Given its assumption that all variables are either integrated of order 0 [I(0)], order 1 [I(1)], or fractionally integrated, if a variable is I(2), the computed F-statistics will be invalid and the approach will yield spurious results. To validate the use of the ARDL approach, it is necessary to conduct unit root tests to confirm the integration order of all the variables.

4.5.1 Unit Root Tests without Structural Breaks

The paper first employs the augmented Dickey-Fuller (ADF) unit root test, which constructs a parametric correction for higher-order correlation by assuming that the series follows an $AR(k)$ process. This parametric approach is considered superior to Dickey-Fuller (DF)

test originally proposed by Dickey and Fuller (1979, 1981) because it accounts for serial correlation in the error terms by summating the lagged difference term of the dependent variable (Nkoro & Uko, 2016). The test is performed first in levels and then in first difference to establish the presence of unit roots and the order of integration. The ADF unit root regressions are based on the following equation.

$$\Delta Y = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 T + \sum_{i=1}^{k} \alpha_1 \Delta Y_{t-i} + \mu_t \tag{5}$$

ΔY is the first difference operator for the dependent variable at time t; k represents the number of lags for the change in the dependent variable; α_0 is a constant; u is the error term.

The optimal number of lags is based on the trade-off between losing observations from the sample but ensuring that the error term is serially uncorrelated. The null hypothesis of the ADF test is that the coefficients are equal to zero. It follows that the alternative hypothesis is that the coefficients are non-zero. The variable is said to be non-stationary if the value of the coefficient (α_1) is less than the critical value. If the coefficient is greater than the critical value, then the variable exhibits stationarity.

4.5.2 Unit Root Tests with Structural Breaks

Conventional unit root tests such as the ADF test fail to account for the possibility of a structural break in the data (Waheed et al., 2006). Perron (1990) showed that the standard ADF test becomes biased towards the non-rejection of the null hypothesis in the presence of a structural break. Noting this potential drawback and to account for the possibility of a break in the series, the Zivot and Andrews (2002) structural break unit root test is performed. This test is based on three models: model 1 permits a one-time change in the level of the series; model 2 permits for a one-time change in the scope of the trend function; and model 3 combines one-time changes in the level and the slope of the trend function of the

series. The following regression equations corresponding to these three models are specified below:

$$\Delta y_t = c + \alpha y_{t-1} + \beta t + \gamma DU_t + \sum_{j=1}^{k} d_j \Delta y_{t-j} + \epsilon_t \tag{6}$$

$$\Delta y_t = c + \alpha y_{t-1} + \beta t + \theta DT_t + \sum_{j=1}^{k} d_j \Delta y_{t-j} + \epsilon_t \tag{7}$$

$$\Delta y_t = c + \alpha y_{t-1} + \beta t + \theta DU_t + \gamma DT_t + \sum_{j=1}^{k} d_j \Delta y_{t-j} + \epsilon_t \tag{8}$$

where DU_t is an indicator dummy variable for a mean shift occurring at each possible break-date (TB) while DT_t is the corresponding trend shift variable. Formally,

$$DU_t = \begin{cases} 1, & \text{if t} > \text{TB} \\ 0, & \text{otherwise} \end{cases}$$

$$DT_t = \begin{cases} t - TB, & \text{if t} > \text{TB} \\ 0, & \text{otherwise} \end{cases}$$

In all three models, the null hypothesis is $\alpha = 0$, which implies that the series contains a unit root with a drift that excludes any structural break. The corresponding alternative hypothesis is that $\alpha < 0$, implying that the series is a trend-stationary process with a one-time break occurring at an unknown point in time. Operationally, the Zivot and Andrews (2002) test regards every point as a potential break-date and therefore runs a regression for every possible break-date sequentially (Waheed et al., 2006). From all possible break-points, the procedure selects the break-date which minimises the one-sided t-statistic for testing $\widehat{\alpha}(= \alpha - 1) = 1$ (Waheed et al., 2006).

4.6 Structural Breaks

Macroeconomic data is susceptible to structural breaks, which can create spurious results. Heeding this concern, the break points are endogenously determined for each estimation. Following Bai and Perron (2003), a break-point least squares is estimated from which break dates can be obtained. These dates are then captured through the inclusion of time dummy variables. The expectation is that these dates will notably coincide with major events in the country such as the transition to democracy or the more recent Covid-19 pandemic crisis.

4.7 Cointegration Test

The cointegration relationship between the variables is examined using the ARDL bounds test. This newly developed test serves as a preliminary check for a long-run relationship between the variables. In operation, the test is the standard F-statistic or Wald Statistic for testing the significance of the lagged levels of the variables in a first-differenced regression. The null hypothesis is that there is no level effect at either the 5% or 10% level of significance. If the test statistic lies above the critical value, then the null hypothesis can be rejected and there is evidence of a cointegrating relationship. Conversely, if it is below the lower bound, the null hypothesis of no level effect cannot be rejected, leading to the preliminary conclusion that no long-run relationship between the variables exists. If, however, the test statistic lies between the bounds, the test result is inconclusive. The critical value bounds are computed by stochastic simulations using 2000 replications (Pesaran et al., 2001).

4.8 Diagnostic Tests

As a robustness check, it is useful to test for serial correlation, heteroskedasticity, functional form and normality. To test for serial correlation, the Lagrange multiplier test of serial correlation is used. If the test statistic is significant, this would be evidence of serial correlation.

To test for functional form misspecification, the RESET test, advanced by Ramsey (1969), is used. If the LM test statistic lies above the 10% level of significance, then functional form has been misspecified. Using the Breusch and Pagan (1979) test, the researcher can determine whether the model suffers from heteroskedasticity. If either the LM statistic or the F-statistic are significant, then the model's standard deviation is non-constant, providing evidence that heteroskedasticity is present.

4.9 Stability Analysis

To determine the stability of the models and the constancy of the long-run parameter, the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squared Residuals (CUSUMSQ) tests are applied to the residuals of the error correction representation. The CUSUM test, proposed by Brown et al. (1975), checks for systemic changes caused by the coefficients of the regression, while the CUSUMSQ test measures the stability of the coefficients' constancy. The CUSUMSQ test is robust to the presence of endogenous regressors in both a stationary and a cointegration environment, while the CUSUM is robust only in a stationary environment and is unable to detect parameter instability when structural invariance fails (Caporale & Pittis, 2004). The model is said to be stable if the cumulative sum lies in the area between the two critical lines. As an additional robustness check, the residuals, for each of the models, are also plotted against two standard error bands. If the residuals exceed the error bands, the residuals are said to be unstable. Conversely, if they stay within the bounds, then the model has more stable residuals and performs better.

5 Empirical Analysis

5.1 Unit Root Tests

5.1.1 Augmented Dickey-Fuller (ADF) Regression Results

ADF regressions were run to determine the integration order of all variables. The results, contained in the appendix (A.1), suggest that RGDPC, INV, PG, LLY, PCR, SML and CI all contain unit roots and are non-stationary. For MCAP, the test statistic, in absolute terms, lies above the 95% asymptotic critical value, meaning that this variable is stationary. To ensure the non-stationary variables are not I(2), regressions are run on the differenced series. Once the first difference is taken, the unit root dissapears for LLY, PCR, SML, allowing for the conclusions that these variables are I(1). Problematically, for variables RGDPC, INV, PG and CI, the test statistic lies below the 95% asymptotic critical value, leading to the conclusion that the variables are I(2). To confirm this troubling finding, the paper conducts further unit root tests that account for structural breaks, noting this drawback of the ADF test.

5.1.2 Zivot and Andrews (2002) Unit Root Test Results

To account for the possibility of structural breaks in the data, the Zivot and Andrews (2002) unit root test is used to confirm the integration order of all the variables. Table 7, contained in the appendix (A.1), presents the results of this test from which several insights can be drawn. First, all variables with the exception of MCAP are integrated on order 1. Once the first difference is taken, the unit root disappears for these variables. MCAP was found to be stationary for the level series. These results notably conflict with the aforementioned ADF unit root results, indicating that the structural breaks in the data were biasing the outcomes. Specifically, the ADF results suggested that variables RDGPC and INV were I(2). However, it has been established that these variables are I(1) after accounting for structural breaks.

Therefore, the paper proceeds on the basis of the more appropriate and statistically sound Zivot and Andrews (2002) results, which have accounted for the structural breaks.

5.2 Bai and Perron (2003) Structural Break Test Results

Following Bai and Perron (2003), the break-point least squares estimates identify two clear structural breaks in the data, both of which coincide with major events in South Africa. The first is for 1995, which coincides with South Africa's transition to democracy in 1994/1995. The second is for 2008, which coincides with the global financial crisis of 2007/2008 that dramatically altered the world economy. To capture these breaks, two dummy variables are included in the estimations. D95 corresponds to the 1995 break while D08 corresponds to the 2008 break. It is also worth noting that these results are validated by the Zivot and Andrews (2002) test results, which spotlighted both these years as break points.

5.3 ARDL Bounds Test for Cointegration

Using the ARDL bounds testing approach, the paper tests for cointegration on five alternative specifications, employing one measure of financial development or financial structure at a time. Table 2 presents the results, which indicate that in all specifications, the F-statistic and W-statistic lie above their upper bound critical values at the 5% and 10% levels of significance. Thus, the null hypothesis of no level is rejected at the 5% level – a result which provides an early indication of a long-run causal relationship among the variables in all the specifications. Crucially, the model specifications include the time dummy variables that account for the structural breaks in the data.

Table 2: Bounds Test Results

Model	F-statistic	W-statistic	Result
LLY	9.189	36.759	Cointegration
PCR	8.165	32.658	Cointegration
SML	8.334	33.361	Cointegration
MCAP	8.213	32.851	Cointegration
CI	8.067	32.269	Cointegration
Critical Value Bounds			
95% Upper Bound	6.085	24.341	
95% Lower Bound	4.792	19.169	
90% Upper Bound	5.129	20.518	
90% Lower Bound	3.971	15.884	

Notes: Each model has been independently specified with a different financial proxy. For example, LLY corresponds to the model where the growth model has been augmented with the liquid liabilities ratio.

5.4 Long-run Estimation Results

Table 3 presents the long-run estimation results, which are remarkably consistent across different model variations. All proxies, except for LLY, are statistically insignificant. When LLY is used as a proxy, the coefficient is positive and significant at the 5% level – suggesting that financial development has proven beneficial to economic growth in South Africa. From a theoretical standpoint, this result confirms the expansion of financial activities in a developing country, like South Africa, would confer some benefit to economic growth. More specifically, the financial system underwent significant reform with the removal of repressive market protection policies, which might explain the significance (Gondo, 2009).

Conversely, the coefficient on PCR is positive but insignificant, suggesting that financial development does not impact economic growth. This insignificant finding is corroborated by existing literature (Berkes et al., 2012). It could also be explained by the fact that the effect of PCR might be captured within the broader significance of LLY (Gondo, 2009).

The coefficient of CI, which incorporates financial inclusion into the analysis, is positive but insignificant. Composite indices such as this one may fail to accurately capture the true dynamics of financial inclusion. This finding is supported empirically with many scholars noting the insignificance of composite financial development measures (Arcand et al., 2014; Rousseau & Wachtel, 2011).

In the South African context, the structure of the financial sector is found to be unimportant to economic growth. Both the SML and MCAP ratios, which serve as proxies for financial structure, are positive but statistically insignificant. The result allows for the conclusion that there is no economic value in promoting one financial system over the other within this context. Critically, the insignificance of financial structure does not imply that the institutions are unimportant. Rather, these variables may fail to fully capture the role of banks and markets within the financial system. Theoretically, this finding is surprising and does not accord with either the bank-based or market-based paradigms, both of which indicate that financial structure is significant. Instead, the insignificance of financial structure in the South African context lends credence to the 'financial services' and 'law and finance' theories. These theories posit that financial structure may be unimportant because banks and markets serve different functions and that what matters is a strong regulatory environment in which investor protection is offered (Arestis et al., 2004; Beck, Levine, & Loayza, 2000; La Porta et al., 1998). From an empirical standpoint, the findings stand juxtaposed to Arestis et al. (2004) who found that a bank-based system in South Africa had a significant effect on economic growth. The insignificance of SML and MCAP also contradicts international literature wherein financial structure, proxied by the same variables used in this study, was found to be highly significant (La Porta et al., 1999; Peia & Roszbach, 2015).

Focusing on the control variables, the coefficient on the investment (INV) variable is positive and statistically significant at the 5% across three of the five models. In the remaining two models, the investment proxy is significant at the 10%. These results confirm the theoretical expectation that investment is an important component and enabler of long-run economic

Table 3: Long-Run Estimation Results

Dependent Variable: ln RGDPC

Regressors	**LLY** *(2,3,1,0)*	**PCR** *(2,0,1,0)*	**SML** *(3,0,1,0)*	**MCAP** *(2,0,1,0)*	**CI** *(2,0,1,3)*
ln LLY	0.015** [0.005]				
ln PCR		0.029 [0.188]			
ln SML			0.017 [0.046]		
ln MCAP				0.056 [0.064]	
ln CI					0.302 [0.813]
ln INV	0.184 [0.121]	0.291** [0.131]	0.312** [0.137]	0.311** [0.122]	0.357* [0.194]
PG	-3.497*** [0.486]	-3.537*** [0.721]	-3.664*** [0.622]	-3.234*** [0.566]	-3.91*** [0.956]
C	1.424 [0.527]	0.226 [0.324]	0.222 [0.342]	0.278 [0.299]	0.218 [0.311]
T	-0.018*** [0.002]	-0.012*** [0.002]	-0.011*** [0.003]	-0.014 *** [0.003]	-0.009 [0.006]
D95	0.079* [0.045]	0.107* [0.054]	0.110* [0.053]	0.098* [0.0532]	0.107* [0.052]
D08	-0.032* [0.110]	-0.091** [0.036]	-0.047*** [0.009]	-0.143 [0.085]	-0.140** [0.051]

Notes: Standard errors reported in square-parentheses and the stars represent the level of significance; * for p<0.10; ** for p<0.05; *** for p<0.01. The ARDL lag selections, based on the Schwarz Bayesian Criterion (SBC), are reported in parentheses and italicised.

growth. Similarly conforming with theory is the population growth (PG) variable. This variable is negative and highly significant at the 1% level across all the models tested, confirming that population growth has a negative effect on long-run growth in the country.

Given the structural breaks in the dataset, two dummy variables were created to account for their idiosyncratic effect. These two dummy variables coincide with major events in the country over the time-series. Specifically, the D95 dummy variable accounts for a change in political dispensation. In July 1994, South Africa hosted its first democratic elections, which was accompanied by the lifting of economic sanctions that had been imposed on the old apartheid regime (Faulkner & Loewald, 2008). With the lifting of sanctions, South Africa's economy became drastically integrated into the world economy and had long-lasting implications for economic growth. Specifically, Clark (1994) notes that the access to foreign finance propelled the country's growth over this time. This political change explains why this dummy carries statistical significance across all model variations.

The D08 dummy variable was included to account for the global financial crisis, which exposed the fragility of the international economic system and saw countries around the world slip into a sharp recessionary period. As expected, the dummy variable is negative and carries significance across four of the five models. This indicates that the *crisis* had an adverse long-run effect on South Africa's growth trajectory, which accords with *a priori* expectations. Due to data limitations (small number of observations in the dataset) and following the structural break tests, the paper does not include a third dummy variable to account for the novel coronavirus pandemic that struck South Africa in March 2020 and also resulted in a recessionary period. This may be considered a drawback of the study and a void which may filled through further research.

Overall, the long-run coefficients presented allow for the derivation of the following conclusions – financial development does not have any negative effects on long-run economic growth and the structure of the financial sector in South Africa is inconsequential.

5.5 Short-run Estimation Results

Table 4 presents variations of the error correction model (ECM) that is used to derive the short-run dynamics. A negative and statistically significant ECM coefficient, denoted as $ECM(-1)$, implies that any short-run disequilibrium between the dependent and the explanatory variables will converge back to the long-run relationship. The ECM coefficient returns a negative and statistically significant result in each model variation, confirming cointegration among the variables. This finding further corroborates the ARDL bounds test results, which suggested a strong long-run relationship between the variables.

Across all model variations, the short-run estimations show a consistent insignificance with the sole exception being the coefficient on LLY, which is significant at the 5% level; a similar result to Gondo (2009). The significance of LLY offers some support for the proposition that financial development has positive growth implications in the short-run. Conflicting with this result, PCR and CI yield no significance suggesting that financial development may not confer some benefit to short-run economic growth. Lending support, there is emerging evidence that shows limited support for the relationship between financial development and growth in Africa (Gries et al., 2009; Menyah et al., 2014).

While there are grounds to rationalise this finding across the continent, the paper disagrees with its assertion in the South African context. Once again, it may be the case that LLY is a more adequate proxy than PCR and the composite indicator may fail to fully capture the short-run dynamics. Moreover, this finding does not lend itself to the conclusion that financial inclusion is unimportant as financial inclusion may have an immediate positive socioeconomic benefit that simply cannot be aggregated into a composite index such as this one. For variables SML and MCAP, the insignificance of their coefficients suggests that financial structure does not affect growth in the short-run; a finding backed by existing empirical literature (Beck & Levine, 2002).

Table 4: Short-Run Estimation Results

Dependent Variable: Δ ln RGDPC

Regressors	**LLY**	**PCR**	**SML**	**MCAP**	**CI**
	(2,3,1,0)	*(2,0,1,0)*	*(3,0,1,0)*	*(2,0,1,0)*	*(2,0,1,3)*
Δ ln LLY	0.167**				
	[0.067]				
Δ ln PCR		0.036			
		[0.041]			
Δ ln SML			0.017		
			[0.051]		
Δ ln MCAP				0.114	
				[0.131]	
Δ ln CI					0.005
					[0.069]
Δ ln INV	0.233***	0.214***	0.024***	0.024***	0.229***
	[0.039]	[0.075]	[0.077]	[0.013]	[0.074]
Δ PG	-0.95***	-0.857***	-0.058***	-0.922***	-0.896***
	[-0.159]	[0.181]	[0.154]	[0.174]	[0.264]
Δ T	-0.004***	-0.004***	-0.003*	-0.004***	-0.004***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
D95	0.024*	0.022*	0.031**	0.024*	0.031*
	[0.011]	[0.011]	[0.012]	[0.012]	[0.013]
D08	-0.062***	-0.058*	-0.037**	-0.049***	-0.034***
	[0.014]	[0.024]	[0.012]	[0.117]	[0.020]
ECM(-1)	-0.611***	-0.238***	-0.208***	-0.635**	-0.0212*
	[0.084]	[0.481]	[0.057]	[0.116]	[0.08]
R-squared	0.79	0.71	0.73	0.80	0.71
Adj. R-squared	0.68	0.62	0.66	0.72	0.61

Notes: Standard errors reported in square-parentheses and the stars represent the level of significance – $*$ for p<0.10; $**$ for p<0.05; *** for p<0.01. The ARDL lag selections, based on the Schwarz Bayesian Criterion (SBC), are reported in parentheses and italicised

The investment proxy is positive and statistically significant across all five model variations, supporting the theoretical expectation that capital formation spurs growth in the short-run as well as in the long-run. With respect to the labour force proxy, it is evident that population growth has negatively impacted short-run economic growth – a finding that is significant at the 1% level across all models. Paying attention to the dummy variable coefficients, the D95 dummy variable carries its long-run significance into the error correction component. In four of the models, the coefficient is positive and significant at the 10% level, indicating that the abolishment of apartheid and subsequent lifting of sanctions had an immediate positive impact on growth in the country. Perhaps a more important observation is the significance of the D20 dummy variable. In the long-run, this variable carried no significance. However, evidenced quite clearly in the table, the variable is negative and significant across four of the models. Specifically, when MCAP is used as a proxy, the variable is significant at the 5% level and indicates that the Covid-19 pandemic stymied growth in the short-run. This is an intuitive finding given that the pandemic along with the concomitant lockdowns resulted in a sharp decline of economic activity.

The R-squared and adjusted R-squared values show that the parsimonious augmented Solow growth model explains the variation in economic growth to a fair degree. Specifically, the R-squared ranges from 0.71 to 0.80 while the adjusted R-squared ranges from 0.61 to 0.72. Although there are drawbacks to the goodness-of-fit measures, these results induce confidence over the variable selection.

5.6 Diagnostic Test Results

Four diagnostic tests are conducted to check the robustness of the models. Table 8, contained in the appendix (A.2), presents the test results for each specification. Using the Langrange multiplier test of serial correlation, the probability of the test statistics lies above the 10% level, indicating that none of the models suffer from serial correlation. Ramsey's RESET

test using the square of the fitted values suggest that functional form has been correctly specified. The normality test, based on the skewness and kurtosis of residuals, indicates that the residuals are normally distributed across all the models. Lastly, the test for heteroskedasticity which is based on the regression of squared residuals on squared fitted values provides evidence that the variance of the error term is homoskedastic, allowing for the conclusion that the coefficients are efficient.

5.7 Stability Analysis

CUSUM and CUSUMSQ tests are used to determine the stability of each model specification. The results, reported in the appendix (A.3), show that cumulative sum for each of the models lies within the 5% critical value bounds, thereby confirming that the models are structurally stable. As an additional check, the residuals for each of the models are plotted within two standard error bands. The plots, which can be found in the appendix (A.4), indicate that the residuals are stable in each of the five alternative models. It is also important to note that the CUSUM, CUSUMSQ and residual plots presented are for the models that account for the structural breaks in the data through the inclusion of two dummy variables.

6 Conclusion and Policy Implications

The nature of the relationship between finance and economic growth has been the source of great inquiry and the subject of intense macroeconomic debate. Despite the extensive and well-established literature, there is little consensus among economists amid conflicting empirical evidence. Motivated by the evident disjuncture, this paper investigated the relationship between financial development, financial structure and economic growth in South Africa over the period 1980-2020. Additionally, the paper utilised a composite indicator that incorporates financial inclusion into the analysis, thereby offering a further novelty to the

paper's research. South Africa was selected due to its significance as a continental economic power, its highly sophisticated financial sector and equally prominent banking system. By focusing on a time-series investigation of South Africa, the study was able to capture idiosyncratic effects of major events in the country such as changing political dispensations and the economic turmoil surrounding the global financial crisis.

To empirically establish the relationships, five parsimonious augmented Solow growth models were employed and estimated using the ARDL approach to cointegration, thereby allowing for the derivation of short-run and long-run relationships. Furthermore, and on account of structural breaks in the data, two time dummy variables that coincide with major events in the country were added as additional predictors. Several noteworthy insights can be drawn from the results of these estimations. When financial development is proxied by the liquid liabilities ratio (LLY) ratio, the coefficient is positive and statistically significant in both the long-run and the short-run. However, when the proxy is changed to either the private credit ratio (PCR) or the financial development composite indicator (CI), the coefficients are insignificant and suggest that finance does not yield considerable influence over economic growth. It may be the case that LLY captures part of credit issued to the private sector and hence, it is plausible to assume that the long-run effect of PCR is contained in the significance of LLY. Furthermore, the effect of financial inclusion may be masked or inaccurately captured using a composite index, which can be considered a drawback of the study. Although the results, taken together, are inconclusive, it can be firmly established that financial development has no negative implications. With respect to the relationship between financial structure and economic growth, the results are consistent. Both the stock market capitalisation (MCAP) ratio as well as the stock market value traded (SML) ratio were insignificant in the long-run and short-run, suggesting that financial structure does not significantly impact economic growth

Given that there exists no negative link between finance and economic growth in either the short-run or long-run, there are several policy implications that flow from this find-

ing. Firstly, financial development should be promoted, but emphasis should be placed on incorporating marginalised sects of the population into the financial system. Through greater financial inclusion and a broader economic base, the effect of financial development may become increasingly pronounced. Secondly, no trade-off between a bank-based versus market-based financial system has been established. Thus, promoting one financial structure over the other does not significantly impact growth. Rather, the country should focus its efforts on promoting efficient capital and credit allocations. Upon reflection, it is important to note that as South Africa moves towards higher-income status, the nature of the relationships may change. Several scholars have noted that in advanced economies, finance tends to have a more significant impact on long-run growth by comparison to developing countries (Arcand et al., 2015; Luintel et al., 2008; Valickova et al., 2015).

Further research on South Africa and the finance-growth nexus may wish to focus attention on the long-run implications of the Covid-19 pandemic. It is too soon to tell what the long-run effects will be from the sharp decline in economic activity. Researchers might also employ different ad-hoc models to assess external validity and to check if the results are sensitive to the variables used. Greater attention could be paid to financial inclusion. Although this paper has incorporated financial inclusion into the analysis, it did so through a composite indicator. As the data on financial inclusion becomes less scant, opportunities will arise allowing researchers to directly estimate the impact of greater inclusivity. As a final remark, the South African government should acknowledge that the financial sector is a stalwart of the economy but requires continuous effort to make it more inclusive.

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A Appendix

A.1 Unit Root Test Tables

Table 5: ADF Unit Root Test (Intercept + No Trend)

Variable	**Level**		**First Difference**	
	Test Statistic	*Outcome*	*Test Statistic*	*Outcome*
ln RGDPC	-2.12	Unit root	-5.28	Stationary
ln INV	-1.83	Unit root	-6.69	Stationary
PG	-4.19	Unit root	-6.92	Stationary
ln LLY	-3.07	Unit root	-7.78	Stationary
ln PCR	-4.50	Unit root	-7.68	Stationary
ln SML	-5.05	Unit root	-7.47	Stationary
ln MCAP	-5.75	Stationary	-9.85	Stationary
ln CI	-4.27	Unit root	-6.32	Stationary
95% Asymptotic Critical Value	5.15		7.13	

Table 6: ADF Unit Root Test (Intercept + Linear Trend)

Variable	**Level**		**First Difference**	
	Test Statistic	*Outcome*	*Test Statistic*	*Outcome*
ln RGDPC	-2.12	Unit root	-5.28	Stationary
ln INV	-1.83	Unit root	-6.69	Stationary
PG	-4.19	Unit root	-6.92	Stationary
ln LLY	-3.07	Unit root	-7.78	Stationary
ln PCR	-4.50	Unit root	-7.68	Stationary
ln SML	-5.05	Unit root	-7.47	Stationary
ln MCAP	-5.75	Stationary	-9.85	Stationary
ln CI	-4.27	Unit root	-6.32	Stationary
95% Asymptotic Critical Value	5.15		7.13	

Table 7: Zivot and Andrews (2002) Unit Root Test

Variable	**Level**		**First Difference**		**Integration Order**
	Test Statistic	*Outcome*	*Test Statistic*	*Outcome*	
ln RGDPC	-2.12	Unit root	-5.28	Stationary	I(1)
ln INV	-1.83	Unit root	-6.69	Stationary	I(1)
PG	-4.19	Unit root	-6.92	Stationary	I(1)
ln LLY	-3.07	Unit root	-7.78	Stationary	I(1)
ln PCR	-4.50	Unit root	-7.68	Stationary	I(1)
ln SML	-5.05	Unit root	-7.47	Stationary	I(1)
ln MCAP	-5.75	Stationary	-9.85	Stationary	I(0)
ln CI	-4.27	Unit root	-6.32	Stationary	I(1)
Critical Values					
1% level	-5.57				
5% level	-5.08				
10% level	-4.82				

A.2 Diagnostic Test Table

Table 8: Diagnostic Test Results

	Statistic	LLY	PCR	SML	MCAP	CI
Serial Correlation	F [p-value]	0.191 [0.666]	0.648 [0.428]	0.126 [0.766]	0.079 [0.781]	0.128 [0.723]
	χ^2 [p-value]	0.319 [0.572]	0.935 [0.334]	0.186 [0.667]	0.116 [0.733]	0.189 [0.663]
Functional Form	F [p-value]	0.355 [0.557]	0.011 [0.919]	0.091 [0.766]	0.068 [0.796]	0.126 [0.726]
	χ^2 [p-value]	0.587 [0.443]	0.016 [0.903]	0.134 [0.714]	0.105 [0.751]	0.185 [0.667]
Normality	F [p-value]	-	-	-	-	-
	χ^2 [p-value]	0.305 [0.859]	1.239 [0.538]	0.855 [0.652]	0.669 [0.716]	1.154 [0.562]
Hetero-skedasticity	F [p-value]	0.004 [0.949]	0.753 [0.391]	0.209 [0.650]	0.112 [0.740]	0.142 [0.709]
	χ^2 [p-value]	0.004 [0.947]	0.779 [0.377]	0.220 [0.639]	0.117 [0.740]	0.149 [0.669]

Note: F refers to F-statistic and χ^2 refers to the LM-statistic. The diagnostic tests are reported for the model specifications that include both the D94 and D08 dummy variables, which account for structural breaks in the data. The probabilities are reported in parentheses.

A.3 CUSUM and CUSUMSQ Plots

Figure 4: LLY CUSUM

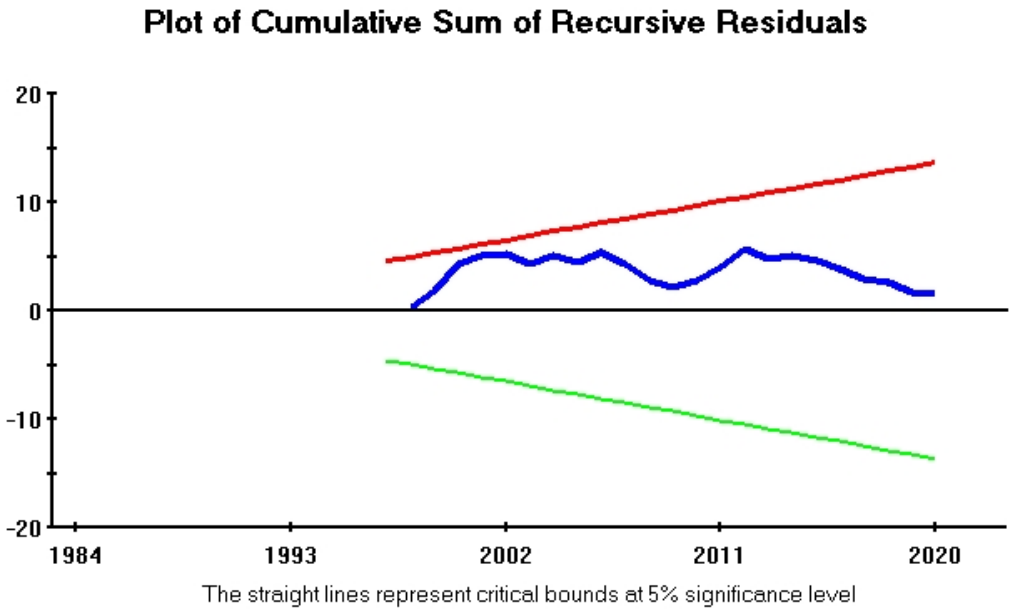


Figure 5: LLY CUSUMSQ

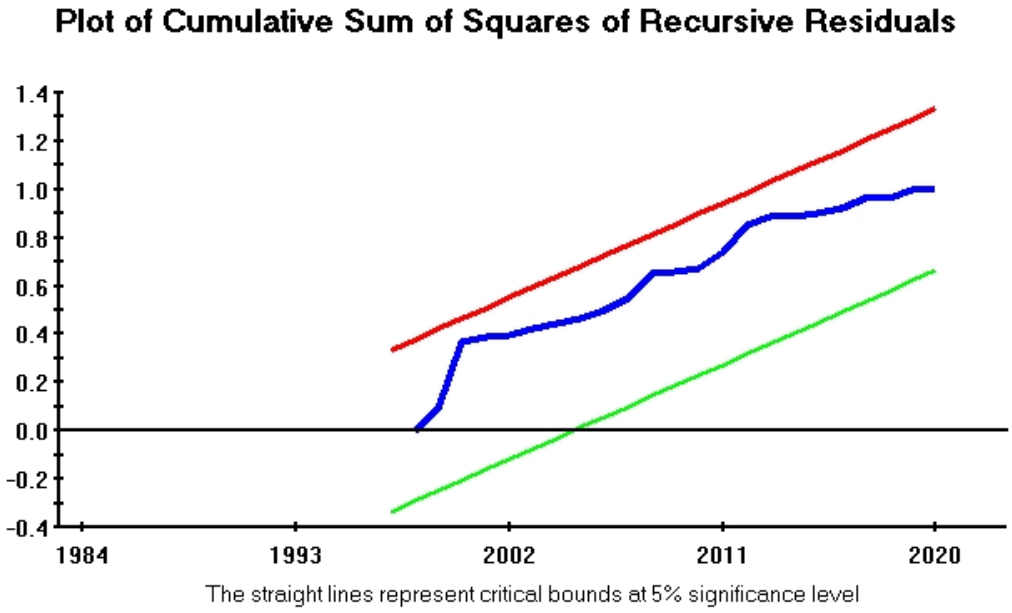


Figure 6: PCR CUSUM

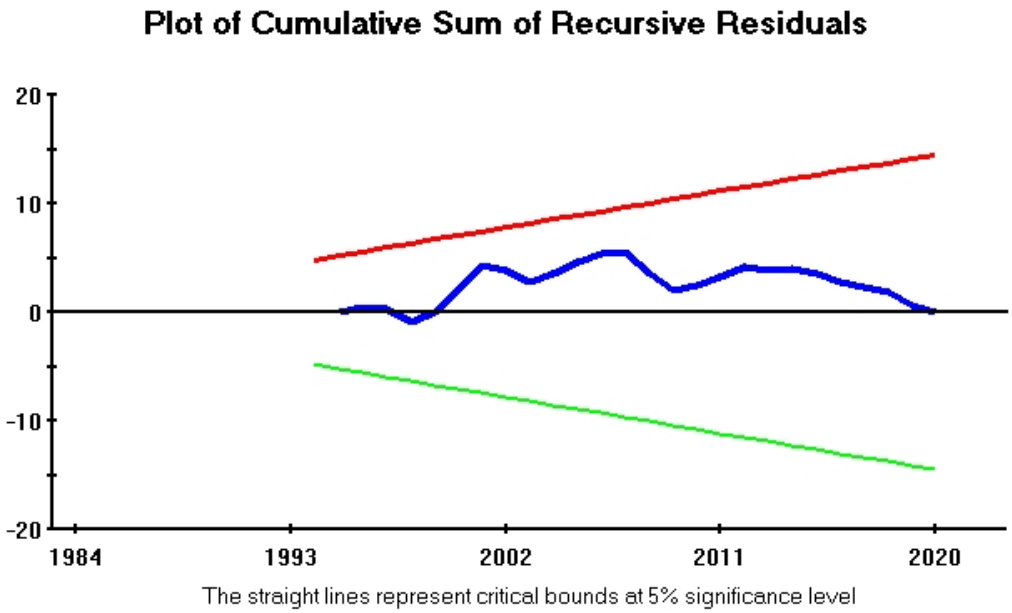


Figure 7: PCR CUSUMSQ

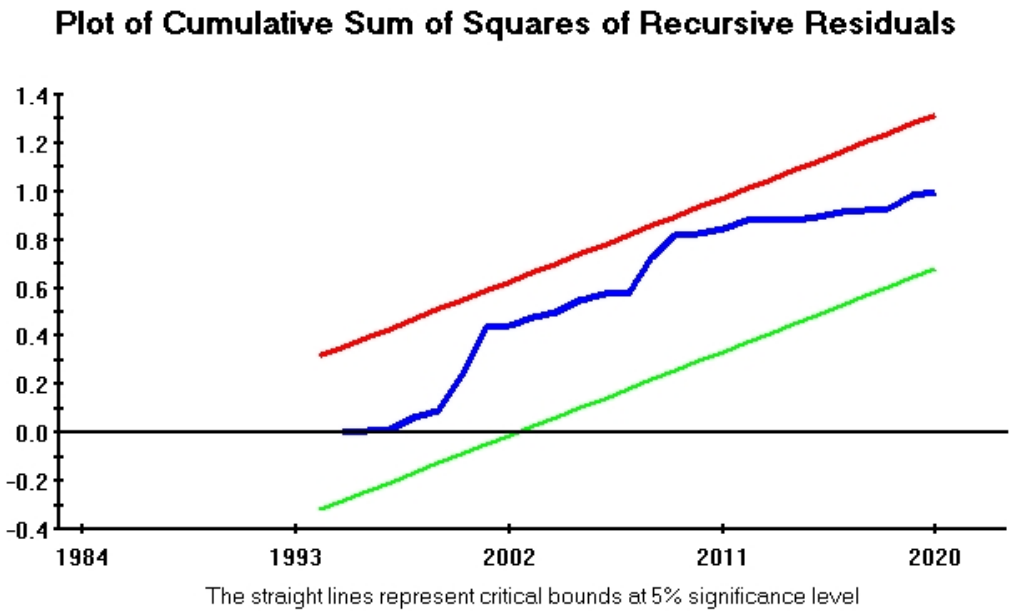


Figure 8: SML CUSUM

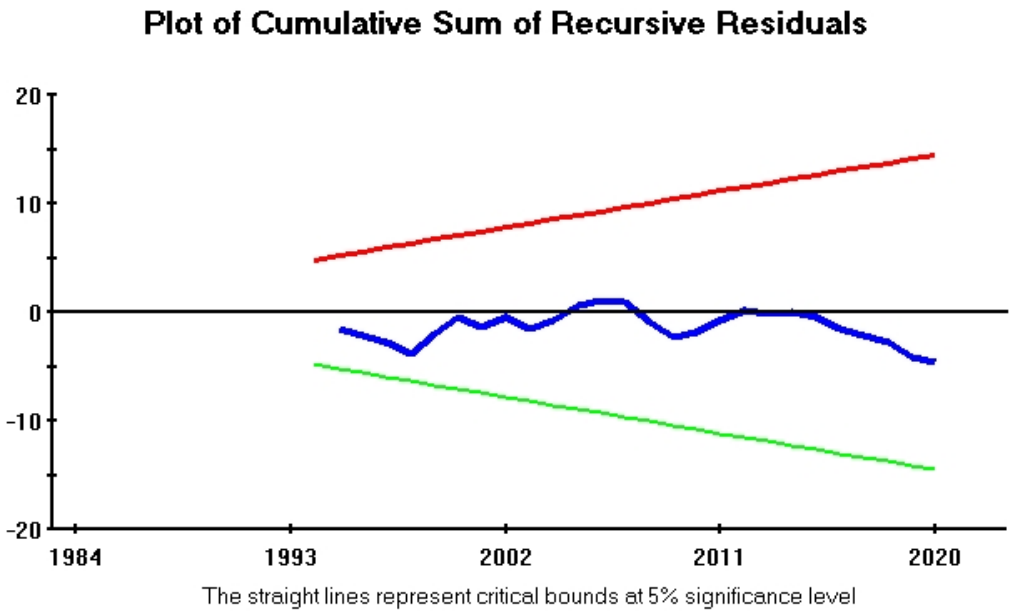


Figure 9: SML CUSUMSQ

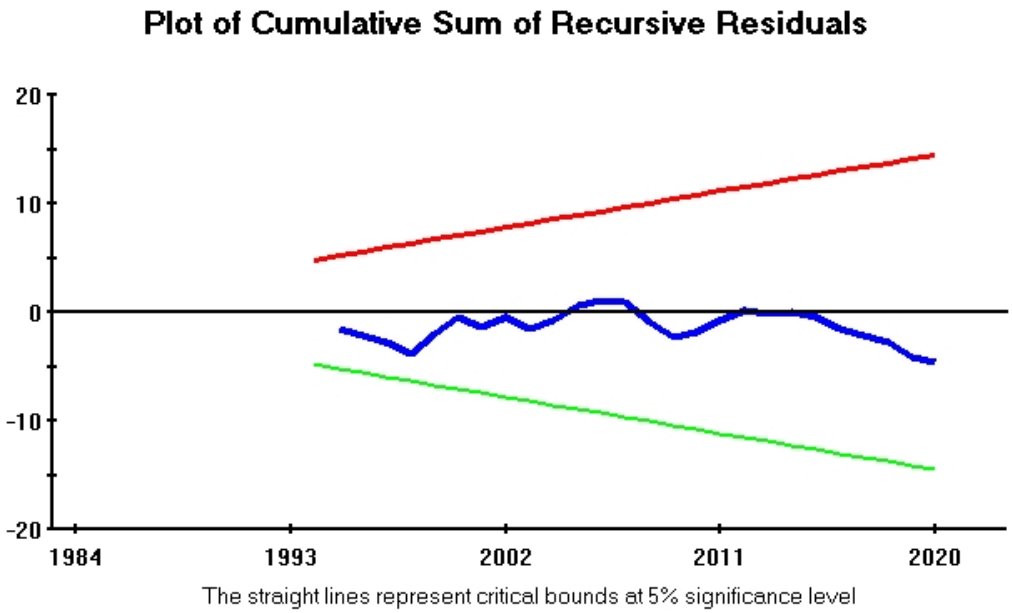


Figure 10: MCAP CUSUM

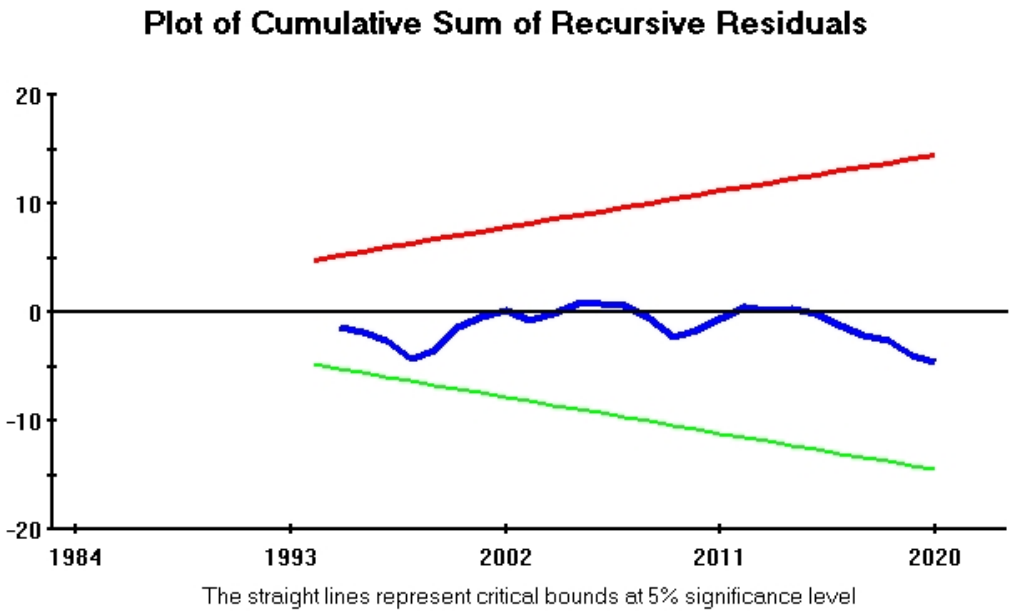


Figure 11: MCAP CUSUMSQ

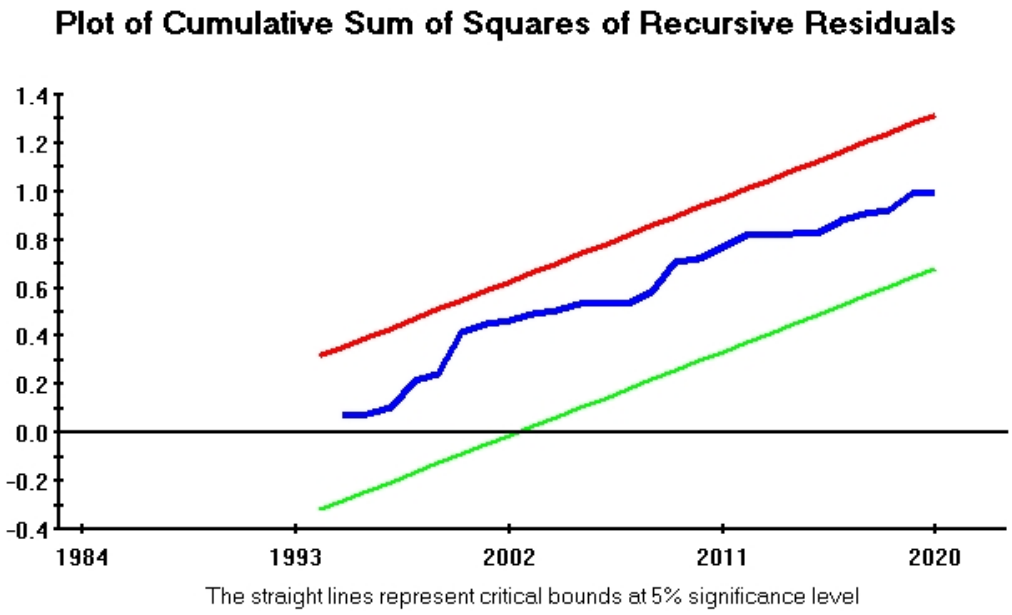


Figure 12: CI CUSUM

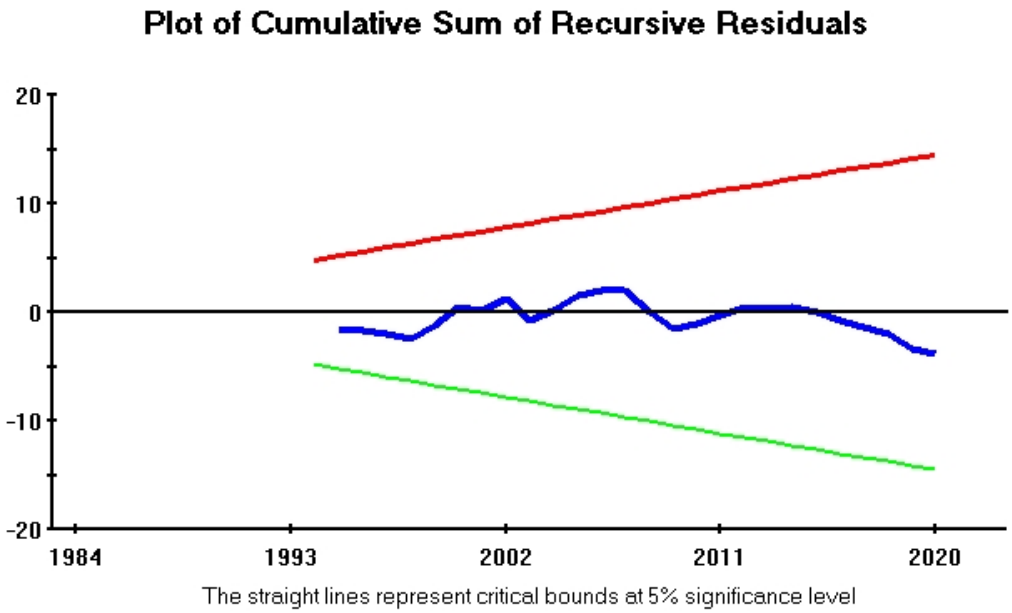
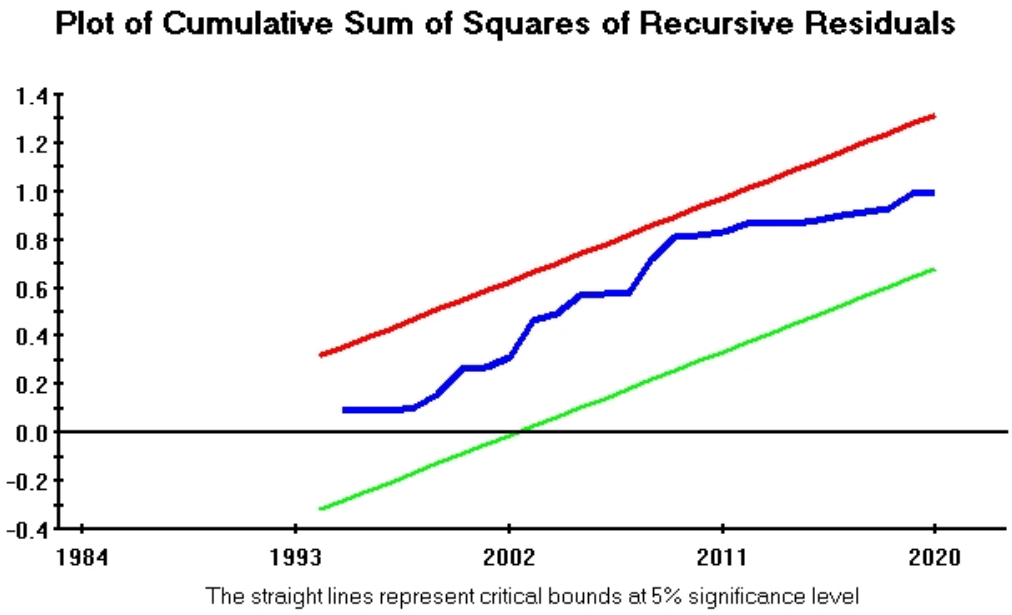


Figure 13: CI CUSUMSQ



A.4 Residual Plots

Figure 14: LLY Residuals

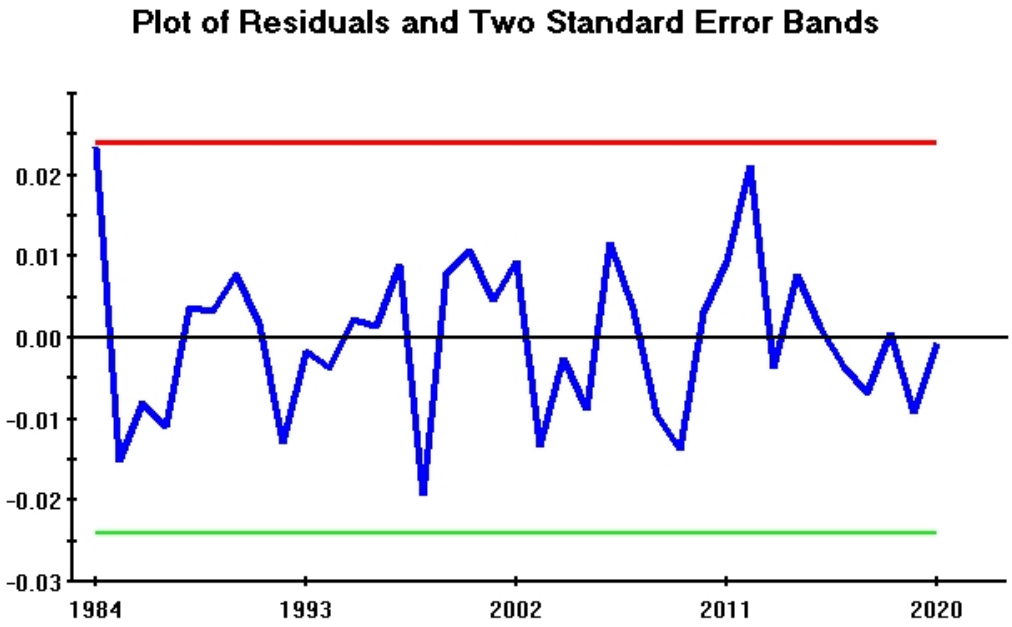


Figure 15: PCR Residuals

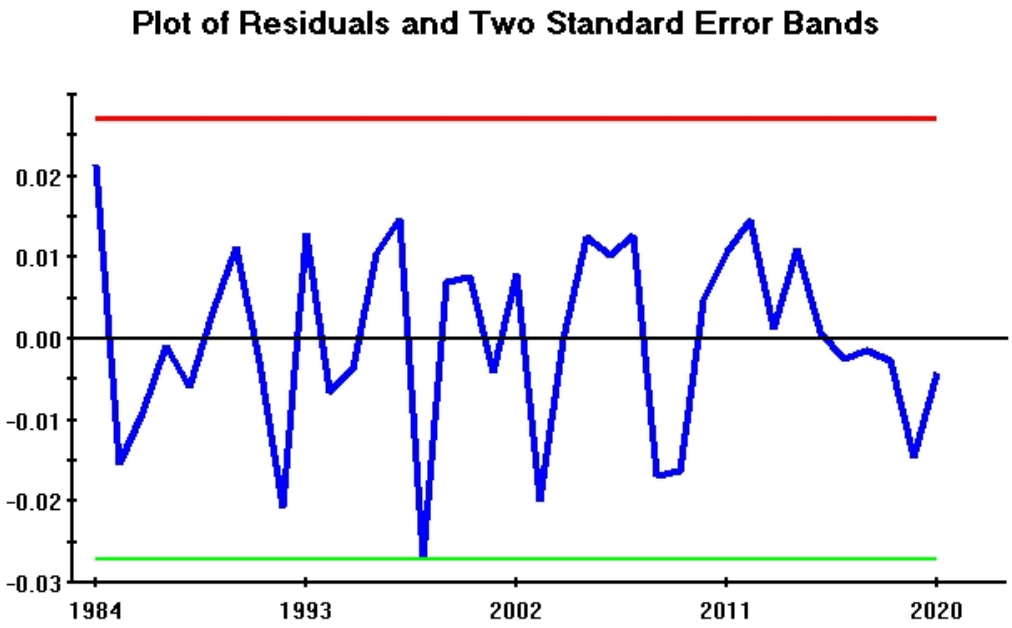


Figure 16: SML Residuals

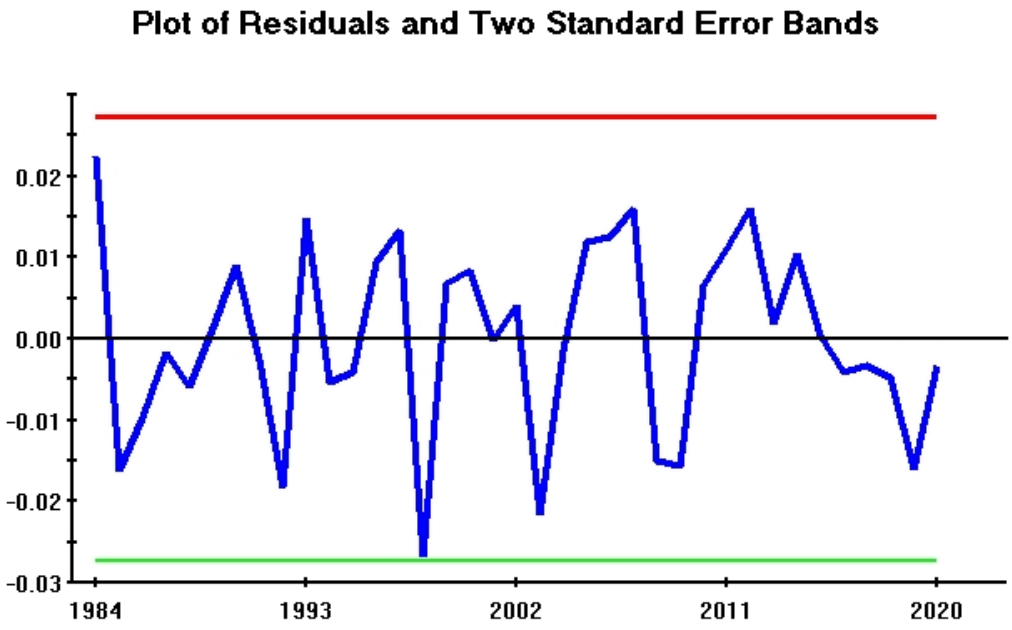


Figure 17: MCAP Residuals

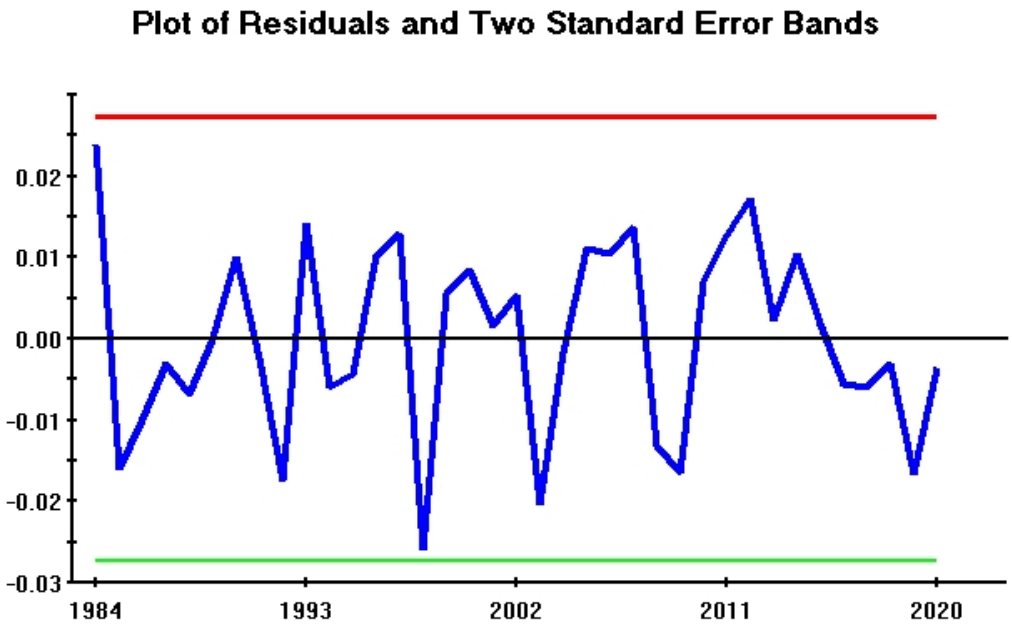
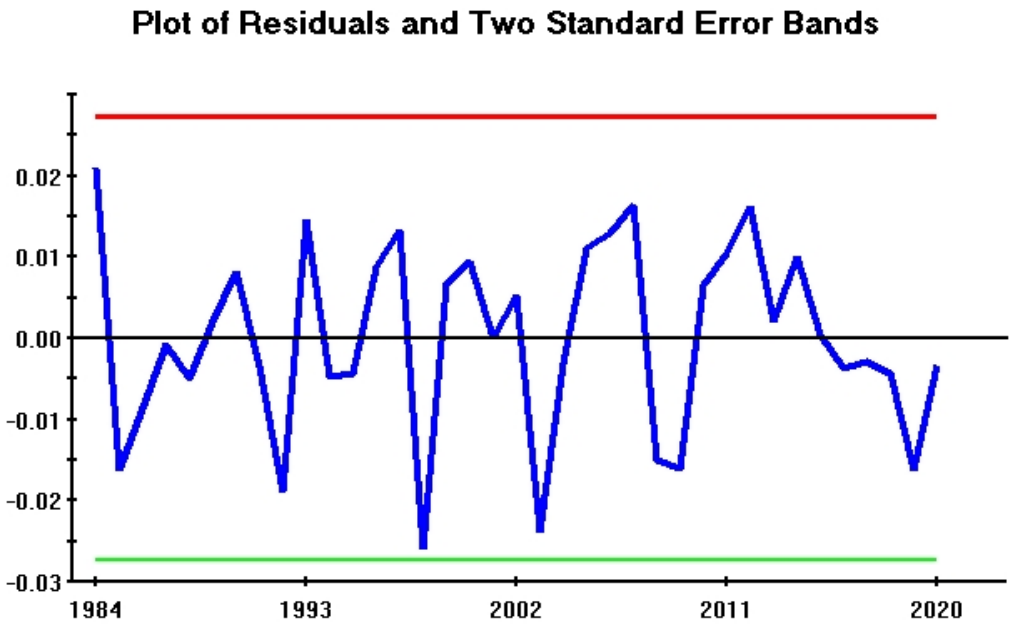


Figure 18: CI Residuals



B Mathematical Note

The auto-regressive distributed lag (ARDL) approach to cointegration is a multivariate method that can be applied to time series variables. On a very general level, the ARDL technique seeks to describe the information that is incorporated within the temporal and cross-sectional dependence of these variables. The polynomial distributed lag (DL) model can be specified as follows:

$$y_t = \alpha + \beta_0 x_t + \beta_1 x_{t-1} + ... + \beta_q xt - q + \epsilon_t \tag{9}$$

$$y_t = \alpha + \beta(L) x_t + \epsilon_t \tag{10}$$

where ϵ_t is the part of the data that we are unable to explain and is assumed to be serially uncorrelated (write in own words); $\beta(L)x_t$ is is a lag polynomial; L is the lag operator. The lag polynomial can be written as $\beta(L) = \beta_0 x_t + \beta_1 \mathbf{L} + ... + \beta_q L^q$ and the lag operator is defined by $L^i x_t = x_{t-i}; i = 0, 1, 2, 3...$

The modification of the model given by equation 9 allows for the derivation of the rational distributed lag model.

$$y_t = \alpha + \frac{\beta(L)}{\lambda(L)} x_t + \upsilon_t \tag{11}$$

where $\lambda(L) = \lambda_0 + \lambda_1 L + ... + \lambda_p L^p$. The lag polynomial is again defined as $\beta(L) = \beta_0 x_t + \beta_1 \mathbf{L} + ... + \beta_q L^q$.

If the model given by equation 11 is extended to incorporate a number of auto-regressive terms, then the ARDL model can be derived. The ARDL(p,q) model can be specified as:

$$y_t + \lambda_1 y_{t-1} + \lambda_2 y_{t-2} + ... + \lambda_p y_{t-p} = \alpha + \beta_0 x_t + \beta_1 x_{t-1} + ... + \beta_q x_{t-q} + \epsilon_t \tag{12}$$

This can be simplified to:

$$\lambda(L) y_t = \alpha + \beta(L) x_t + \epsilon_t \tag{13}$$