THE INTERACTIONS BETWEEN SECTORAL CREDIT ALLOCATION DECISIONS AND ECONOMIC GROWTH: AN EMPIRICAL STUDY OF ZIMBABWE

by

MTETWA ARNOLD

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Supervisor: Prof R.T. Mpofu

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DECLARATION

Name: MTETWA ARNOLD

Student number: 61779881

Degree: Doctor of Philosophy (PhD) in Management Studies

I, the undersigned, declare that this thesis entitled,

The interactions between sectoral credit allocation decisions and economic growth: an empirical study of Zimbabwe

is my own work, and that all the sources I have used or cited have been showed and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at UNISA for another qualification or at any other higher education institution.

26 February 2022

Signature Date

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Most importantly, I wish to praise the Almighty God, our Father, and Jesus Christ, our Lord, for the greatest gift of life and wisdom; without his mercy, succeeding in this research was to remain a dream.

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DEDICATION

To God the Father and Jesus Christ our Lord.

ABSTRACT

Despite policy measures aimed at improving the performance of commercial banks and their contribution to economic growth, little progress has been made in reviving the Zimbabwean economy. The effective function of banking as an essential sector in Zimbabwe is crucial to the promotion of the economic growth of the country. To achieve this objective, the study used agriculture, manufacturing, mining, individuals, finance and other sectors as independent variables using monthly data. The previous empirical examination of the connection of the relationship is anchored on aggregate economic growth (proxied GDP), on the assumption that each economic sector responds similarly to GDP. However, the degree of credit utilisation and productivity of credit may not homogeneously remain the same across sectors. Therefore, this study seeks to contribute to the literature by examining the interaction between bank lending through sectoral credit allocation (SCA) and economic growth. The study employed the Augmented Dickey-Fuller (ADF) to test for stationarity in the time series. Johansen cointegration, the vector autoregressive model and the vector error correction model were used to identify the long-run and short-run dynamics among variables. The Granger causality test was used to determine the causal direction. In the context of this study, monthly time series data were used to examine the interaction between sectors of the economy and economic growth in Zimbabwe during the period 2010–2021. The study used secondary data from the Reserve Bank of Zimbabwe (RBZ). As a result, ADF has been enhanced.

The Johansen cointegration test, on the other hand, demonstrated a long-run link between the variables. Credit allocation to the agriculture, industrial, and mining sectors grew the economy, but credit allocation to individuals, the banking industry,

and other sectors did not. The findings imply that policymakers, government, and financial regulators must promote financial allocation to agriculture, mining and manufacturing as critical for economic transformation. The banks must ensure that more credits flow to the mining, manufacturing, and agricultural sectors to promote growth for all economic sectors. Understanding the relationship between SCA and economic growth is critical, as it informs authorities to properly allocate resources and obtain proportionate returns.

KEYWORDS: bank credit, causality test, economic growth (GDP), credit allocation, VAR, VECM, Zimbabwe, financial institutions, cointegration, finance, private credit.

UKUXHUMANA PHAKATHI KWEZINQUMO ZOKUKWABIWA KWEZEZIMALI NOKUKHULA KOMNOTHO: UCWANINGO OLUSEKELWE EKUQAPHELISENI NASEKUKALWENI KWEZIMO ZASEZIMBABWE

ngu

MTETWA ARNOLD

luhanjiswe ngokuhambisana nezidingo ngezinga le

ZIQU EZISEZINGENI ELIPHAKEME KAKHULU LEZEMFUNDO

esifundweni

SEZIFUNDO ZOKUPHATHA

EMFUNDWENI EPHAKEME YASENINGIZIMU AFRIKA

Umphathi: USolwazi R.T. Mpofu

2022

OKUCASHUNIWE

Naphezu kwezinyathelo zengqubomgomo ezihlose ukuthuthukisa ukusebenza kwamabhange ebhizinisi kanye negalelo lawo ekukhuleni komnotho, incane inqubekelaphambili eseyenziwe ekuvuseleleni umnotho weZimbabwe. Ukusebenza kahle kwamabhange njengomkhakha obalulekile eZimbabwe kubalulekile ekukhuthazeni ukukhula komnotho wezwe. Ukufeza le nhloso, ucwaningo lusebenzise ezolimo, ezokukhiqiza, ezezimayini, abantu ngabanye, ezezimali kanye neminye imikhakha njengokuguquguquka okuzimele kusetshenziswa imininingwane yanyanga zonke. Ukuhlolwa kwangaphambilini kobuhlakani bokuxhunywa kobudlelwano kusekelwe ekukhuleni komnotho okuhlanganisiwe (igunya le-GDP lokusebenzela omunye), kucatshangwa ukuthi umkhakha wezomnotho ngamunye uphendula ngendlela efanayo kwi-GDP. Kodwa-ke, izinga lokusetshenziswa kwamanani akweletwayo kanye nokukhiqiza kwesikweletu kungenzeka kungahlali ngokufanayo kuzo zonke izigaba. Ngakho-ke, lolu cwaningo luhlose ukufaka isandla emibhalweni ngokuhlola ukusebenzisana phakathi kokubolekwa kwebhange ngokusebenzisa ukwabiwa kwezezimali ngokwemikhakha (SCA) kanye nokukhula komnotho. Ucwaningo lusebenzise ukuhlola ukuthi impande yeyunithi ikhona kusampula yochungechunge lwesikhathi (ADF) ukuze ihlole ukuma ochungechungeni lwesikhathi. Indlela yokunquma ukuthi uchungechunge lwesikhathi oluthathu noma ngaphezulu luhlanganisiwe, isilinganiso esisetshenziselwa uchungechunge lwesikhathi esibandakanya amanani aguquguqukayo amabili noma ngaphezulu, kanye nesilinganiso esiguquguqukayo esimile ekwehlukeni kwaso kusetshenziswe ukuhlonza amandla esikhathi eside kanye nesikhathi esifushane phakathi kokuguquguqukayo.

Ukuhlolwa komqondo wezibalo wembangela osuselwe ekubikezelweni kwasetshenziswa ukuze kutholwe isiqondiso sembangela. Kulolu cwaningo, imininingwane yochungechunge lwesikhathi lwanyanga zonke yasetshenziswa ukuhlola ukuxhumana phakathi kwemikhakha yomnotho nokukhula komnotho eZimbabwe phakathi nesikhathi sika-2010-2021. Lolu cwaningo belusebenzisa imininingwane yesibili evela ebhanga elikhulu lezwekazi laseZimbabwe (RBZ). Ngenxa yalokho, i-ADF iye yathuthukiswa.

Ukuhlolwa kokunquma ukuthi uchungechunge lwesikhathi oluthathu noma ngaphezulu luhlanganisiwe, ngakolunye uhlangothi, kubonise ukuxhumana okuhlala isikhathi eside phakathi kokuguquguqukayo. Ukwabiwa kwezikweletu emkhakheni wezolimo, izimboni, kanye nezimayini kwawukhulisa umnotho, kodwa ukwabiwa kwezikweletu kubantu ngabanye, imboni yamabhange, neminye imikhakha akuzange kube njalo. Imiphumela isho ukuthi abenzi bezinqubomgomo, uhulumeni, nabalawuli bezezimali kumele bakhuthaze ukwabiwa kwezimali kwezolimo, ezezimayini nezokukhiqiza njengento ebalulekile ekuguquleni umnotho.

Amabhange kumele aqinisekise ukuthi izikweletu eziningi ziyangena emkhakheni wezimayini, wezokukhiqiza kanye nowezolimo ukuze kuthuthukiswe ukukhula kwayo yonke imikhakha yezomnotho. Ukuqonda ubudlelwano phakathi kwe-SCA nokukhula komnotho kubalulekile, njengoba kuzisa iziphathimandla ukuthi zabele izinsiza ngendlela efanele futhi zithole izinzuzo ezilinganayo.

AMAGAMA ASEMQOKA:

bank credit: ibhange lesikweletu

causality test: Ukuhlolwa komqondo wezibalo wembangela osuselwe ekubikezelweni

economic growth (GDP): ukukhula komnotho

credit allocation: ukwabiwa kwesikweletu

VAR: uchungechunge lwesikhathi esibandakanya amanani aguquguqukayo amabili noma ngaphezulu

VECM: isilinganiso esiguquguqukayo esimile ekwehlukeni kwaso

Zimbabwe: iZimbabwe

financial institutions: imikhakha yezezimali

cointegration: ukuhlolwa kwemininingwane ukuthola uma kukhona ubudlelwano phakathi kochungechunge olubili noma ngaphezulu oluhlobene nesikhathi.

Finance: ezezimali

private credit: indlela yamabhizinisi yokukhulisa imali

MATEANO PAKENG TSA DIQETO TSA KABO YA MOKITLANE HO YA LEBATOWA LE KGOLO YA MORUO: PHUPUTSO E ITSHETLEHILENG HODIMA BOPAKI MABAPI LE ZIMBABWE

ka

MTETWA ARNOLD

E nehelanwe ho latela ditlhoko tsa grata ya

BONGAKA BA FILOSOFI

thutong ya

DITHUTO TSA TSAMAISO (MANAGEMENT STUDIES)

sekolong sae

YUNIVESITHI YA AFRIKA BORWA

Mosupisi: Prof R.T. Mpofu

2022

KAKARETSO

Leha hona le mehato ya dipholisi e reretsweng ho ntlafatsa tshebetso ya dibanka tsa kgwebo le tlatsetso ya tsona kgolong ya moruo, ho bile le kgatelopele e nyane haholo tsosolosong ya moruo wa Zimbabwe. Tshebetso e ntle ya ho banka jwalo ka lekala la bohlokwa Zimbabwe e bohlokwahadi ntlafatsong ya kgolo ya moruo wa naha. Ho fihlella maikemisetso ana, phuputso e sebedisitse temo, tlhahiso, dimmaene, batho ka bo mong, ditjhelete le makala a mang jwalo ka ditshupo tse ikemetseng tsa ho fapana ka tshebediso ya datha ya kgwedi le kgwedi. Tlhahlobo e fetileng e itshetlehileng hodima bopaki ya kgokahano ya kamano e thehilwe hodima kgolo ya moruo ya palohare (GDP e emetsweng), ka tumelo ya hore lekala ka leng la moruo le arabela ka tsela e tshwanang ho GDP. Leha ho le jwalo, botebo ba tshebediso ya mokitlane le tlhahiso ya mokitlane di kanna tsa se dule di tshwana ho pharalla le makala. Kahoo, phuputso ena e batla ho tlatselletsa ho dingolwa ka ho hlahloba kamano pakeng tsa kadimo tsa dibanka ho ya kabo ya mokitlane ka makala (SCA) le kgolo ya moruo. Phuputso e sebedisitse Augmented Dickey-Fuller (ADF) ho etsa teko ya ho se fetohe letotong la nako. *Johansen cointegration*, e leng mmotlolo wa *vector autoregressive* le mmotlolo wa tokiso ya phoso ya vector di sebedisitswe ho hlwaya dintlha tsa nako e telele le tsa nako e kgutshwane hara diphaphano. Teko ya *Granger causality* e sebedisitwe ho fumana tsela ya lebaka. Sebakeng sa phuputso ena, ho sebedisitswe data ya nako ya letoto la kgwedi le kgwedi ho hlahloba kamano pakeng tsa makala a moruo le kgolo ya moruo Zimbabwe pakeng tsa 2010–2021. Phuputso e sebedisitse datha ya bobedi ho tswa ho Banka Resefe ya Zimbabwe (RBZ). Ka tsela eo, ADF e ntlafaditswe.

Teko ya *Johansen cointegration*, ka lehlakoreng le leng, e bontshitse kgokahano ya nako e telele pakeng tsa diphaphano. Kabo ya mokitlane ho makala a temo, tlhahiso, le dimmaene e hodisitse moruo, empa kabo ya mokitlane ho batho ka bo mong, indasteri ya dibanka, le makala a mang ha e ya hodisa moruo. Diphetho di supa hore baetsi ba melawana, mmuso le balaodi ba ditjhelete ba tlameha ho ntlafatsa kabo ya ditjhelete ho tsa temo, dimmaene le tlhahiso hobane di bohlokwa bakeng sa phetoho ya moruo. Dibanka di lokela ho netefatsa hore mokitlane o eketsehileng o leba ho makala a dimmaene, tlhahiso, le temo e le ho ntlafatsa kgolo bakeng sa makala ohle a moruo. Ho utlwisisa kamano pakeng tsa SCA le kgolo ya moruo ho bohlokwa, hobane e lebisa ho kabo e nepahetseng ya dihlahiswa le disebediswa ke ba ikarabellang le ho phumano ya dipoello tse loketseng.

MANTSWE A BOHLOKWA: mokitlane wa banka, teko ya mabaka, kgolo ya moruo (GDP), kabo ya mokitlane, VAR, VECM, Zimbabwe, ditsi tsa ditjhelete, teko ya dipalopalo (*cointegration*), ditjhelete, mokitlane wa poraefete.

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RBZ:	- Reserve Bank of Zimbabwe
GDP:	- Gross Domestic Product
ECOWAS:	- Economic Community of West African States
IMF:	- International Monetary Fund
ARDL-	Autoregressive Distributed Lag

1 CHAPTER ONE: INTRODUCTION

1.1 Chapter Introduction

This introductory chapter begins with a discussion of the study's background, the significance of the study, a description of the research topic, the aims and objectives, and the research questions. It also highlights the motivations for conducting this study. Further, the chapter presents the contributions of this research.

The modern economy is based on credit. The economy needs credit for various reasons such as to promote its activities (Nwaru and Okorontah, 2014). In the economic literature, the relationship between credit and the economy has been extensively debated. Practitioners and policymakers are interested in the debate about the finance-growth nexus (Elijah and Hamza, 2019; Nyasha and Odiabudo, 2017; Ibrahim and Alagaidede, 2018). Finance plays a crucial role in driving growth, which may account for the enduring interest (Durusu-ciftci, Ispir and Yetkiner, 2017), when surplus units in the system are mobilized and this excess liquidity is efficiently and productively allocated. Notwithstanding extensive research, the relationship between finance and economic growth remains inconclusive (An, Zou, and Kargbo, 2020; Deb, Mishra, and Banerjee, 2019). The relationship is described as complex, with findings from different studies varying according to country-specific factors, measures of financial development, and empirical models used. Additionally, outcome variation can be attributed to the volume of financial resources allocated to individual economic sectors.

The importance of commercial banking institutions in fostering economic growth has sparked much debate in the literature. According to pioneer economists such as

Schumpeter (1911), banks play a key role in the economy. The author asserts that allocative efficiency of savings to the finest entrepreneurs generates output growth the economy. According to Fry (1988) and King and Levine (1993), the roles of banks are critical for the economy's progress. Modern research, such as that of De Serres, Kobayakawa, Slok and Vartia (2006) and Levine (2003), has concurred with the preceding point and has employed measurements of bank size and structure in examining the evidence of a relationship between the banking sector and economic growth.

While finance growth was dismissed in different facets, little is known about the relationship between sectorial finance and economic growth. It is more helpful to examine the impact of sectorial credit than to focus on aggregate response, as different sectors have different economic contributions. Apart from this, initiation of growth policies starts at the sectorial level, hence the importance of studying sectorial credit allocations and tools for sector-level policy economic growth. Credit allocation across sectors has varied significantly. Alliance for a Green Revolution in Africa (2017) suggested that the total share of financial resources to the agricultural sector was perceived as risky and that the cost of extending credit was high. In addition, it is worth noting that variation exists across sectors of productivity of capital. As such, the return on invertible projects could dictate which sector(s) is/are more economical. This study seeks to contribute to the literature on the interactions between sectorial credit allocation decisions and economic growth in Zimbabwe. Previous studies such as Aluko, Adeyeye, and Oladele (2020), An *et al*. (2020), Ho and Iyke (2020), and Ibrahim and Alagidede (2018) have focused on the impact of financial development (aggregate level) on economic growth. This study complements previous studies by focusing on

sectoral financial allocation rather than aggregate private credit. Evidence based on sectoral impact could assist policymakers in developing different sectors.

A positive change in national income is referred to as economic growth, defined as a general change in the level of output of goods and services in a country during a particular time for the purposes of this study. Economic growth is frequently measured in terms of production levels within a country. Total factor productivity (TFP), real per capita GDP, physical capital accumulation, and other factors all contribute to economic growth, as measured by GDP (Gross Domestic Product) in this study (Allen and Ndikumama, 1998; Odedokun, 1998).

On the issue of causality, there are still differing viewpoints. Based on the causal direction, there is an empirical examination of the relationship between sectoral credit allocation (SCA) decisions and economic growth (Melander, 2008). SCA has the potential to cause economic growth. According to Bayoumi and Melander (2008), a 2.5 per cent decline in credit has a 1.5 per cent negative impact on GDP. On the other hand, economic growth can be a cause of SCA. This is especially true when the degree of economic growth encourages the expansion of the financial system through increased SCA.

Bidirectional causality was also observed in several instances. Demetriades and Hussein (1996) examined a group of 13 states and found that all three causal directions (directional, reverse, and bidirectional) were present, as briefly described above. They concluded that the question of causality is a country-specific phenomenon rather than a worldwide phenomenon, as previously stated. Several

studies, including Odedokun (1998) and Ghirmay (1998), support Demetriades and Hussein's (1996) and (2004) conclusions.

Therefore, it is essential to investigate the link between SCA and the economy to determine the contributions of each sector to the overall economy and the existence of causation between variables. The findings serve as a platform for a critical assessment of whether commercial banks can be relied on to stimulate the Zimbabwean economy through their intermediary function.

1.2 Background of the study

The Basel Committee, in line with the Banking Supervision, identified the impact of bank finances on economic growth. It argued that monetary policy affects the supply of bank credit and banks (Basel Committee on Banking Supervision, 2012). Given the importance of a conducive monetary policy on economic growth, the question is how the Zimbabwean economy can grow under the current policy environment that is not supportive of bank lending, a key ingredient in spurring economic growth.

In countries with a strong financial and monetary system, economic growth tends to be more rapid (Mckinnon, 1973; Shaw, 1973; Fry, 1988, King and Levine, 1993). The banking system is a world-class industry that performs a critical role in the economy by providing financial resources to both the public and private sectors. However, the industry is facing incapacity because of poor credit facility allocation decisions. This study aims to determine the link between commercial banks' presentation and economic growth in Zimbabwe through their allocative decisions. It also aims to determine the causation and direction of the effect, and the interaction of the factors

with one another. Various points of view have been expressed regarding the causal relationship between the two.

Previous research has found that banks' credit has a negative impact on economic growth because of banking and regulatory changes (Fadare, 2010). There is limited evidence of loan facilities granted to various industries' contributions to economic growth. As a result, there is a pressing need to examine the effects of such allocation decisions on economic performance. The banking sector is the backbone of the economy; however, as previously said, the Zimbabwean banking sector is struggling to leverage the economy. The RBZ has sufficient resources, but foreign currency shortages are becoming more acute. The economy faces unprecedented trade shortfalls, inflation, unemployment, liquidity, and investment problems, among other things, despite the monetary and national policies appearing to be very firm. Capital flight and illogical loan decisions have resulted as a result of this.

Some economies have benefited from the distribution of various forms and types of credit to specific borrowers, industries, and sectors of the economy, while others have suffered. This means that while banks must manage their credit portfolios carefully, sectoral performance should not be overlooked. The study aims to delve deeper into this crucial topic. The researcher used Zimbabwe as a case study to complete the investigation. Since the establishment of a new monetary system in 2009, banks have played a crucial role as the primary loan providers in Zimbabwe. They have dominated the Zimbabwean financial market in terms of loans and financial services. As a result, it is crucial to examine the efficacy or applicability of banks' and regulators' sectoral credit allocation decisions.

Banks in Zimbabwe are constantly adapting to changing domestic and international situations, especially because they have become the primary funding source for all sectors of the economy. Domestically, there has been the extinction of the capital market and a stagnant stock market. In contrast, internationally, due to political and economic perceptions, there has been a significant drop in the flow of cash through foreign investors. Early researchers such as Schumpeter (1911, 1933), Goldsmith (1969), and Kunt and Levine (2001) hypothesised that banking enables technological innovation. The recognised allocative efficiency of savings towards entrepreneurial and productive potential is a factor that stimulates economic growth. It is through the banks' judgments on how to distribute credit in various sectors of the economy, whether directly or indirectly.

According to the classic conception, banks act as financial intermediaries, mobilising or attracting liquid resources from savers and depositors and channelling them through loans for consumption or investment. According to Goldsmith (1969:400), the mobilisation of financial resources, stimulates economic growth. Goldsmith described mobilisation as a means of facilitating the movement of funds from depositors to the best uses, or where funds generate the greatest social return in the economy. Surprisingly, banks might have a negative impact on economic growth. The issuing of sterile credit can be used to stop viable growth. As a result, credit allocation decisions to economic sectors may have a good or negative impact on the economy.

When the banking system directs financial resources towards excessive consumption, a negative effect occurs. Irrational consumer credit means that more money would be chasing existing products and services, increasing aggregate demand and, eventually, price levels. Inflation, on the other hand, is an unfavourable outcome for economic

growth. Similarly, credit allocation may be steered toward speculative tendencies, which may signal sustainable development in the near term, but the market would eventually correct itself. The study examines the influence of financial resources channelled by the banking sector on each avenue. The credit's statistical relationship with economic growth is then determined. Sectoral credit distribution decisions have a long-term impact on economic performance and activity. Bank credit allocation decisions have the potential to impact the economy.

In a dynamic economy, better credit allocation decisions to different sectors, such as agriculture, construction, manufacturing, and services, encourage banks to effectively deploy credit resources with a significant return on GDP (Deloitte, 2015). The allocation of credit to specific industries is thought to be crucial in explaining economic trends. This research is significant in Zimbabwe, where the stock market has not matured sufficiently to absorb the banking system's funding strain.

In recent years, the distribution of bank lending among industries, institutions, enterprises, and sectors has shifted dramatically, prompting emergent finance firms to examine the economic implications of this "debt shift." The notion that various economic sectors exhibit unique dynamics with significant long-term ramifications for the whole economy is the driving force for this research. The study also provides a methodological contribution. The VECM and VAR were employed separately in earlier approaches, but this study examines the influence of the variables in both the short and long term. It also compares the variables' impulse response functions (IRFs) and variance decomposition (VD). Data are being used to assess the impact of debt allocation decisions by sector on the economy.

The banking system allocates money, manages postlending loans, employs corporate control, facilitates risk management, and improves lending principles, among other things, to promote economic progress. The actions of the financial sector are favourably related to long-term economic growth (Beck et al. 2004). Banks are one-of-a-kind enterprises, not just as deposit guarantors but also as loan providers to deficit units. Any economy's economic growth is dependent on the banking industry. In the same vein, banks play a critical role in long-term economic growth since they act as intermediaries. To support much-needed economic revival efforts, banks' lending and investment strategies should be in sync.

Consistent with the preceding discussion, this study aimed to investigate the role played by the banking industry in Zimbabwe's economic growth between 2010 and 2021 by financing various economic sectors. Zimbabwe relies heavily on a bank-based financial system due to the scarcity of foreign direct investments and the weakness of its capital market. As in many developing and emerging economies, the banking sector is regarded as the most important sector of the financial system, playing a vital role in the provision of capital and working capital funds to the economy (Almahadin, H. A., Kaddumi, T., and Qais, A. K., 2020). Consequently, the banking sector is regarded as the most stable subsector of the financial services industry. The financial services sector is regarded as one of the most established and robust industries in Jordan, demonstrating resilience in the face of significant external shocks and retaining its position as the primary driver of economic growth. As a result, the Reserve Bank of Zimbabwe (RBZ) maintains a pro-growth monetary stance, following an increase in commercial bank deposits and profits (RBZ, 2021). In addition, this study was motivated by the absence of empirical research examining the role of the banking

sector in supporting sectoral performance and boosting Zimbabwe's economic growth. There was a presumption that the empirical findings of this study will provide interested parties with informative and useful content for decision-making processes and policy design. Indeed, chapter 5 presents the findings that can inform decision-making on resource allocation.

Many economies have implemented traditional and unconventional credit easing policies to pump liquidity into economic sectors and prevent the economy from collapsing (Bowdler and Radia, 2012). These regulations ensure that the banking system has enough liquidity to make loans and advances to businesses. Nonetheless, the sector's variability tends to result in an uneven credit distribution. Overheating develops in some sectors because of poor sector performance, while others remain stagnant or recover only slowly. Zimbabwe's economy was divided into agriculture, mining, services, persons, construction, financial institutions, distribution, communication, transportation, and manufacturing. The performance of these distinct areas differs from one another. Owing to this performance disparity, this study aimed to determine whether bank credit and economic growth are related. This can be comprehended by examining the roles of the banks in section 1.3.

1.3 The Intermediary role of banks

The economics and finance literature gives support to the view that economies with better financial schemes carry a strong potential for growth than their inefficient counterparts, which bear bank failure risks (Kasekende, 2008). Following a review of the literature, the study suggests that better-performing financial systems make an external financing option easy for sector, industry, and firm expansion. Banks facilitate

the mobilisation of financial resources from surplus units to deficit units. Banks are the link between depositors and borrowers. Mishkin (2007) found that banks efficiently redirect funds from the depositing sectors to the deficit units of the economy. Although they adhere to definite regulations, the financial intermediaries have space to determine the decisions for allocating funds. Gross (2001) highlights that those banks play a significant function in the determination of the investment type, job creation and income distribution, which are all pillars for economic growth.

With the efficient operation of financial institutions, transaction costs are believed to fall. Information about opportunities for investment is more efficiently collected and processed at lower costs (King and Levine, 1993) compared to the traditional platform of the barter system. The coming in of banks brought economies of scale, hence reducing investment costs. As such, inefficient banking institutions push up transaction costs and distort economic growth.

Limited availability of information between the surplus units and deficit units acts as a source of adverse selection and moral hazard. This results in the compromise of a fair market play, causing the market (demand and supply) to operate outside a fair price mechanism. There would be no price equilibrium in the absence of financial intermediaries. Banks can play the role of screening and monitoring potential borrowers in a thrust to minimise risks. Although the risk itself cannot be eliminated, Gross (2001) noted that the banking institution has a capacity to reduce the level of risks by properly determining how and who to allocate capital through information gathering. This implies that banking institutions utilise the imperfect market in determining who and how to allocate funds to. The decision to allocate credit is heavily the responsibility of banks as financial intermediaries.

The key role of banking institutions is intermediation between surplus and deficit sectors. The mobilisation of the financial resources from surplus sectors makes the credit function available, which is crucial for economic growth. As such, it is important to understand in section 1.4 how the banking sector and Zimbabwean economic growth are structured.

1.4 The Banking Sector and Economic Growth in Zimbabwe

The Reserve Bank of Zimbabwe (RBZ) reports that Zimbabwe's banking sector comprised thirteen (13) commercial banks, four (4) building societies and one (1) savings bank in 2016 (RBZ, 2017). It stated that as of 31 December 2016, commercial banks accounted for 82.02 per cent of the total banking sector deposits and 74.18 per cent of the total banking sector loans. This implies that commercial banking is the dominating subsector in the Zimbabwean financial system. Banking realises stability following many efforts by the regulator and government. Additionally, the sector's resilience, despite many economic challenges and growing supervisory oversight, bolsters confidence to support satisfactory economic activity for sustainable economic growth.

Table 1. 1: Architecture of the Banking Sector and Economic Growth (2010–2021)

Type of bank	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21
Commercial banks	15	17	16	15	15	13	13	13	13	13	13	13
Merchant banks	5	4	2	2	-	-	-	-	-	-	-	-

Building Societies	4	4	3	3	4	4	4	5	5	5	5	5
Savings Bank	1	1	1	1	1	1	1	1	1	1	1	1
TOTALS	**25**	**26**	**22**	**21**	**20**	**18**	**18**	**19**	**19**	**19**	**19**	**19**

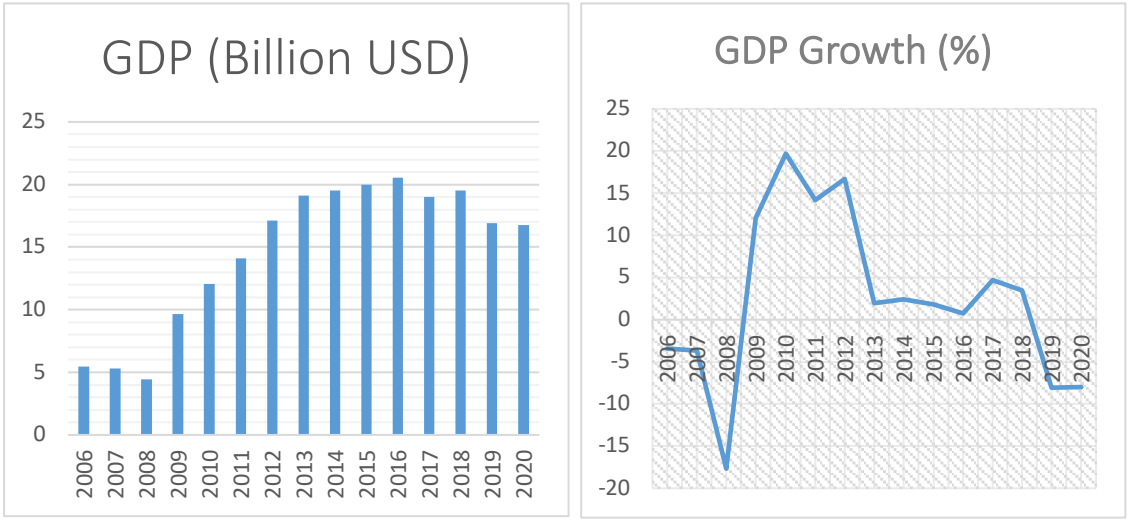
According to RBZ (2017), the banking sector carries a portfolio composed of 13 commercial banks, registered stability, safety, and soundness. The sector's assets stood at $8.3 billion and loan advances amounted to $3.69 billion, while deposits into the banks stood at $6.51 billion (RBZ, 2017). Cracknell (2012) maintained that financial access promotion is a key driver behind the financial sector strengthening and advancing national objectives. Credit growth in the banking sector did not increase much in 2016. Loans and advances in the banking sector slightly improved from $3.65 billion to $3.69 billion as of 30 September 2016 and 31 December 2016, respectively.

Given the sector's crucial role in economic growth, banks have taken measures to attract access to capital and credit through a wide network of branches, agencies, and mobile facilities. Access to financial services increased from 38 per cent in 2011 to 69 per cent in 2014. The increase followed a raft of reforms and initiatives by the government and the RBZ to restore financial stability, restore confidence, strengthen supervision and surveillance, mobilise domestic resources, enhance credit creation and promote financial inclusion.

Zimbabwe is one of the developing and emerging economies distinguished by a number of distinguishing characteristics. Since 2010, the country has operated without a national currency. In its place, the economy adopted a multicurrency system, with

the United States dollar, the South African rand, and the Botswana pula dominating the currency basket. In addition to the aforementioned, the country's economy relies heavily on foreign aid and support, although the flow of aid and support has been diminishing day by day allegedly due to economic and political mismanagement. In addition, policymakers in Zimbabwe have not adopted a good strategy to continuously direct financial resources from unproductive sectors to productive areas to reduce unemployment, increase aggregate demand, enhance investments, and boost GDP over the long term (Awad, Hallam and Alialhuseen, 2017). A summary of the background of the Zimbabwean economy is depicted in the figure below:

Figure 1. 1: Zimbabwe's GDP and GDP growth rate



Source: World Bank Historical data (2021).

In recent years, the average real GDP growth has been below 2 percent, which is insufficient for the Zimbabwean economy to enter a self-growth platform and achieve sustainable development. Zimbabwe, as an exporter of commodities, is hampered by global economic developments, specifically the direction of trade, commodity prices, commodity demand, and the condition of global financial markets.

1.5 Problem Statement

The study investigated the relationship between the credit portfolios of commercial banks and economic growth. In light of this, historical data were used to determine past and present credit allocation trends to determine the significance of sectoral credit allocation in driving economic growth.

In contemporary economic growth studies, the significance of the financial sector in driving growth has garnered particular attention. As highlighted by Edirisuriya (2008), it is expected that the financial sector will promote efficiency in the financial allocation of credit resources (2008). This ensures that financial intermediation is conducted effectively. According to Asamoah (2008), the financial sector attracts competition and promotes savings, resulting in a greater supply of investment funds to stimulate economic growth. Few published studies have examined the relationship between sectoral credit allocationn (SCA) and economic development in developing economies such as Zimbabwe, where dollarization restricts the space for quasi-financial activities. A review of previous works reveals a dearth of information regarding the contribution of each economic sector to national growth in a dollarized economy. This study aimed to fill this gap by analysing the evidence on sectoral credit allocation in Zimbabwe and by examining the dynamic relationship between SCA decisions and economic growth in Zimbabwe. To achieve the macroeconomic goal of economic expansion, RBZ encourages banks to invest their deposits in the country's diverse sectors.

The research aimed to answer the following questions: Does a correlation exist between the volume of bank loans to various economic sectors and economic expansion? What, if any, significance does the relationship have? Answering these

questions would shed light on the empirical relationship between sectoral bank loans and economic growth. These findings contribute to the policy framework of the government and the RBZ to promote investment, sectoral productivity, and economic growth in general.

1.6 Research Objectives

As previously highlighted in the introductory section, banks play a crucial function in the intermediation and funding of the economic sectors. The question to be answered is “Is the sectoral allocation of credit relevant in explaining economic growth” based on the available theoretical framework and practical evidence. The question focuses on finding answers to whether the banking sector be used to explain economic growth in the context of Zimbabwe. Research objectives are categorised into one main objective and secondary objectives as follows.

1.6.1 Primary Objective

The main objective of the study is to investigate the interaction between sectoral credit allocation made by commercial banks and economic growth (GDP) in Zimbabwe.

1.6.2 Secondary Objectives

In a bid to achieve the above primary objective, the research also seeks to:

1. Examine whether it is possible to use bank lending (sectoral allocation) as a means to explain economic growth in Zimbabwe.
2. Scrutinise the causal rapport between sectoral credit and economic growth in Zimbabwe, both in the long and short run.

3. Examine the interactive relationships among the variables used in this research.
4. Determine policy recommendations in line with the findings.

1.7 Research Questions

To answer the above objectives, the following questions are highlighted below.

1. Is there an affiliation between economic growth and sectoral loan allocations in Zimbabwe?
2. What is the causal relationship between economic growth and sectoral bank allocations in Zimbabwe, both in the short and long run?
3. Is there any interactive relationship between the variables used in sectoral credit and economic growth in Zimbabwe?
4. What policy recommendations can be deduced following the findings?

1.8 The study hypotheses

The formulated hypotheses guide the research objectives.

1.8.1 Hypothesis 1

H_0: There is no substantial interaction between credit to sectors and economic growth in Zimbabwe.

H_1: There exists a substantial association between credit to sectors and economic growth in Zimbabwe.

1.8.1 Hypothesis 2

H_0: There is an insignificant causal link between sectoral credit and real GDP.

H_1: There is a significant causal link between sectoral credit and real GDP.

1.9 Delimitations

The major constraints that limit the smooth conduct of this study include the following:

- The sample period would be minimal, although it covered a five-year period specified by Basel II.
- Banks have a high confidentiality policy as a sectoral culture and oath of secrecy. Therefore, access to privileged and sensitive information for the study might be difficult and limited, except for financial information approved for public disclosure.
- Banks in this research have different financial year ends; therefore, additional data from the RBZ would be used for its annual compilation regardless of the specific banks' trading year.

1.10 Definition of terms

Essang and Olajide (1974) define a commercial bank as a financial institution run or operated by either or both the private institutions and the government to make a profit. A loan and advance (credit) is an inscribed or oral contract for a provisional transfer of a property (Dhikhary, 2006). This is frequently cash or its equivalent, from the lender to the recipient who promises to repay it according to arranged terms (Dhikhary, 2006). The handover of the asset is in the background of a direct connection between a debtor

and lender. In this contract, some part of the principal is repayable after a stated period. It is the amount extended out with a future date of repayment (Aryeetey, 1996)

Economic growth is the continuous expansion in the aptitude to fulfil the demand for commodities ensuing from rising production scale and increasing throughput (United Kingdom Department for Business, Innovation, and Skills, 2011). It is an upsurge in a nation's total wealth.

Sectoral credit allocation is a discipline of allotting and distributing available, scarce credit resources to compete for alternative economic sectors to satisfy unlimited sectoral funding requirements. Therefore, credit allocation is regarded as efficient if the economy has achieved greater returns. Sound credit allocation by the commercial bank must be overemphasised. It is a major contributor to sustainable development, particularly in the absence of an active capital market. Credit distribution involves deciding on the distribution of scarce capital/financial inputs among competing areas of the economy.

1.11 Scope of the study

The study focuses on commercial banks, which account for 72 per cent of Zimbabwe's banking sector. Commercial banks provide loanable funds to all major economic sectors, and their nationwide branch network allows a broad perspective within the scope of the study. The study focuses on the period 2010-2021, during which the RBZ launched Vision 2020 to stabilise the financial sector and promote financial inclusion, a function dominated by commercial banks. The study period 2010–2021 was chosen because hyperinflation was tamed and the financial sector experienced few policy changes following the Vision 2020 policy. The strategy aims to integrate all economic

agents and sectors on a level playing field and to treat them equally. Validating their similarity in terms of economic development is essential. In addition, there is a devolution policy designed to promote investment and productivity at the local level.

1.12 Motivation for the study

The motivation for this research can be divided into economic and academic as follows.

i) National or Economic

By 2030, the nation's economic status will be that of a second-rate nation. Despite the above notion, Zimbabwe is one of the least developed economies. As a result, examining the contribution of the banking sector to the driving force of economic growth becomes more crucial. The location of banks in Zimbabwe makes them better positioned to facilitate economic growth.

It is also worth noting that globally, there has been growing interest in examining credit and its capacity to generate growth. These studies have concurred that external financing has grown firms more than those relying on internal financing only. The efficient allocation of credit has been identified as a key financial intermediation duty by recent studies by Beck, Cull and Jerome (2005), Boyreau-Debray (2003) and Levine (2002). In their findings, credit to the public sector was less powerful in contributing to growth due to wastages and politically driven projects, which may possess less competitive results. They highlighted that growth is only achieved if the credit resources are efficiently channelled. Based on these findings, it is crucial to examine whether this holds for Zimbabwe.

ii) Academic Motivation

The primary motivation behind this study is that through the review of past works, there is reasonable evidence of limited research conducted to examine the relationship between SCA and economic growth in a dollarised monetary system. It is necessary to know if a dollarised monetary regime would bring positives to the economy compared to the local currency.

Additionally, the researcher in this study has selected RBZ as the data source because it acts as the architecture, implementer and supervisor of the monetary operations in compliance with the national objectives as jointly established in the counterparty fiscal policy. The drive for economic growth is tailored by both the monetary and fiscal authorities; hence, the selection of RBZ is a key data source in the discussion of this thesis. Regarding selecting the RBZ as the primary data source, the key reasoning behind this selection is the availability of the time series data, which might not be easily accessible from individual banks.

Third, the selection of the commercial banks as the foundation (proxy) of this discussion is that they constitute 70 per cent of the bankable funds and serve a variety of sectors. This is the case because the savings bank, building societies and even merchant banks have a selective allocation of funds. The latter banks are specialised banks; hence, the analysis tends to be biased if they act as data sources. Commercial bank facilities represent all sectors of the economy. Additionally, commercial bank portfolios include borrowers that comprise individuals, small enterprises, and corporate entities and hence suitably represent the Zimbabwean banking sector.

Moreover, commercial banks are scattered conveniently across the country for the convenience of borrowers and depositors.

1.13 Assumptions

1. Published financials are accurate and authentic, and the researcher bases on auditors' opinions and relies upon them.
2. The multiple regression model and the data analysis software were assumed to be adequate for the study. They can capture the relationship and causality between the dependent and explanatory variables under study.
3. The factors contributing to sector determination are only micro, while macro factors are assumed to be constant, as the entire economy faces the same macro environment.
4. The Indigenisation Act is not tailored towards specific sectors but applies to all sectors of the economy; hence, there is no bias in the results of the findings.

1.14 The potential value of the study

A successful result of this enquiry helps policy makers, the Reserve Bank of Zimbabwe (RBZ), the government and the management of the banking sector tailor policies for the banking sector. These policies would encourage banks to extend credits to the priority economic sectors. They would also re-examine the delimitation of preferred sectors to ensure more credit allocation to the sectors with higher contributions to economic growth. This study provides insight into exploring the possibility of reducing or increasing the concentration limits of banks for loans in specific sectors as guided by their impact. This would incentivize banks to allocate credit to more productive sectors, reducing credit misallocation.

Additionally, to the best of the researcher's awareness, there is scant practical literature on the bearing of sectoral credit allocation by banks on economic growth in the Zimbabwean context. The findings of this study are expected to support the government in identifying sectors worth funding by monetary policy and sectors worth funding by fiscal policy to realise its government objectives. Finally, the study's prospects to realise the relationship and causality between the variables render it of significant value.

Empirical confirmation of the interaction of sectoral credit allocation decisions on economic growth has been documented in the literature. Nevertheless, the Zimbabwean context is not covered by the literature. For instance, Bigstern et al. (2000), Obamuyi, Edun and Kayode (2010), and Balago (2014) examined the influence of bank credit on economic growth, yet the SADC region has not been included. Additionally, consensus is lacking from previous studies on which sectors spearhead economic growth, regardless of whether credit has been channelled towards productive sectors. Therefore, this study need to explore the Zimbabwean context for country-specific policies and strategies to be formulated.

The study also confirms existing works by converging the relationship between finance in the form of credit and economic growth at the sectoral level. This contribution is a departure from earlier studies that concentrated on bank credit (macroeconomic level and others on a cross-country level). Using country-specific data, the study examined the statistical relationship, causal relationship and cointegration relationship between sectoral credit and economic growth.

In the literature, several inconclusive findings exist regarding the connection between sectoral credit allocation and economic growth. As a result, the Zimbabwean context cannot be deducted from previous studies. Some authors argue that credit influences economic growth, with others possessing an opposite viewpoint. To fill this gap, this study also envisages the Zimbabwean context on the map. The study applied the ordinary least squares (OLS) multiple regression approach to confirm the impact of sectoral credit allocation decisions on economic performance from an analysis of secondary data.

1.15 Chapter Summary

This introduction provides a summary of the research study. It emphasises the introduction of the thesis, the study's context, the problem statement, the objectives of the study, and the research questions designed to address the objectives. This chapter also describes the significance of the study, its scope, limitations, terminology definitions, and underlying assumptions. The following is how the study will be planned in the subsequent section. In Chapter 2, a theoretical and empirical literature review of previous works is presented. The focus of Chapter 3 is the research methodology.

1.16 Structure of the thesis

There are six chapters in the thesis. Immediately following this introductory chapter is Chapter 2, which reviews prior literature, both theoretically and empirically, regarding the long- and short-run relationship between bank lending decisions and economic development. Chapter 3 elaborates on the research objectives, while Chapter 4 presents and discusses the economic and statistical methods utilised in this thesis. The methodologies include Augmented Dickey-Fuller (ADF), Phillip Peron (PP),

Engle-Granger, and the cointegration tests of Johansen. In addition, this chapter provides a comprehensive explanation of the estimation of Granger causality under the vector error correction model (VECM) and the vector auto regression model (VAR) when cointegrated variables are present.

Chapter 5 discusses the empirical findings, the analysis of time series data, descriptive statistics, descriptive statistics of loanable funds, economic growth, and the determination of the VAR's optimal lag lengths. In addition, the chapter provides the results of the PP and ADF tests for each variable, as well as the short-run Engle-Granger and Johansen cointegration causality relationship and long-run causality tests. Chapter 6 concludes the thesis by discussing the conclusions, policy implications, recommendations, and areas for future research.

2 CHAPTER TWO: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the relevant literature. It seeks to develop a better understanding and insight into the relevant contexts and previous studies related to this study's focus. Therefore, it assists in identifying the research gap that this study seeks to fill. This section stresses the theoretical and empirical literature in line with the study. The connection between monetary policy and economic growth will open the discussion.

Moreover, this chapter also discusses the concept of commercial bank loans and sectoral allocation. It also explores the literature on the delimitation of credit allocation and misallocation. Such discussion will shed light on a connection between credit portfolios (SCAs) and economic growth. Evidence of disassociation between credit and economic growth before exploring evidence from previous methodologies will equally be discussed in this section of the thesis.

2.2 Theoretical literature

It is overbearing to realise that for many years academics have frequently had contrasting opinions regarding the functionality of banks in enhancing economic development purposes. In this respect, others believe and acknowledge the vital role played by banks in driving the economy. However, there is still another section that takes bank credit extension as an overstressed factor of growth. From the latter's viewpoint, it is clear that finance is preceded by economic development. This section

highlights and discusses the developmental theories of economic development in tandem with financial growth philosophy over the years.

2.2.1 Economic growth

Economic growth is the exponential rise in real GDP per capita over a given period. Thus, a gradual increase over years of productivity can transform developing economies into developed ones. This growth rate can be calculated using the following formula.

$$Real\ GDP\ Growth\ Rate_t = \left(\frac{Real\ GDP_t - Real\ GDP_{t-1}}{Real\ GDP_t}\right) * 100$$

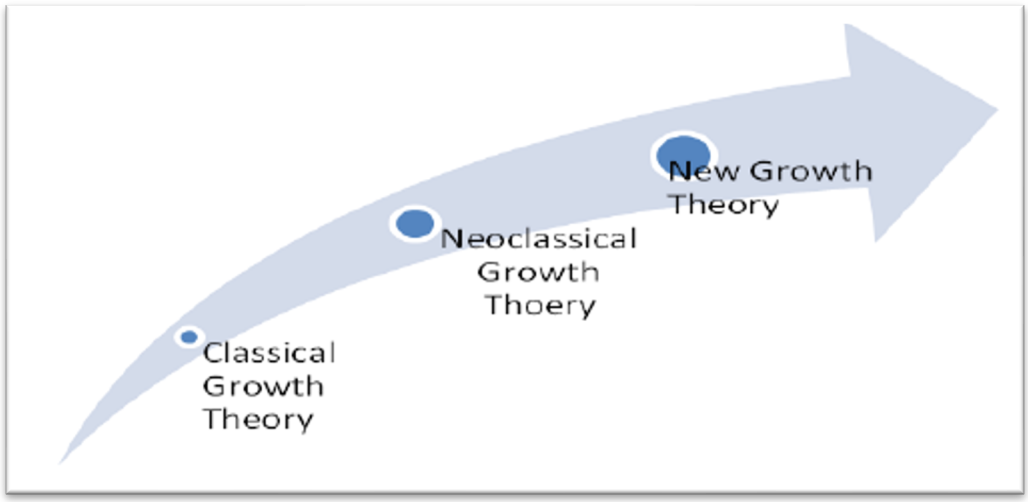
Real growth explains how quickly the national economy is escalating. Most nations use this measure to explain the economic powers' potential variations. However, this measure does not tell us about the differences in people's living standards.

Fig 2.1 displays the alternative theories describing economic growth. However, no theory provides a comprehensive answer to elementary questions hereafter: "Why do growth rates vary? What causes economic growth? Why are developing countries poor? What policies can stimulate developing countries to grow? How Zimbabwe's progress rate is sensitive to shocks and government policies?" Economists, however, can find a way to provide satisfying answers to these questions. These economic theories regarding growth are an overtime development, with each theory building upon the previous ones, accounting for both strengths and weaknesses (Parkin, 2012).

The real GDP communicates the pace and speed at which the absolute economy expands. The measure, widely used in many economies, is valuable in explaining the possible adjustments in the equilibrium of economic influence among economies. In contrast, it leaves out fluctuations in the living standards of citizens.

Different economic theories concerning growth, as displayed below, outline varying economic growth perceptions. However, none of these theories comprehensively answers the questions, "what causes economic development? why do growth rates vary? why are other economies poor? what policies can boost these economies to grow?. Economists, however, can find a way to provide satisfying answers to these questions. These economic theories regarding growth are an overtime development, with each theory building upon the previous ones, accounting for both strengths and weaknesses (Parkin, 2012).

Figure 2. 1: Economic Growth Theories



2.2.1.1 Walter Bagehot

The role of finance in economic development is credited to Walter Bagehot's (1873) essay "Lombard Street: An explanation of the money market" in finance and economics. Bagehot (1873) contends that if English traders use a larger proportion of borrowed funds, they could sell their goods at extremely lower prices than a dealer using his own capital and still make higher profits after paying off their loans. In the face of competition, these traders can lower their prices even further, forego a smaller return, and push out the old-fashioned agents who traded the market using paper contracts. Bagehot concludes that traditional “growth in finance, such as the joint-stock company and inadequate liability, permitted the industrial uprising in Britain by enabling the disposition of capital for large-scale investments” (Driffill, 2003:368).

2.2.1.2 Classical growth theory

Adam Smith, Rev Thomas Robert Malthus, and David Ricardo contributed to classical growth theory in the late eighteenth and early nineteenth centuries. The classical growth theory is alternatively called the Malthusian theory; it highlights that national savings and capital-output stimulate the rate at which an economy grows. As such, an increase in the propensity to save is a firm foundation leading to economic growth. In the same manner, the theory explains that financial intermediaries in their project evaluation, advisory services, risk management, savings mobilisation, and transport facilitation promote innovativeness and technological development, which in turn raise the economic production rate.

2.2.1.3 Neoclassical growth theory

Neoclassical theory stipulates that labour, technology, and capital are key driving forces that enhance productivity. This also leads to the improvement of economic power and raising the living standards of citizens. The focus of this theory is to support a balance (equilibrium) among the factors of production. When capital is increased, labour and technology need to be adjusted to the level of capital injection. This theory is a theory of numbers to maintain equilibrium given any adjustment (increase or decrease) in the driving forces.

The work of Solow (1956) and Swan (1956), which is a postponement of the Harrod-Domar classical introduced in 1946, is the foundation of neo-classical growth theory. According to Solow (1956), economic growth is the result of the interaction among factors of production. The theory states that a conditional equilibrium can be attained in the economy by altering the mix of labor, capital, and expertise, ignoring any specific role that finance may play in economic growth. Solow (1956) contended that economic growth is independent of the rate of saving and investment in the economy and that capital investments resulting from increased savings only lead to transitory growth since capital in a closed system with a fixed supply of labor is subject to flagging returns. Solow (1956) advocated for sophisticated technological expansion and innovation for sustainable economic development to be achieved.

2.2.1.4 Endogenous Growth Model

The endogenous growth model includes a body of work that criticises the neo-classical growth model. This implies that endogenous factors, rather than external pressures, influence economic growth. In this sense, the theory contains two parts: one that views

investments in research and development to be meaningfully determined by economic growth and the other that focuses on externalities and positive spill-over effects, which are important to economic growth. The importance of financial intermediation in creating economic growth is central to this idea. Levine (1997) noted the importance of the financial sector in impacting economic growth in the endogenous growth model. Smith (1991) noted that liquidity risk should be effectively managed to smoothen financial intermediation. In addition, Saint-Paul (1992) presented a similar review showing that an efficient stock market fosters economic growth. Levine (1997) reinforced Saint-Paul's (1992) argument by emphasising the roles played by stock markets in generating income.

2.2.1.5 Financial Repression Hypothesis

The debate on financial repression was pronounced by the work of McKinnon (1973) and Shaw (1976). Financial institutions play a pivotal role in promoting economic growth. However, the nature of services provided by financial institutions may hinder economic growth. An efficient financial system leads to the efficient allocation of capital and hence promotes economic growth (McKinnon, 1973; Shaw, 1976). According to McKinnon (1973) and Shaw (1976), government interventions may suppress competition in the financial sector, thereby leading to poor economic growth and lower levels of savings and investments.

2.2.1.6 New growth theory

According to Romer (1990), the real GDP is affected by peoples' choices and preferences, which stimulates what to produce in an economy. Production is tailored according to what people want in pursuit of profit. Such knowledge is based on the

founding ideas of Schumpeter in the 1930s and 1940s. This is a profit-oriented theory, that is, national production is remote controlled by the choices and preferences of customers.

2.3 The more relevant theory

Neither of the above theories gives us a definite answer. However, each theory holds something of importance. Classical theory teaches us that physical resources are scarce and static. In this regard, it is difficult to expand growth without technology except to accumulate more physical resources. The neoclassical growth theory introduces technology to work on classical physical resources. With advances in technology and human capital accumulation, GDP can be boosted, hence improving citizenry welfare. The new growth theory centres on the swift innovativeness of human resources to meet the choices and preferences of the market (Parkin, 2012).

2.3.1 Schumpeter's View

The first stated remark on how financial transactions play a fundamental role in economic growth was made by Joseph Schumpeter. He said this: "*The banker stands between people who want to make new combinations and those who have productive means. He is a phenomenon of development, but only when the social process is not directed by a central authority. He makes it feasible to carry out new combinations by authorising people to establish them in the name of the community. He is the trade economy's ephod*." (Schumpeter, 1934:74)

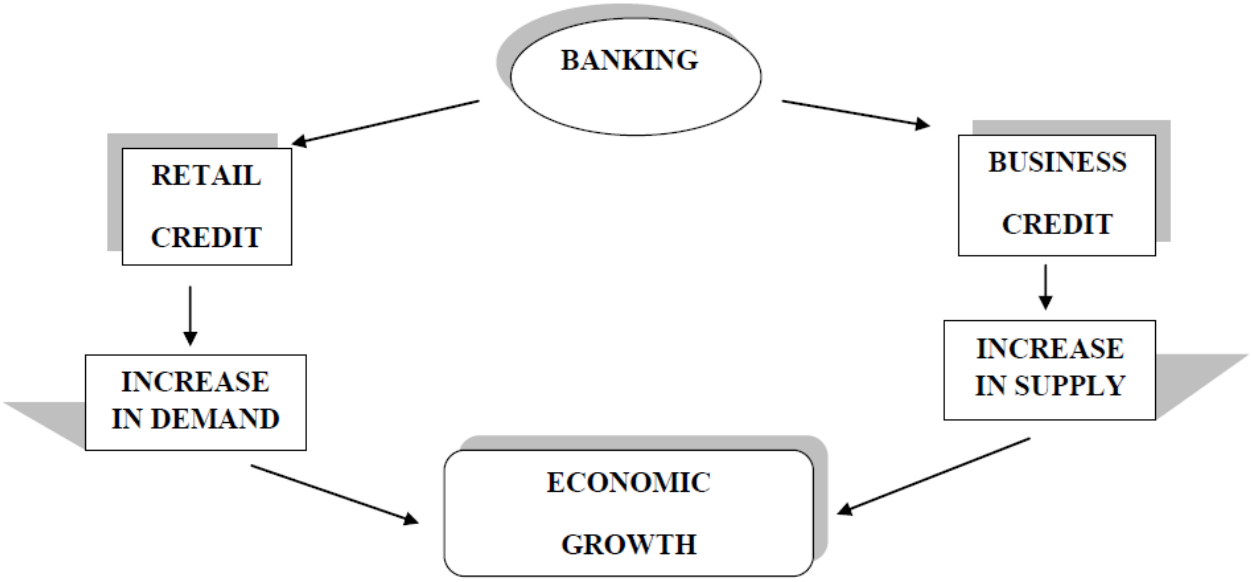
Only in the last decade has Schumpeter's view about the nexus between banking (and finance) and economic development (and growth) been taken seriously. Below, the

study reviews some of the recent pieces of the literature. Schumpeter sharpened his view in later writing. While discussing business cycles, he wrote, "The relation between credit creation by banks and innovation is fundamental to the understanding of the capitalist engine" (Schumpeter, 1939:78).

Economic growth, measured by GDP in this thesis, can simply be defined by a surge in a country's output. It is beneficial to have a growing economy. Even banks benefit from the growing economy in many facets, including improvement in capital investment, investor confidence, greater business increase, increase in employment and environmental outcome. Consequently, banks can translate these benefits through an increase in bank lending.

Financial institutions channel savings from surplus agents to deficit units. Their role fosters investment activities. The function of financial markets can boost economic development by channelling financial resources in their most productive and efficient ways. Loanable funds can be channelled out retail credit and business credit. Retail credit mainly speerts increased demand, while business facilities are set to effect an increase in supply, as summarised in Figure 2.2 below. More recently, Arcand, Berkes, and Panizza (2012) noted that bank finance promotes growth. The author pointed out that growth is promoted where credit to private sector entities is below 100 percent; furthermore, finance curtails growth.

Figure 2. 2: Relationship between banking and economic growth



Source: Author's computation.

According to Schumpeter (1934), the economic progression would be crippled unless the proper number of financial resources in the form of asset capital and loans and advances were provided by the banks. Schumpeter (1934) viewed the banking sector as a source of capital, which is in turn used to generate income and, hence, economic growth. However, Schumpeter's view remained silent on the size of credit facilities that manage economic growth. Most central banks, analysts and policymakers believe that growth in credit facilities stimulates the growth of the national economy. This view matches public sentiments.

According to Parkin (2012), a determination of what amount of loanable amount is sufficient to drive effective economic progress must be made. The question is whether bank lending has an impact on GDP and whether this is determined by the credit

facility type (consumption or productivity) and the targeted economic sectors. Parking (2012) highlighted that capital and credit resources channelled toward productive and investment sectors contribute a larger impact on GDP.

2.3.2 The Solow Growth Model

The growth theory presented by Solow agrees with the neoclassical theory viewpoint. The assertion is that for an economy to realise equilibrium, there is a need for a natural adjustment of the factors of production by the economy. Harrod-Domar's growth model was the widely used model before Solow's model. Harrod-Domar's model places more focus on the negative effects of the coexistence of growth and a rise in unemployment.

The assumption of the model is the production of a single good Y_t by means of capital, $K_{t,\ and}$ labour force, $L_{t.}$ However, the effectiveness of these factors of production is dependent on the level of advancement the economy has in technology, $A_{t.}$ This is explained by the production function hereafter:

$$Y_t = f(K_t, A_t, L_t)$$

Solow's growth model aims to show the diverse patterns of increase in capital stock, labour force and how they interact with technology advancement. As a result, the model seeks to bring together the net effect of how the factors of production cause national output in terms of goods and services.

2.4 Financial Sector Growth and Economic Development

In development economics, the association between banking sector operations and economic growth is researched extensively. Scholars have explored the effects of the

banking sector on domestic savings, capital accumulation and credit distribution in relation to economic development. Additionally, testing this relationship empirically and classifying directions of the causality and their comparative significance, both at the sector level, country-specific or cross-country level, is vital.

Financial markets channel savings to deficit units from surplus units to facilitate investment activities. The promotion of economic growth after the mobilisation of financial resources and allocation to various sectors remains an inconclusive relationship. In contrast, the role of the banking system and the development of the economy have been approached varyingly. Dȧwson (2008) regards financial development as a cause of economic development. Other scholars identify economic growth's leading role in financial development as economic growth leading to financial development (Odhiambo, 2010; Blanco, 2009). Another class of scholars, such as Khan (2001), believe in the complementarity and bidirectional role of the two. They assert the existence of a balanced association between economic growth and financial development. However, Kar, Nȧzhoglu ȧnd Agir (2011) identified no causal association between financial growth and economic development. They view that neither economic development nor financial development has an economic effect proceeding the other.

The contemporary literature advocates the rise of unanimity on the vital prominence of banking sector growth in facilitating sustainable development (Levine, 2004). In facilitating growth, reducing information, administration and transaction costs are the most important roles of the banking sector in developing economies. On this notion, Levine (2004) identified the key functions performed by the financial sector in promoting economic growth:

• *Mobilisation and pooling of savings*. Economies that support financial institutions in pooling the savings of individuals and corporates effectively promote economic growth by expanding the savings pool from diverse individual depositors and financing a differentiated portfolio to overcoming investment indivisibilities. Mobilising savings creates a platform for credit resource allocation decisions. Savings mobilisation agglomerates capital from diverse savers to facilitate a reallocation of investment capital.

• *Production of information and allocation of capital to feasible investment destinations*. Investors encounter difficulties in accessing the information on economic agencies, which makes the best use of their financial resources in a productive manner. For financial intermediaries, their specialisation acumen enables them to manage to allocate resources productively and efficiently for sustainable growth.

• *Monitoring investments and advising on corporate governance*. Postlending loan management involves the effective monitoring and influence of firms (borrowers) on the best use of financial assets and improves firm and shareholder value maximisation. This after-service function has important implications for deposit mobilisation, credit distribution decisions and their ultimate utilisation. Emerging opinions believe that monitoring and disciplining by financial institutions are effective corporate governance pillars. Banks support the sustainability of economic development by addressing the moral hazard problem. Monitoring increases project productivity by ensuring that entrepreneurs remain focused on their project success (Morales, 2003). Blackburn (2005) demonstrated how effective monitoring absence by financial intermediaries results in the loss of depositors' resources, thereby straining the growth prospects of the economy.

• *Facilitates trading, diversification, and risk management*. The financial and banking systems, in particular, aid in alleviating the menaces accompanying individual sectors, projects, enterprises and businesses in an economy or region. The ability of financial institutions to provide safety nets through economic diversification fosters sound allocation of credit resources. It also promotes more savings and increases economic growth. Additionally, the ability to hold a diversified but competing portfolio stimulates investment In growth-enhancing innovative activities.

• *Promoting the trade of goods and services*. A commercial bank system facilitates trading. Therefore, businesses in an economy are enhanced by an active and vibrant financial system. The system provides mechanisms that facilitate payment processing and lowering information and transaction costs. Therefore, the financial system promotes specialisation, technological innovativeness, and economic growth by facilitating trading among economic agents.

During a study re-examining causal and cointegration relationships from 1960 to 2005, Esso (2010) identified mixed results. The study focused on the Economic Community of West African States (ECOWAS) between financial deepening (share of private credit to GDP) and economic growth. Esso demonstrated that there is a long-run relationship between financial development and economic development. Nevertheless, the relationship had a different direction of causality from the findings. The results found in Mali and Ghana showed that economic growth in these countries is stimulated by the effects of financial development. In economies such as Burkina Faso Sierra Leone and Ivory Coast, economic growth improves the performance of financial institutions. However, in Liberia and Cape Verde, causality was found to be

bidirectional (Esso, 2010). As such, Ghana, Cape Verde, and Mali's policymakers were left with the responsibility of financial reforms to grow their economies.

Cote d'Ivoirę, Burkinȧ Faso end Sięrra Leone were encouraged to focus on economic growth. The countries are at the same stage. This disqualified the view of the development stage as a determinant of the causal relationship between financial developments. Nevertheless, an inconsistent causality direction is evident in the relationship. The studies used the private credit to GDP variable as a proxy of financial development. However, it might have limited the probabilities of illuminating new connections between capital and development in these economies.

Additionally, the countries have heterogeneous policies, regulations, customs, personalities, financial systems, investment attitudes of investors and variations in the influence of powerful offices. As a result, concluding country-specific concerns from a cross-country approach would be irrational (Favara, 2003; Ram, 1999). It then becomes difficult to use panel and cross-country regressions and effectively draw conclusions for policy development. Therefore, time series is a more appropriate approach to a particular country such as Zimbabwe.

The selected literature shows a strong connection between capital allocation and economic growth. Financial development and capital allocation have predictive powers for future growth. This causation stems from development capital to economic growth. The vast literature connecting financial expansion and economic growth exists (Elijah and Hamza, 2019). However, studies that ascertain the role of sectoral credit allocation in financial services on economic development are scarce. Several authors

have focused more on total bank credit as a percentage of total deposits and linked it to economic growth.

Nevertheless, an in-depth examination of the performance of every beneficiary sector of bank credit is crucial. As a result, encouragement of bank credit should be ascertained (Caporalea *et al.,* 2016). If so, identifying sectors to lubricate and foster economic growth would also be important. Studies examining the impact of financial resource allocation to key sectors of the economy and how they affect economic growth have remained limited. Therefore, examining bank credit to key sectors helps determine the necessity of bank credit in sustaining the economy and if other factors should be prioritised ahead of bank credit. Financial development is not a spontaneous means to stimulate an increase in a country's net worth (Nwaru and Okorontah, 2014). The destination of allocated funds could be a hindrance to economic development. An economy can have a well-established financial system but suffer from inefficiency in credit allocation, and poor monitoring acumen makes bank credit ineffective and unproductive to the general economy. The following section reviews these shortcomings.

Financial development underwrites a parameter that is too common and cannot provide deeper insight into the value of credit to the nationwide growth of a country. It needs to be narrowed down to a specific financial market or sector concerned to generate better policies going forward. The impact of SCA on GDP is consistent with the agreed norm and logic.

2.5 The Relationship between Economic Growth and Financial Development

This research is based on the fundamental linkage between economic development and appropriate financial development. Various authors have rightfully established this linkage (Schumpeter, 1912; Mckinnon, 1973; Pagano, 1993). These authors identified an encouraging effect of monetary intermediation on economic growth. The interceptions experienced by the banking sector in many economies are not a mere coincidence; they are a positive objective for national development. Major interceptions by regulators, fiscal authorities, and any progressive stakeholders in realigning the operations of financial institutions have motives. To attain feasible financial market stability, economic development and growth of the economy are more important.

The banking sector plays a fundamental function in driving the direction and speed at which the economy grows. As a result, the sector is viewed narrowly as a mechanism that creates liquidity, profitability, and investment among competing economic sectors (Durusu-ciftci *et al.,* 2017). Jhingan (2004) noted a feasible banking system to be the implicit secret to resource distribution between diverse portfolio assets with a sound balance between profitability and liquidity. This vigilance promotes confidence and safety of depositors' funds, firmness of the financial system and efficient expansion of the deposit mobilisation acumen, propelling credit expansion.

The Zimbabwean banking reforms and interventions were meant to attain the macroeconomic objectives of poverty reduction, price stability, managing the unemployment rate and external balances and achieving high economic growth. However, there have been recent reforms that involve interest rate cuts, banking

relicensing and bank licence cancellations (for failed banks), formation of deposit insurance, asset management of nonperforming loans, and raising of minimum capital required thresholds. These recent reforms strengthen financial intermediation, foster depositor confidence in the banking system, and promote industrialisation, job creation, financial stability, and national progress. The interventions came in the 2004 bank crisis, which saw various banks facing closure following bankruptcy stimulated by nonperforming loans, poor corporate governance, insider loans, and concentration lending. The bank crisis had a net effect on the economy's direction. The backdrop of corrections of the operational weakness is centred on the provisions of affordable credit to activity sectors and small and medium business accommodation (Anyanwa, 2010). The latter is stimulated by the speed of the emergence of small and medium businesses in various developing economies. Financial intermediaries seek to balance efficiency and an acceptable risk transformation (Ahmed and Wahid, 2011).

With the advent of modern technologies and innovations in financial modelling, finance has become an enormously essential component in explaining the growth speed and direction of an economy. Policymakers are daunted with the question of how to structure an economy towards growth gear. The 2060 agenda focuses on an objective towards a sustainable financial sector through reforms. These reforms are meant to cut transaction costs, reduce information asymmetry, increase resource mobilisation, open potential business opportunities, enhance corporate governance, and facilitate trading, efficient resource allocation and management of risk (Levine, 1993). A stable and strong financial sector is characterised by quality financial decisions that support national capital accumulation through a better distribution of financial resources (Alliance for a Green Revolution in Africa, 2017). Using recent data, this thesis

attempts to ascertain the strength of the role of credit distribution to respective sectors as an indicator in explaining economic growth. Attention is also given to the area of causality; *is it credit to sectors that drive the economy, or is resource allocation triggered by economic growth?* Before the effect and direction can be detected, this section summarises previous contributions on the relationship between economic growth and financial intermediation.

The financial sector inevitably influences the distribution of resources across sectors, space, firms, and time. Therefore, the actions of banks undoubtedly alter credit allocation. Similarly, decisions that make depositors and investors more confident in the safety of their funds influence how they allocate their monies. Thus, it is imperative to discuss the influence of the decisions to allocate credit on savings mobilisation, investment, and growth. In light of the host functions of the banking sector, a significant difference exists in the allocation volumes of credit across sectors of the economy. Therefore, it is crucial to determine the influence this has and identify the role of credit in explaining economic growth. Jorgenson (2005) argues against the assertion that capital accumulation is the major driver of the economy. This conclusion makes it crucial to identify how each unique decision fosters productivity growth.

In pursuing the finance-growth connection, however, the effects of credit allocation decisions might be twofoldfold. That is, the financial decision to improve credit allocation for a transformed economy may lower the risk yet also lower the savings rate (Oliynyk-Dunn, 2017). The impeding frictions across sectors and markets are influenced by numerous factors. According to the Growth Research Programme (2015), the factors that lead to low productivity and returns include laws, regulations, climate, politics and social influences and policies applicable across sectors and the

economy at large. These factors affect the welfare of the economy and the allocation of resources differently.

The allocation of capital by financial intermediaries is determined by their ability to collect, process, assess and disseminate information on investments. Savers have limited access to information about investable opportunities; therefore, they trust bankers to make better decisions in distributing credit to profitable destinations. Thus, several theorists presuppose capital flows to higher-value projects. However, this is so only when intermediaries have sufficient information and can exercise their autonomy on the beneficial sectors and firms regarding market conditions under which trade occurs (Bagehot 1873: 53]. Upholding this function, banks are well positioned to improve resource allocation, as they can cut costs on information acquisition and processing. Where imperfect information about sectors is available, however, suboptimal allocations of financial resources emerge. Potential implications for the short- and long-term growth paths of the economy would emerge.

Additionally, the financial system as a vehicle to drive the economy, must understand the corporate governance of its borrowers. The degree of monitoring borrowers' use of the capital allocated to them has an implication on the deposit mobilisation and allocation decision. Therefore, banks can improve allocative efficiency and encourage savers to be more willing to fund the economy. In turn, the poor understanding of corporate governance or lack of thereof impedes capital from flowing to projects of highest value use. As suggested by Stiglitz and Weiss (1983), the corporate governance mechanism has dire ramifications for the general economy. The existence of entities of influence has shaped the political, economic, and social standing of the banking sector. Therefore, the influence altered public policies and decisions (Morck,

Wolfenzon and Yeung (2005)). Corporate decisions and social and national policies are distorted. As a result, the implication can reduce innovativeness, promote rent-seeking, and sadly hinder national development.

It is pragmatic to broadly employ active strategies that enhance the performance of credit portfolios by opportunistically shifting the asset mix directly in response to the volatility trends on the return and risk. These insights can be effectively exploited to modify standing fiscal and monetary policies. The prescriptions of these insights ascertain that investors should inject their financial resources into assets of high expected returns and withdraw allocations tailored to slow-growing destinations. This can generate economic significance. This typically focuses on allocating resources between two asset classes of different performance.

The investment management process has been determined by the efficiency in asset allocation as modern portfolio theory explains. Initial credit allocation decisions attribute significantly to the overall performance of portfolios held by commercial banks. The strategic distribution of credit resources among competing sectors involves choosing a portfolio allocation promising and consistent with the national economy's objectives and constraints. Stiglitz (1985) highlighted the inherent free-rider problem that atomistic markets hold. Well-developed banking systems instantly disclose necessary information to investors and dissuade them from unproductive projects for market development.

Regarding investment decisions, banks can adopt their core activities without disclosing their decisions to the public market. Regardless of the nondisclosure, they make incentives to study the market, firms, and sectors with positive connotations on

growth, fostered by resource allocation decisions (Rajan and Zingales, 1999). Thus, such banks are more effective than atomistic markets in driving the economy to achieve national objectives. The proponents of the bank-based system argue that market-based systems have information acquisition shortcomings on sectors, firms, and their respective management operations. The latter system distorts the resource allocation process and, hence, economic performance. Bank-based systems are a better alternative system for resource allocation. They perform a better job in studying credit destinations and their operations, financing projects and industrial expansion. This makes it permissible for this study to focus on the net effect of the credit allocation decisions by the bank-based decisions in boosting economic growth. The crucial issue is to understand whether the banking system is a special purpose vehicle of both the monetary and fiscal authorities in spearheading the growth of the economy, particularly in the absence of a domestic currency. Ibrahim et al., 2017; Lee, 2012. Lee (2012) provided evidence that market-based economies derive growth from the stock market, whereas bank-based economies derive growth from the banking sector. The evidence suggests that the banking sector drives the economy in the short term (during the early stages of development) and that the stock market takes over as the economy develops. In a sample of stock markets and banks from both developed and developing economies, Ibrahim et al. (2017) discovered that both stock markets and banks contribute positively to economic growth. However, it was reported that the impact of banks was more persistent than that of the stock market. Using a sample of 60 countries, Boadi et al. (2019) found that market-based financial systems drive economic growth more effectively than bank-based systems.

Thus far, the author has focused on general aggregate growth. The researcher does not discuss the direct effect of the environment on the banking sector. This study's thrust is aggregate growth. The nexus between finance and credit distribution is grossly relevant. Income distribution is relevantly sound to imply economic development and hence needs to focus on credit distribution decisions on the national agenda. Different economies are endowed with unique circumstances, including technology, capital resources—both financial human, savings attitude, innovativeness incentive and public policies that influence where the economy rest. This unique distribution of the factors makes it difficult to generalise economies except to undertake country-specific studies to have a deeper and clearer understanding of each market. Zimbabwe, for example, has been trading without a domestic currency, making it difficult for the regulatory authority to stand tall as a lender of last resort. This leaves banks at ransom in times of distress, fostering decisions that might be a risk to national objectives. They can channel much of the resources towards consumption rather than productive projects.

The theory provides a conflicting effect on the connection between economic performance and credit distribution. Some theories (Aghion and Botton (1997) argue for the existence of a disproportionately beneficial role for poor sectors that lack collateral, political connections, or viability maps to access credit. This, therefore, restricts some sectors from fully exploiting potential investment opportunities. As a result, these decisions restrict credit flow and may stymie aggregate growth. However, political economy theories have stepped further. They suppose that a financial system poised for national growth is founded on availing its financial resources to the majority of its sectors instead of restricting financial services to entrenched incumbents (Rajan

and Zingales, 2003; Morck, Wolfenzon and Yeung, 2005). Thus, by easing credit constraints, the financial market may foster entrepreneurial skills, new market entrance and economic development. In contrast, Lamoreaux (1994) and Haber (2004, 2005) argue that the rich sectors and those blessed with political favour benefit most. Similarly, projects with no political mileage may not be sufficiently funded to the expected tune. As a result, financial capital flows to a select few. Thus, it remains an open question whether credit allocation decisions to competing sectors boost aggregate economic growth.

2.6 Relationship between Economic Growth and Bank Lending

The literature on the relationship between bank lending and economic growth has evolved, and there is no consensus on the findings. In investigating this relationship, to address objective number three, the theoretical works by Bagehot (1873), Schumpeter (1954), Gurley and Shaw (1955, 1960), McKinnon (1973), Shaw (1973) and Lucas (1988) provide the basis of the study.

Despite the numerous studies that have been undertaken, there is still no consensus on how credit extension contributes to economic growth. According to Patrick (1966), the causal relationship between finance and growth is referred to as supply-leading since it is assumed that financial institution operations enhance the supply of financial services, resulting in economic growth. Similarly, the demand-following concept is applied when economic growth increases the demand for financial services, which then encourages financial development.

Both country and cross-country analyses were conducted by previous researches on the relationship between finance and economic growth. The existing literature

demonstrated a positive correlation. Previous research demonstrated a positive linear relationship between the two variables (Benczr, Karagiannis, & Kvedaras, 2019). Using a sample of 35 countries, Goldsmith (1959) discovered a positive correlation between aggregate finance and growth. Recent studies have reinforced the positive relationship based on Goldsmith's findings (such as Zeqiraj, Hammoulideh, Iskenderoglu, & Tiwari, 2020; Lenka & Sharma, 2020; Shravani & Sharma, 2020; Tursoy & Faiscal, 2018).

Notable studies, however, have found neither a negative nor a nonexistent correlation between private credit and economic growth (Boadi, Osarfo, & Boadi, 2019; Mahmood & Rehman, 2019; Ibrahim, Abdullahi, Azman-Saini, & Rahman, 2017; Lee, 2012). Lee (2012) provided evidence that the stock market-based financial system promotes growth in market-based economies. The author further provided evidence that market-based economies derive growth from the stock market, whereas bank-based economies derive growth from the banking sector. The evidence suggests that the banking sector drives the economy in the short term (during the early stages of development) and that the stock market takes over as the economy develops. In a sample of a variety of stock markets and banks for various developed and developing economies, Ibrahim et al. (2017) discovered that both stock markets and banks contribute positively to economic growth. However, it was reported that the impact of banks was more persistent than that of the stock market. Using a sample of 60 countries, Boadi et al. (2019) found that market-based financial systems drive economic growth more effectively than bank-based systems.

Although the pathways and even the direction of causality remain unexplained in both theory and empirical investigation, this link has grabbed economists' minds. In

economics, there are two schools of thought on the relationship between bank lending and economic growth. The first trend, which is referred to as the “no apparent association” trend, observes that there is no apparent association (no causality between bank lending and economic growth). The second trend is contradictory viewpoints, which are reflected in three views. First impressions are important (unidirectional causality, which includes supply-led and demand-following). The second point of view (Bidirectional Causation) holds that reciprocal causality in the way banks function negatively impacts economic growth, suggesting that banks shift deposits out of the economy rather than injecting these savings back into the economy.

2.7 The correlation between credit and economic growth

The presence of an affiliation between credit and growth appears unquestionable, as several finance studies have dealt much with the concept and positively confirmed it, although causality direction remains debatable. Patrick (1966) coined the causality direction as either led by supply or follows demand. Demetriades and Hussein (1996) suggest the third as bidirectional causation. A close relationship may exist between credit and economic growth; nevertheless, the degree of the relationship remains undisclosed in the context of Zimbabwe. This study seeks to interrogate this relationship, quantify it, and establish the significance of each explanatory variable and the causality direction of the variables.

Commercial banks are well positioned to function as key conduits propelling the economy. This results in the growth of business operations. The banking sector is the most pronounced formal market for credit. They mobilise savings and can better guide

them towards profitable investments for a competitive asset portfolio capable of growing the economy. Access to capital enriches the productive capacity of businesses. Salas and Saurina (2002) argued that big banks have established internal control systems, structures and processes that help in the effective screening and monitoring of loan portfolios. Many questions may be asked; if they are credit constrained, are they pursuing weak projects or are in unprofitable sectors? If not, are banks inefficient in credit allocation? Alternatively, if banks are efficient, are they credit constraints? The study would interrogate all these questions.

Financial institutions are argued to be better positioned to appraise potential entrepreneurs, hence, their likelihood to finance profitable investments that accelerate growth (King and Levine, 1993). The banking sector's mobilisation and allocation of loans and advances to productive sectors, such as mining, services, construction, manufacturing, and agriculture, would provide an enormous contribution of services that would excite economic growth. The banker is a developmental phenomenon. Its direct financial resources in the economic and social process to entrepreneurs.

Given the impossibility of reviewing all works on the traditions of sectoral credit allocation and economic growth among different economies, selected literature on the concept is reviewed. The study reviewed various scholars regarding the impact of commercial bank credit in relation to economic progress in Zimbabwe. Ijaiya and Abdulraheem (2000); Antony (2010); Tawose (2012); Akujuobi and Chimaijer (2012); Ogege and Shiro (2013); Ebi and Emmanuel (2014); Nwakanma, Nnamdi, and Omejefe (2014); and Yakubu and Affoi (2014). Sectoral credit allocation has a relationship with economic growth, and much of the finance literature from previous studies pointed towards a significant positive impact between commercial bank credit

to various sectors and economic growth. Ijaiya and Abdulraheem (2000) studied the effect of agricultural credit on Nigerian poverty reduction between 1980 and 1996. The authors adopted the OLS technique. The results found a reducing effect of credit to agriculture on poverty by stimulating economic development. The works of Ijaiya and Abdulraheem (2000) laid a foundation for this study. The authors, nevertheless, focused on the relationship between agriculture and poverty. Not only does this study focus on the agriculture sector, but it also includes more sectors to prove their relationship and significance in explaining economic growth.

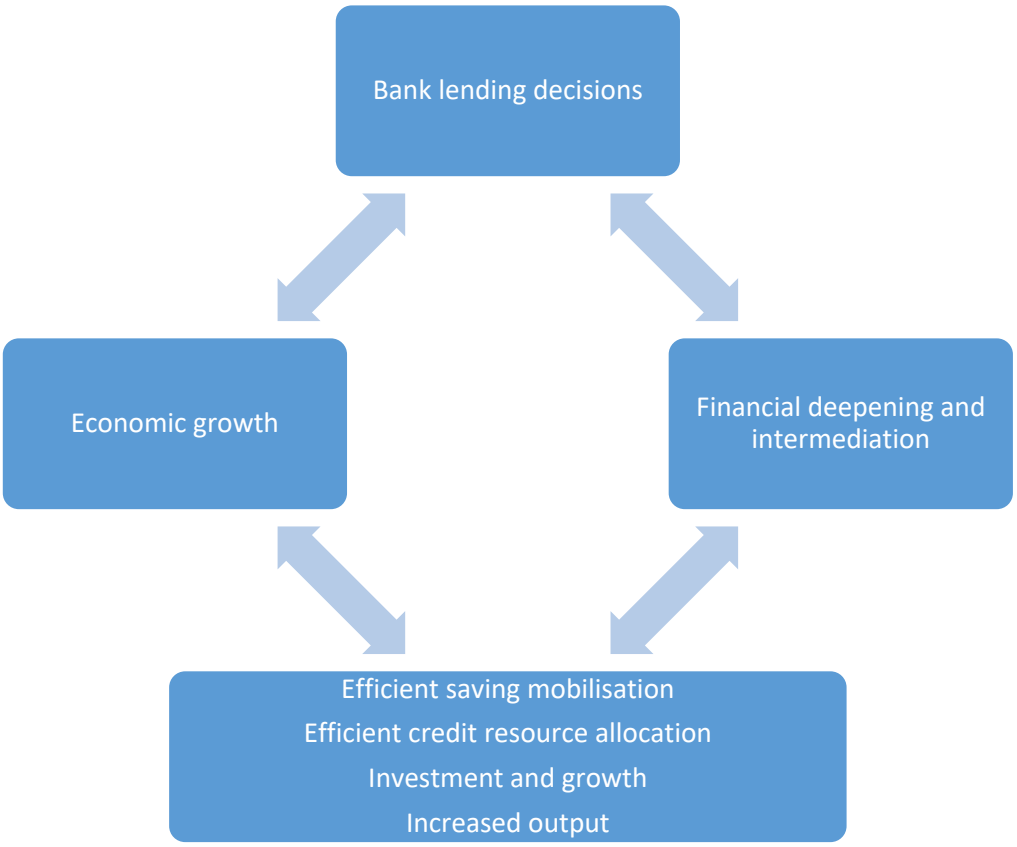
2.8 Conceptual framework

This section discusses bank lending decisions towards growing the economy. Credit is a promise of money in the form of a loan or advance by one party (lender) to another (borrower). Credit is the epicentre of commercial banks' function, as it serves as a special purpose vehicle or conduit for loanable funds. They mobilise funds from surplus units and redirect such funds to deficit units, preferably for productive purposes. The administration of bank credit is indiscriminately provided to the government, industry, firms and individuals as loans and advances. The availability of loanable funds fosters the need for the pursuit of an intermediary role. The lending decisions facilitate financial deepening and intermediation. Cheong and Chan (2011) suggest that financial intermediation promotes the growth of the country. This was in line with sound and objective lending principles. The possible channels and their impact on national investment are scrutinized. Credit accessibility and stability are identified as the fountains of the operational behaviour and attitude of the commercial banking sector. Cheong and Chan (2011), however, further suggest that financial

intermediation contributes less to the causal relationship of industrialised economies than in developing countries.

The background of the study of the nexus between the financial system and economic growth dates back to the times of Goldsmith (1995), Cameron (1967) and Shaw (1973). The authors demonstrated that the financial sector acts as a catalyst for economic growth through financial deepening and intermediation. The observations of these authors can be simply depicted in Figure 2.3 below. Figure 2.3 below shows various forms of connection between economic growth and the financial sector. This circumstance is in line with Odhiambo's (2005), (2007) and (2011) research findings. Odhiambo (2005) observed a bidirectional causality relation between financial development and economic growth, whereas in his (2007) paper, he found that financial development leads to economic growth (supply-leading response). Again, Odhiambo (2011) found that economic growth leads to financial development (demand-pulling response). The financial intermediation played by banks acts as a special purpose vehicle in the allocation of savings to credit portfolios.

Figure 2. 3: The relationship between banks and the economy:



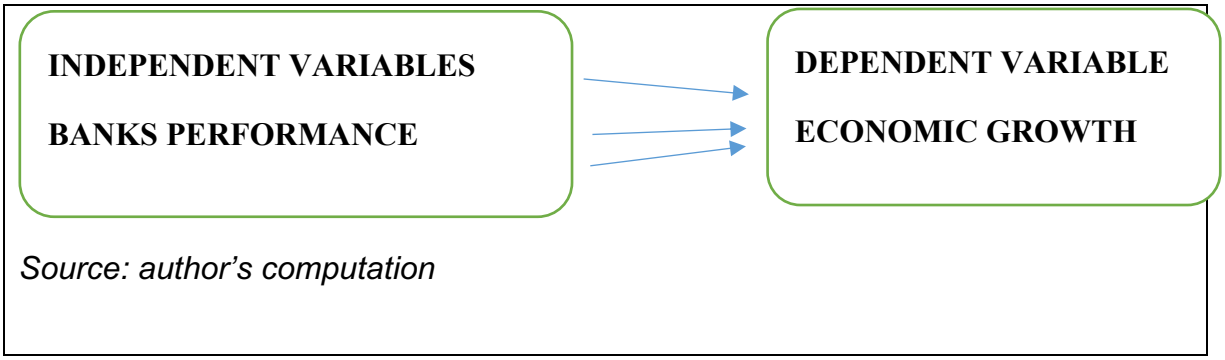
Source: Author's computation

The decision to allocate scarce financial resources has a strong implication for the degree of speed and direction the economy takes. Money is needed for capitalisation and liquidity purposes in an economy. The credit function directly mobilised financial resources towards productive investment by growing the economy. Intermediation is vital for the growth of the sectors and the economy at large. Importantly, the prosperity of individual sectors in the economy is expected to collectively explain the prosperity of the general economy. Therefore, studying the role of each sector in relation to GDP is an important engagement to identify policy direction for the general economy.

Figure 2.4 below explains the relationship between bank performance and economic growth. Economic growth is explained by banks' performance. The above reasoning

is supported by Patrick (1966), who examined the causal relationship between finance and growth. He observed a supply-leading hypothesis since it is assumed that financial institution operations enhance the supply of financial services, resulting in economic growth.

Figure 2. 4: Conceptual Framework (Author's perception)



Source: author's computation

2.9 Sectoral allocation of credit

Many theorists and economists stressed that banks dominate the intermediary component of the financial system. They provide linkage for different competing sectors towards realising economic growth, a macroeconomic thrust of the government. The financial role of the banking system affects capital allocation. This financial role influences savings by improving productivity and stimulating innovation and technical change and the economic growth rate (Sanusi, 2011). It has played a significant role in economic development (Sanusi, 2011). Banks act as intermediaries who stand between possessors of productive means and those who wish to form economic combinations for value addition and beneficiation. Therefore, banks promote the formation of new combinations and are the ephor of the exchange economy.

The nexus between sectoral credit allocation and its effects is not new (Bezemer, 2014). Not all sectoral capital is linked directly to productivity growth. Thus, the

channels from credit to growth are tailored to expedite divergence of their multiplier coefficients. However, in contemporary financial development studies, this differential credit expansion and performance was neglected. Scholars of finance literature suggest that institutional structural reforms can advance resource provision and improve productivity volume, that is, structural change into higher-productivity sectors and improve financial allocation to individual sectors (Dabla-Norris, Ho, Kochhar, Kyobe, & Tchaidze, 2013).

Beck, Dermiguc-Kunt, Laeven and Levine (2012), in a ground-breaking cross-country study, found that household credit or consumptive loans are costly to the economy. This was also confirmed by Bezemer *et al.* (2016). Additionally, Jappelli, Pagano and Di Maggio (2008) collected microcredit data for the United Kingdom, United States, and German economies. They observed that more household debt leads to added insolvencies, bankruptcy, default, and arrears (Jappelli *et al.*, 2008). Household credit increases the probability of crisis (Buyukkarabacak & Valev 2010). Sutherland *et al.* (2012) noted that when household debt rises above the trend, recession possibilities also increase.

Rodrick (2008) documents the effect of sectoral credit allocation on economic performance. He concludes that credit resource rationalisation into the production of tradable goods causes this connection (Rodrick, 2008). Additionally, McMillan and Rodrick (2011) suggest that an alteration of productive capital resources into comparatively less productive sectors stifles growth. The study concluded that reallocation of credit out of the manufacturing sector slows down both output and productivity. The key novelty of the study was how the portion of productive capital allocated to the manufacturing sector performs. Each economy takes varied

fundamentals that support or compromise the efficiency of capital and, eventually the much-needed growth.

It is difficult for any economy, particularly developing economies, to realise economic growth and development without efficient and vibrant financial institutions. The objective of credit distribution is to stimulate sectors to make a joint contribution to the general growth rate of an economy. Sectors with a greater influence on the population and high employment sectors, such as industry, mining, and agriculture, lead to a better and growing economy in a country (Akpansung and Babalola, 2012). Wade (1990) argued that Taiwan's economic success was anchored on a sound distribution of credit to productive sectors. The control of the manner in which bank credit is distributed has played a recommendable role in boosting Japan, Korea, Taiwan, Japan, India, Indonesia, Malaysia, and Thailand's economies (Eastwood & Kohli 1997). Banks allocate credit in several ways to credit destinations, as this section seeks to explore.

According to the Central Bank of Nigeria (2003), financial resources and their equivalents advanced by the banking sector make up bank lending. Through bank lending, savings are channelled into high-yield investments to promote output. Bank lending has a fundamental responsibility of allocating funds to destinations of maximum utilisation. Therefore, credit access supports the character of intermediation to be conducted, which is important for output growth in the country. If these economies rely on bank credit for productive capital, banks are expected to channel financial resources towards productive sectors. As a result, extending credit towards weak sectors compromises both economic growth and the sustainability of the financial sector.

Using sectoral panel data for Kenya, Were, Nzomoi and Rutto (2012) investigated the influence of access to bank credit of key sectors on economic performance. They found a positive relationship between credit access and real value added sectoral gross domestic product (Were *et al.*, 2012). The authors found that provisional access to capital by key sectors embraces great prospects for encouraging sectoral growth. Despite the conclusions, sector performance varies across countries or time. No sector has a unanimous conclusion that it fosters economic growth. An economy might be sector-based, yet that sector might not be necessarily statistically significant in explaining the growth. However, the relationship between sectoral credit allocation to key sectors and economic growth is not explored extensively in the Zimbabwean setting. This is a knowledge gap that this study seeks to fill.

From the finance literature, evidence on the impact of the sectoral allocation of credit and economic growth is sparse and inconclusive. Only a few studies have analysed the relationship in the subject matter in Nigeria, the USA, and some limited countries in Europe. However, their focus was on individual sectors such as agriculture, manufacturing, industrial performance, or production. This study is thus sensible and significant, given the widespread distribution of loans across various sectors. To my understanding, no study has been conducted with the same line of thought in Zimbabwe. Therefore, the insights drawn after this scrutiny afford a sound foundation for determining future strategies and policy frameworks to improve Zimbabwean sustainable growth. Having discussed this, section 2.9 highlights the empirical evidence from previous studies.

2.10 Empirical Literature

In this study, empirical research is discussed. The causality effect would be considered, as it is crucial in this study for development policy. The time perspective would be taken with significance to assess the extent to which findings change in relation to observed time frames. It has remained difficult for many researchers to choose the appropriate proxy in previous studies; hence, the proxies are discussed.

A myriad of scholars concurred over the existence of a relationship between economic growth and bank lending decisions. However, they differed in the causality direction. Gurley and Shaw believe that the increase in the provision of credit to various sectors is propelled by increased demand for financial services. This is so for an expanding economy. In conjunction, Oluitan (2009) noted the need for policymakers to focus more on the regulatory, legal, corporate governance and policy reforms than on measures that propel lending decisions to boost market functioning. This was evident in the study of Turkey, where economic growth was identified as a driver for financial sector development, as suggested by Muhsin and Eric (2000).

In contrast, supporters of the supply leading hypothesis argued that attaining economic progress is founded on the quality of bank lending decisions as a tool of its realisation. This hypothesis was originally founded on the works of Schumpeter (1934), who characterised economic development as an offspring of the efficient allocation of credit to positive destinations. The view was also maintained by scholars such as Fry (1988) and Greenwood and Jovanic (1990).

Most scholars in finance and economics have not differed on the existence of a relationship between bank lending and economic growth in any economy. However,

they did not settle on the direction of causality that exists between bank credit and economic growth. Obamuyi (2010) considers the effect of the financial liberalization policy in Nigeria in transforming the private sector towards development. Relevant descriptive and quantitative data were used to determine the impact. The net effect of the financial liberalization policy of that country envisaged an insight that made the policy makers strengthen that policy. The policy increased the productive capacity of the manufacturing sector, which was detrimental to the economic increase.

Therefore, the findings pointed out that the government, the central bank and its other special arms need to complement the policy. This can be done by channeling more financial resources to the private sector but towards investment in real assets. In the study, credits to the private sector had no positive effect on economic development. Usually, the credit was meant for production (while others diverted to less or nonproductive sectors) or it was too small to warrant any substantial resuscitation of the economy (Law and Singh, 2014). Focusing on the role of credit not by the global private sector but by economic sectors as individuals is vital to compact this dilution effect. However, other ancillary factors were identified as barriers to economic development. Such factors are pertinent in many developing economies and include unhealthy infrastructure, weak corruption policies, economic and political instability, and high cost of funds.

The policy implication is that growth can be stimulated positively by the rudimentary functions of banks if a much-needed conducive environment is established. In addition, the private sector should utilise advanced financial resources efficiently for industrialisation. If the economy is to truly benefit from the functions of banks, availing accessible credit by the government is important. This study, therefore, would assist

policymakers in fine-tuning their lending policies and the private sector to espouse a value reorientation approach to enhance the performance of the economy.

Lemo (2005) suggests that the primary objective of banking reforms is to guarantee efficiency and financial sector stability. The reforms enable the banking industry to be clothed for resilience, enabling the industry to anchor economic growth sufficiently and sustainably through intermediation functions. A myriad of scholars concurred on a relationship between economic growth and bank lending decisions. In contrast, they differed in causal direction. Gurley and Shaw (year) believe that the increase in credit provision to various sectors is propelled by increased demand for financial services. They attribute the causation to an expanding and growing economy.

Studies pursued in many continents and countries shared a supply-leading hypothesis. King and Levine (1990) found that bank lending decisions lead to economic efficiency and development. This came from a study of seventy-seven economies, a basket of both developing and developed countries. The authors used a cross-country regression.

Similarly, using a panel estimation technique, Diego (2003) found comparable results from a study of fifteen European Union countries. The objective was to assess the implication of the lending policy's influence on economic growth. Bank lending decisions promote economic growth if properly administered. Habibullah and Eng (2006) found that efficient lending decisions boost economic growth. This was noted in the conduct of thirteen Asian countries' analysis of causality.

According to Lang and Nakamura (1995), bank lending decisions alone cannot lead to economic progress. This is because the monetary authorities’ policies and

measures play a complementary role in making lending decisions of influential effect. Similarly, credit availability plays a pivotal role in driving the business cycles of an economy. Swiston (2008) quantitatively detected the significance of bank lending decisions accounting for over 25 per cent of the contribution of financial factors to growth. He noted a reduction in economic activity by 0.75 per cent following a 20 per cent tightening in the lending decisions.

2.10.1 Direction of Causality

To gain a better overview of objective number 2, the main papers that have dealt with the causal effects of bank finance and economic development posed mixed reactions. One side of the coin sceptically concluded; it is conditional that finance causes growth. However, the reverse side of the papers rested their conclusions that, in general, finance causes growth.

Additionally, other studies have investigated not only the correlation but also the possible causal relationship between finance and economic growth. Earlier studies by Calderon and Liu (2003) indicated that private credit causes economic growth, whereas Ang and Mckibbin (2007) discovered the opposite scenario, with economic growth causing finance. Hsueh, Hu, and Tu (2013) observed that the direction of causality was sensitive to the financial variable used, although they discovered that domestic credit significantly drove economic expansion. Using a variety of financial indicators, Pradhan, Arvin, Bahmani, Hall, and Norman (2017) found a mixed causal relationship. Using a banking indicator, they discovered a unidirectional causal relationship between growth and bond, stock market, and insurance indicators.

2.10.2 Finance conditionally causes growth

The goal of this study is to critically examine whether the notion that finance plays a critical role in transforming the economy holds true, as the "finance causes economic progress" hypothesis concludes. This section focuses on discussing the matter as suggested by previous authors regarding the finance and economic growth relationship. This section, as a result, focuses on country-specific studies. The heterogeneity of countries calls for a careful conclusion to avoid the scenario of the ESAP prescription, which did not suffice the expected positive results in developing economies as in developed countries. In studying the role of finance in 98 states, specifically using the private sector credit ratio to GDP, De Gregorio and Guidotti (1995) noted a broadly positive relationship. The positive relationship was relatively stronger in the early years of the study in the 1960s than in the later years towards 1985. It was also weaker in more developed countries than in their counterparts, middle- to lower-income countries.

This study was based on research covering the period 1960 to 1985. In the same study, it was highlighted that the competitiveness of bank finance to stimulate economic growth and bank efficiency should not be overemphasised rather than investment volume. One can easily realise that the link between finance and growth can be modified according to timeframe, region, credit allocation policies and levels of national income. The authors tried to apply the same methodology to twelve identified Latin American economies and found a negative correlation between bank credit and economic growth. This conclusion concurs with the earlier suggestion that the link is country-specific and heterogeneous. What is warranted is the need to explore individual country factors to make a more informed conclusion. The enormous and

diverging people's perspective on financial resource allocative decisions is a key consideration to understanding and embracing basic connectivity for transformational impact. Stakeholders are considered unique monetary regimes, trading environments and other related factors for a better evaluation of the impact of bank management and regulatory authorities on the direction of the economy (Zang and Kim, 2007). The direction pursued by an economy relies heavily on influential decisions employed on or against it.

In many nations, the decision-making dilemma spawns ambiguity in an economy and cannot transform it positively. The absence of consensus on the causality direction was equally stressed by Demetriades and Hussein (1996). They concluded that the relationship of these variables runs differently in countries, hence limiting room for generalisation. Therefore, the cross-country regression findings hold if far from factual truth. Cross-section results lack clarity in exposing the differences in institutional characteristics, governmental or regulatory policies, and differences in the operations of monetary regimes and their implementation. All these differences have a strong role to play in the banking sector operations and the financial development process. The perspective of Demetriades and Hussein was not limited to themselves; Ram (1999) also bought the perspective. However, Ram (1999) doubted the authenticity of the cross-country studies in generalising the estimated results. The author accounted for ninety-five states where he explored the covariation from a country-specific perspective. This study is centred on an individual country. Held negative correlations covering the period 1960 to 1989 and fifty-six out of ninety-five countries held repelling correlations between the two variables. After running several methodologies to ascertain his findings, he later doubted the authenticity of the previous studies that

employed some cross-country estimates. His opinion suggests that such previous studies might be very spurious and cannot be confidently relied on. Cross-country evidence cannot be conveniently used to derive general conclusions about individual countries. Each country has independent factors that either oil or impede economic growth. It is, therefore, biased to make a general statement suggesting that the financial system stimulates economic growth. The causal affiliation in many smaller economies is empirically weak.

A clearer observation pursued in eighty-five countries for the period 1960 to 1998 by Favara (2003) found no room to conclude universality among nations because of the geographical location, institutional characteristics, or income of a country. The author used multivariate time series. Business cycles visit countries at various times and carry different effects. As far as causality may exist, its strength and direction are country-specific, and variation applies. Cross-sectional analysis not only disguises policymaking but is also inappropriate. This suggestion borrows much support from Zang and Kim (2007), who noted the absence of positive evidence of a correlation in financial development indicators to economic growth regarding a unidirectional causal link. These conclusions do not simply imply that the financial sector has no role in spearheading economic growth, but more importantly, a balanced approach should be adopted. This is true. Zimbabwe, for example, whose financial institutions have neither been subscribing to market forces nor functionally operating with its own currency. The literature holds no evidence of a strong link between economic growth and finance. Zimbabwe has been going through a transition; therefore, this study aims to analyse the impact of financial resource allocation decisions on the general economy.

In transitional economies, Koivu (2002) argues that the quality of decisions in lending and the causal size of the asset portfolio are major factors in economic transformation rather than the huge size of the banking sector. She records a no-forceful tie between private sector credit and economic growth. Mehl, Vespro and Winkler (2005) and Fink *et al.* (2005) also failed to find convincing evidence of profitable economic growth from financial deepening in Southeast Europe for the period 1993 to 2003. They, however, presented conceivable elucidations for their findings. They suggested that numerous factors influenced their results. Using the standard growth regression model, which might not be a better prescription for transitional countries, short stretch progressions or economic growth is influenced by the quality of the banking sector decisions rather than focusing on financial deepening. This study shows the quality of the banking sector's decisions in allocating scarce financial resources (allocative efficiency) among the competing economic sectors. More precisely, it is where you invest that matters in determining economic growth rather than financial deepening intrinsically. It is critical to note that inefficiency in allocative decisions stagnates or stifles the growth possibilities of a country.

What conclusions can be derived from this section? Simply, many economists shy away from confidently claiming that finance causes growth. Their results indicate that those economies are heterogeneous and that homogeneous policy prescription is ill-suited. The differences in individual states are founded on countries' income levels, institutional characteristics, time horizons, proxies for financial indicators, business cycles, monetary regimes at work, and policy implementation processes, among other things. Country heterogeneity has been emphasised in this section, hence the foundation on which this study was pursued.

2.10.3 Finance causes economic growth

In consideration of the econometric research on economic growth, statistical significance was found. The relationship is viewed as economically large between private sector credit allocation by commercial banks and other intermediaries as a fraction of GDP and long-run growth rates. The samples stretch from 1976 to 1993, focusing on forty-three countries, as discussed in King and Levine (1998). In their study, although they did not test the causality of economic growth in the banking sector, they showed that banking development is a strong engine for economic growth. They acknowledged that although a plethora of variables are evident in contributing to national development, banking sector development is strongly influential on economic progress.

To obtain a better overview, Levine, Loayza and Beck (2000) modified their previous studies King and Levine (1993) and Levine (1998) by shifting from a time series perspective to a dynamic panel analysis from 1960 to 1995. The sample study data consist of five-year averages for seventy-four countries. The notable results prove the existence of a strong positive correlation. In the same vein, it was suggested as policy advice that more financial resources should be allocated to boost the financial system to act as a special purpose vehicle that stimulates or accelerates economic growth.

A sharp contrast emerged from authors who did not find a connection between finance and growth. Odedokuri (1996) noted the existence of invariant growth-promoting patterns across countries and geographical regions of financial intermediation. The author uses a time-series regression model for seventy-one countries.

Deb, Mishra, and Banerjee (2019) divided their samples into developed and emerging economies using quarterly data from 1993 to 2014. In developed economies, private credit drives economic growth in accordance with the supply-side hypothesis, whereas in emerging economies, the demand-following hypothesis holds true. Dash, Pradhan, Mardana, Gaurav, and JJayakumar (2020) established a long-run causal relationship between private credit and economic growth by employing insurance and bank development indicators. In the short run, the authors discovered a bidirectional relationship between insurance and economic growth.

In an analysis of a much-expanded sample size of 190 countries, Calderon and Liu (2003), covering the period 1960 to 1994, adopted the Geweke decomposition test. They used pooled data. Various findings were recorded, supporting that economic transformation is stimulated by financial development and that bidirectional Granger causality coexists. More importantly, it was evident from the same paper that the causal relationship is more pronounced not in industrialized countries but in developing countries. From that perspective, financial deepening is more influential in developing countries than in industrial zones regarding the rate of national growth. In addition, the findings reveal that drastic capital accumulation and an increase in productivity propel economic growth with marginal and strongest effects, respectively. The time effect contributed to the financial system and economic growth relationship. It was noted that the longer the period, the stronger the effect on economic development.

The time effect was opposed strongly by Frank *et al.* (2005). His growth thrust was spearheaded by productivity in a study of eleven countries in the transitional stage between 1990 and 2001. More precisely, the financial sector, through bank credit and

stock market capitalisation, did not trigger long-term growth. It, however, spurred short-run growth in countries that include Slovenia, the Slovak Republic, Romania, Poland, Lithuania, Latvia, Hungary, Estonia, the Czech Republic, Croatia, and Bulgaria.

Christopoulos and Tsionas (2004), unlike Calderon and Liu and Fink *et al.,* do not find short-run causality or bidirectional causality. However, they did not divert from policy advice to improve the operations of the financial markets or the banking sector to trigger economic growth, although they were delayed but significant.

Nevertheless, various econometric methodologies were applied by different authors for different countries and periods. These include stretching from time series, panel analysis, and cross-section; all converge that finance plays a crucial role towards economic growth. Is this a comprehensive conclusion or needs to be sceptical about this answer?

2.10.4 Finance has no effect on economic growth

Numerous studies, such as Driscoll (2004), Bolbol and Fatheldin (2005), and Chang, Jia and Wang (2010), identified an inverse relationship between banking sector credit and economic growth. Driscoll (2004), covering the period 1991-2002 for the Chinese economy, used the loan-to-deposit ratio to represent sectoral credit. From the inferential results, he found an absence of a relationship between loan allocation and the growth of the Chinese economy for the studied period. As China's financial liberalisation expands, however, sectoral credit reallocation and loans contribute to positively transformed economic growth, despite banks being owned by the government. Bolbol and Fatheldin (2005) considered Egypt's financial system and

productivity based on 1974–2002 timeframe. They identified that productivity is not supported by the bank-based indicators except that they are concomitant with the per capita income threshold.

Stern and Feldman (2004) noted that as banks grow big, sound lending principles become compromised. This has led to the assumption that large banks engage in excessive risk-taking behaviours by extending loans even to lower quality economic sectors. Zimbabwe has many commercial banks of varied sizes; the researcher aims to test the nature of the bond concerning sectoral allocation of credit and economic growth between 2010 and 2021.

Access to credit by sector is not a guaranteed means of economic progress. It is the context in which these loans are channelled out and post-lending loan management that matters. Put simply, it points to credit misallocation and poor monitoring of the loan once granted to make them to the best use for maximum productivity. The promulgation of the concentration limits was established on this notion, where lenders sometimes advance credit to deficit units without an economic need being established. This research, set up on the earlier stated views, anticipates a correlation between the sectoral credit allocation and economic development. Nevertheless, the nature of the correlation cannot be ascertained. The theory by Wicksell in 1901 argues that lending stimulates economic growth once interest rates are lower than the marginal productivity of capital that ought to be promoted. In contrast, economic growth is stifled when the marginal productivity of capital is lower than the interest rate. Therefore, the theory is clear, and the relationship findings are based merely on the lending circumstances context. Hence, a conclusion on the relationship between sectoral lending depends on the prevailing marginal productivity of capital and the lending

rates. This theory could also have missed; however, the roles of commercial banks assert that banks have more information about investable projects or sectors. If they are abreast with this valuable information, it sounds irresponsible to lend to a less productive borrower.

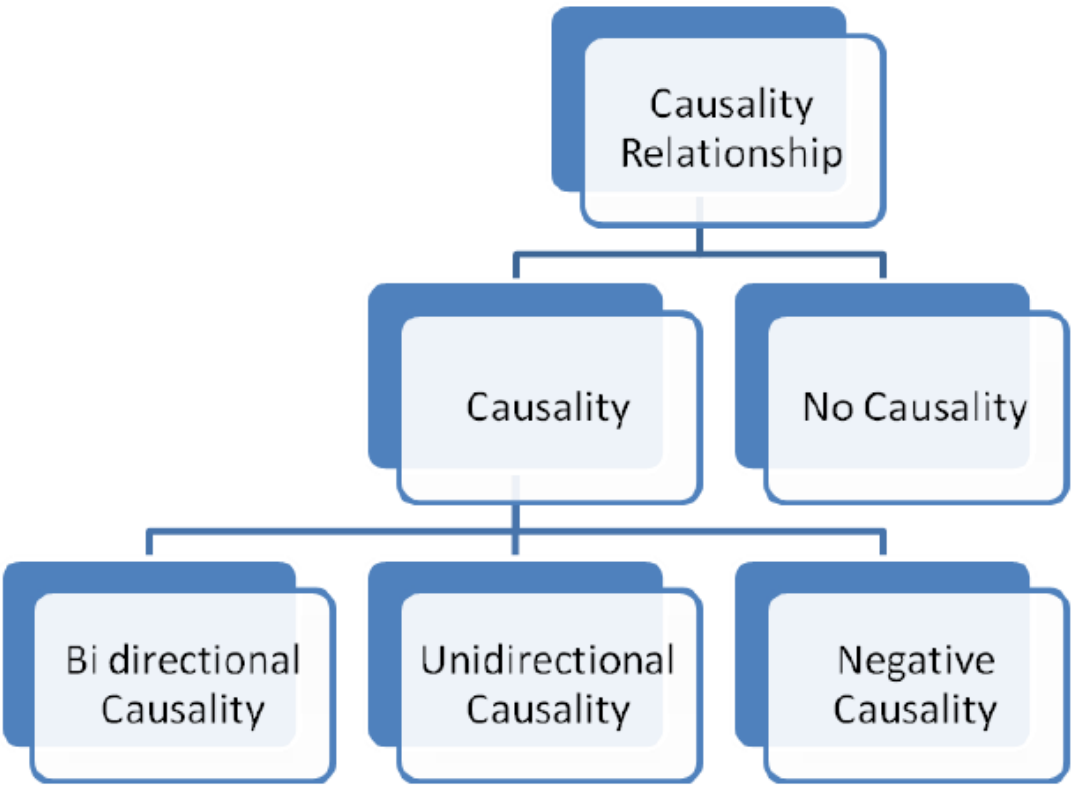
All these views are important to this study. They bring in various perspectives that need further research to determine whether they are realistic for Zimbabwe's commercial bank credit allocation to various sectors on economic growth between 2010 and 2021. However, from earlier literature, sectors perform differently across economies. Notwithstanding the growing works on the bank credit allocation and economic growth nexus, varied conclusions are asserted on which sectors steer economic growth and hence need to put Zimbabwe on the map of the literature too. There has not been a universal sector that drives economic growth forward, leaving a gap in studying the Zimbabwean context. Each economy has unique sectors that drive its respective economies. Therefore, there is no space to generalise specific sectors as drivers of economies towards an economic boom.

An imperative need exists to study the Zimbabwean economy to identify sectors in need of promotion to revive the collapsing economy. The need is against the government's upholding of agriculture and mining sectors with high regard. Therefore, the search for the validity of commercial bank credit decisions on economic growth in Zimbabwe, considering the significance of the decomposition of fund allocation per sector into components in long-run relations, deserves further attention and study. Differing results were noted earlier, entailing the need to lay a foundation through this study towards making sound economic decisions of channeling more credit towards

profitable sectors for a sound risk-return trade-off. Additionally, debate remains on the extent to which economic sectors steer economic growth.

A large body of empirical evidence exists on the finance growth relationship, as mentioned earlier. Lucas 1988 concludes that the finance-growth nexus is overstressed. However, research on the Sub-Saharan states has sparse empirics in this matter. In a review of various empirical works, mixed findings of causality direction on the finance-growth relationship as indicated in Figure 2.5 breakdown of causality. The findings also differ according to period, methodology, financial development measurement and data employed.

Figure 2. 5: A breakdown of the causality



Source: Author's computation

The researcher categorises the literature related to bank lending and economic growth according to the causal relationship depicted in the above figure. According to Odhiambo (2005), (2007) and (2011), it is possible to find any nature of association depending on how variables relate. Some relationships can be bidirectional, unidirectional and/or negative.

2.10.5 Causal relationship between bank lending and economic growth

Chipote and Makhetha-Kosi (2014) explored the relationship between monetary policy and economic growth in South Africa between 2000 and 2010. The dependent variables used to determine the relationship were money supply, GDP, and Repo rate. Other dependent variables include the exchange rate and consumer price index. Different techniques, namely, the Phillips and Perron (PP), unit root, augmented Dickey-Fuller (ADF), Johansen cointegration and vector error correction (VECM) models, were employed. However, in trying to come up with a conclusion based on the South African market, the authorities adjusted the monetary policy by using the money supply and repo rate and found an insignificant effect of credit to the government. However, all the variables used were of positive impact to GDP, save for inflation, which was significant.

In Saudi Arabia, 92 per cent of the GDP flows from oil exports. Nasir, Khokhar and Ali (2014) examined the causal link between economic development (GDP), lending rate and financial depth using the vector error correction model (VECM) and Johansen cointegration models. The findings showed a long-run relationship among the above variables using the single cointegrated equation listed below.

$$Ecog_t = \alpha_0 + \alpha_1 LLI_t + \alpha_2 PRIVY_t + \alpha_3 LR_3 + \varepsilon_t$$

where $Ecog_t$ is real GDP growth and LLI and PRIVY are proxies of financial depth to GDP, the percentage of financial institution claims to the private sector and the central bank lending rate, respectively. The findings were in contrast with many conventional studies on the matter, which pointed out that the lending rate is caused by financial depth. The model was run using the present circumstances. The other causal connection was insignificant and difficult to interpret in relation to GDP. No short-run relationship was noted in this model. This was reflected by the Wall test, which was influenced by unique political and economic circumstances.

In another scenario, Aliero (2013) explored the relationship between loans and advances to the private sector and real GDP using time series data for 37 years (1974-2010). The independent variable was credit to the private sector, while real GDP represented the dependent variable. The specification of the econometric model was as follows.

$$Y = \beta_0 + \beta_1 PSC_t + \mu_t$$

where Y is the real GDP, β_0 (constant parameter), PSC_t (is private sector credit), and β_1 (is a vector of the coefficient of private sector credit). The autoregressive distributed lag (ARDL) and F test for integration were used. From this study, a long-run equilibrium relationship exists between economic developments and private sector credit. In this study, private sector credit was used as a dependent variable. However, no causal relationship was determined between GDP and private sector credit.

2.10.6 Causality between economic growth and bank lending

Nwaru & Okorontah (2014) examined the impact of banks on GDP and factors that prompt financial intermediation. The research was carried out in Nigeria for the period of 1985-2010. The econometric investigations are specified as follows:

$$LRGDPg_t = \alpha_0 + \alpha_{11} LRCPSg_t + \alpha_{12} LRTXPg_t + \varepsilon_t$$

$$LRCPSg_t = \alpha_0 + \alpha_{21} LRGDg_t + \alpha_{22} LRTXPg_t + \alpha_{23} LRFCIg_t + \varepsilon_t$$

Further:

$$LRGDPg = \log of\ real\ Gross\ Domestic\ Product$$

$$LRCPSg_t = \log of\ real\ private\ sector\ credit$$

$$LRTXPg_t = \log of\ reai\ total\ export$$

$$LRFCIg_t = \log of\ real\ foreign\ capital\ inflows$$

Cointegration tests were used to determine long-run and short-run relationships. The findings indicate that bank lending does not impact productive sectors in Nigeria. In addition, real output fosters financial development. However, the effect is not vice versa. Exports lack significance in pushing financial development. Financial sector growth was strongly dependent on inflows of foreign capital.

Okwu, Owolabi and Olanrewju (2013) determined the relationship between banking sector reforms and the growth of manufacturing output. They employed cointegration and Granger techniques with annual data from1970 to 2008. The following regression equation is determined.

$$MGDP = f(BF_t, LC_t, A_t)$$

where MGDP is the manufacturing output, BF is the banking reforms, LC is the lending capacity of the banks and A represents the conditioning variables determining invested capital productivity.

The findings revealed that the MGDP and FBF move in contrasting directions, meaning that no variable causes the other. The BF moves differently from the MGDP, and not one of the variables determines the other within the study period. There was evidence of the causal link between the MGDP and BF with the direction running from the MGDP to banking development. Alternatively, there is a bidirectional relationship.

Ndlovu (2013) explores the causal link between GDP and financial system development covering the period (1980-2006). The economic model used is as follows.

$$GDP_t = \sum_{i=1}^{n} \beta_i \, FD_{t-i} + \sum_{i=1}^{n} \lambda_i \, GDP_{t-i} + \delta_t$$

$$FD_t = \sum_{i=1}^{n} \mu_i \, FD_{t-i} + \sum_{i=1}^{n} \theta_i \, GDP_{t-i} + \varepsilon_t$$

where GDP is economic development and FD is financial system development.

The findings point to the existence of demand following financial growth. From economic growth to financial development, there is a unidirectional causality. The improved results suggest that demand exists in Zimbabwe as a result of financial development and that there is unidirectional causality from economic growth to financial development. The improvement in the financial system development was

necessitated by the pressure to make banks in the capital markets, innovativeness and hybrid financial instruments.

Al Fara (2012) investigates the role of the banking sector in funding Palestinian economic development between 1995 and 2011 (Carby, Craigwell, Wright, and Wood, 2012). The unit root test and cointegration test, as well as the Engle-Granger technique, were used in the analysis.

The econometric investigations are specified as follows:

$$GDP_t = AL^{\alpha}K^{\beta}BC^{\gamma}$$

$$BC_T = \beta_0 + \beta_1 GDP + \beta_2 POP + \beta_3 TDEP + \beta_4 RI + \beta_5 NB + \mu_t$$

where GDP is L is labour, K is capital and BC is bank credit.

The findings show a causal relationship between banking credit and gross domestic product, with each affecting the other. For example, if GDP increased by 1 percent, banking credit increased by 1.56 percent, whereas if bank credit increased by 1 percent, GDP increased by only 0.19 percent, indicating that credit has a positive impact on the economy. In addition, the research found that banking credit has a positive relationship with gross deposits, bank branches, and population but an inverse relationship with interest rates.

In Malawi, Simwaka (2012) investigates the causal relationship between financial development and economic growth over time (1980–2010). The autoregressive distributed lag (ARDL) method is used.

The econometric investigations are specified as follows:

$$g_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\, \Delta LRGDP_{t-i} + \sum_{i=1}^{p} \alpha_{2i} \Delta CU_{t-i} + \sum_{i=1}^{p} \alpha_{3i} \Delta fin_{t-i} + \beta_1 LRGDP_{t-1} + \beta_2 fin_{t-1} + \beta_3 CU_{t-1} + \gamma_{1t}$$

where Δ is the first-difference operator and γ is assumed to be a white-noise disturbance term. g_t is real GDP growth; *LRGDP* is the log of real GDP growth; and *fin* takes three different values, namely, the ratio of private sector credit to GDP (PGDP), the ratio of bank deposits to GDP (BGDP) and the ratio of private sector credit to total domestic credit (PDOM). *CU* is the capacity utilisation expressed as a proxy of the output gap and has been estimated by using the HP filter.

A long-term positive and significant association between financial development and economic growth was found. The results confirmed that economic growth promotes financial development with no feedback consequences.

Murty, Sailaja, and Demissie (2012) employed a multivariate Johansen cointegration approach to investigate the causations between bank loans and economic growth in Ethiopia. Time series data from 1971/72 to 2010/11 were employed, while the dependent variable real GDP growth was explained by bank credit to the private sector, bank deposit liabilities to GDP ratio, gross secondary school enrolment, consumer price index, final government consumption to GDP ratio, and trade openness (the ratio of exports and imports to GDP), with e representing a random error term.

The econometric investigations are specified as follows:

$$Y_t = A_t(K_t^d)^{\beta}(L_t)^{1-\beta}$$

$$y_t = \beta_0 + \beta_1 lnk_t^d + \beta_2 lnse + \beta_3 lnpc_t + \beta_4 lndp_t + \beta_5 lnp_t + \beta_6 lngc_t + \beta_7 lnop_t + \varepsilon_t$$

Time series data are estimated using a multivariate cointegration VAR econometric model. The results reveal that the long-run elasticity estimates are economically justifiable in terms of sign and size. The study's first major finding is that bank lending has a long-term impact on real GDP per worker due to its role in domestic capital accumulation, efficient resource allocation (efficiency), and total factor productivity.

Law and Singh (2014) and Samargandi, Fidrmuc and Ghosh (2015) employed the dynamic threshold model developed by Kremer, Bick, and Nautz (2013). This is an extension of the static model developed by Hansen. The evidence from their findings supported the hypothesis of excessive finance. In accordance with the excessive finance hypothesis, Bijlsma, Kool, and Non (2018) concurred that finance has a positive impact on economic growth that diminishes over time.

Assam, India, Hussain and Chakraborty (2012) empirically examined the relationship between financial development and economic growth, as well as their causality. Time series techniques are used to verify the data sets' stationary properties, followed by Johansen and Jesulius cointegration research to examine the long-term relationship between the two variables. Using time series data from 1985 to 2009, the researcher explored the relationship between Assam's financial development and economic growth (annual data sets). The study's variables are gross state domestic product (GSDP) and a financial development indicator (IFD), which includes (1) the number of

bank branches per thousand population (NB), (2) the ratio of outstanding credit of all the state's scheduled commercial banks to the various sectors, and (3) the ratio of outstanding credit of all the state's scheduled commercial banks to the various sectors. The econometric investigations are specified as follows:

$$F_j = W_{J1}Y_1 + W_{J2}Y_{2.} + \cdots + W_{JP}Y_P$$

where Wj s is the factor score coefficient and p is the number of variables. The study finds a cointegrating relationship between them. Furthermore, Granger causality tests suggest that financial development causes economic growth in the case of Assam.

2.10.7 Relationship between financial development and economic growth

Fosu (2013) examines the relationship between financial development and economic growth in twenty-eight African countries from 1975 to 2011. The Westerlund cointegration and GMM dynamic panel techniques are used to study the causal links between financial development and growth.

The econometric investigations are specified as follows:

$$Y_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 X_{it} + \alpha_{it} + \mu_{it}$$

where i and t denote country and time, respectively, Y is GDP per capita, FD is financial development, X is a vector of control variables, β measures the effect that financial development and the other factors have on economic growth, captures the country-specific effect that varies across individual countries and $\alpha_{it}$is the error μ_{it} term.

The findings suggest a long-term link between financial development and economic growth. When the banking sector's domestic credit is used as a proxy for financial development, it leads to economic growth. The findings suggest that financial development and economic growth are linked in both directions.

Yazdi and Khanalizadeh (2013) analysed the causal relationship between dynamic financial development, economic growth, and instability in Iran using annual time series from 1970 to 2011. In this study, we apply a time-series analysis (ARDL and Granger causality), and the econometric investigations are specified as follows:

$$GDP_t = f(FD_t, GC_t, INF_t, TR_t)$$

where GDP is a gross domestic product, FD is financial development, GC is General government final consumption expenditure (per cent of GDP), IFN is the inflation rate and TR is trade openness of the economy.

The model results imply that agricultural economic growth and financial development are bidirectionally related. Guttentag (2011) investigates the existence and direction of the causal relationship between financial development and economic growth in Bolivia using a time series approach and Grangercausality tests inside a cointegration and vector error correction model (VECM) framework. For this objective, a pentavariate vector autoregressive (VAR) system is created using annual data from 1962 to 2009. The model is estimated twice using the credit-to-private-sector-to-GDP ratio and the Money and Quasi-Money (M2)-to-GDP ratio as proxies for financial development. Economic growth is measured in terms of GDP per capita, and three nonfinancial elements are considered to adjust for omitted variable bias.

The econometric investigations are specified as follows:

$$X_{it} = \mu_1 + \rho_{11}X_{1t-1} + \rho_{12}X_{2t-1} + \varepsilon_{1t}$$

$$X_{2t} = \mu_2 + \rho_{21}X_{1t-1} + \rho_{22}X_{2t-1} + \varepsilon_{2t}$$

whereμ_1 and μ_2 are constant drifts, ρ is a set of parameters to be estimated, and ε_{1t} and ε_{2t} are residual terms with mean zero and constant variance.

The findings demonstrated that financial development indicators and economic growth have a consistent long-term relationship. The results show that the two models exhibit opposite causation patterns after controlling for a set of nonfinancial variables. There is evidence of a modest unidirectional Granger causality from loans to growth. There is also evidence that growth and M2 have a one-way causal relationship. However, the two proxies for financial development capture different characteristics of the financial system.

Demetriades and Hussein (1996) were the earlier studies to engage the time series approach and thus where this study anchors on. In a study of 30 countries, 14 of the 16 developing countries studied revealed a stable long-run relationship between real per capita GDP. However, considerable variations existed across countries. Bidirectional causality was evident in seven countries while reverse causality was unearthed in six countries.

Jordaan (2010) examines the connection between financial and economic development. Using cointegrated vector autoregression methods (VAR) and Granger causality, the causation between various economic factors in Botswana from 1977 to 2006 is investigated (VECM). As proxies for financial development, the study uses the

ratios of bank deposit liabilities to nominal nonmineral GDP (LNDEPLIAB) and credit extended to the private sector to nominal nonmineral GDP (LNPRIVGDP). Although most studies employ GDP-based proxies for financial development, this analysis looks at nonmineral GDP since, as previously mentioned, the mining sector in Botswana uses little credit.

The econometric investigations are specified as follows:

$$FINA_t = \alpha_0 + \alpha_1 GDP_t + \varepsilon_{1t}$$

$$GDP_t = \beta_0 + \alpha_1 FINA_t + \varepsilon_{2t}$$

The research shows evidence of both supply- and demand-side viewpoints. When the deposit liabilities to nonmineral GDP ratio is used as a proxy for financial development, the causality flows from financial development to economic growth, confirming Schumpeter's supply-leading perspective. When the ratio of private sector credit to nonmineral GDP is used as a proxy for financial development, the demand-leading approach is supported since causality runs from economic growth to financial development.

Egbetunde and Akinlo (2010) examined the long-term and causal relationship between financial development and economic growth in ten countries in Sub-Saharan Africa. The study covers the Central African Republic, Chad, Congo Republic, Gabon, Kenya, Nigeria, Sierra Leone, South Africa, eSwatini, and Zambia between 1980 and 2005. The vector error correction model (VECM) is employed. The ratio of real gross domestic product (GDP) to total population was used to calculate per capita real production in this study (denoted as Y). The ratio of broad money (M2) to GDP is used to gauge financial development (F). The ratio of total capital stock to total population

is used to calculate real per capita capital stock (abbreviated as K). The term "real interest rate" is defined as (R). The econometric investigations are specified as follows:

$$\Delta X_t = \mu + \sum_{i=1}^{\rho-1} \Gamma_i \Delta X_{t-i} + \pi X_{t-1} + \varepsilon_t$$

where X_t is an $(nx1)$ column vector of ρ variables, μ is an $(nx1)$ vector of constant terms, Γ and Π represent coefficient matrices, Δ is a difference operator, and $\varepsilon_t \sim N\,(0, \Sigma)$. The findings reveal that in the Central African Republic, the Congo Republic, Gabon, and Nigeria, financial development Granger causes economic growth, whereas in Zambia, economic growth Granger causes financial development. Kenya, Chad, South Africa, Sierra Leone, and Swaziland identified a bidirectional association between financial development and economic growth. The findings highlight the need to develop the financial sector through sound regulatory and macroeconomic policies. However, in Zambia, economic growth must be prioritised to push financial development.

2.10.8 Causality between economic growth and bank lending

Tariq, Khan, and Rahman (2020) utilised the static Hansen's threshold model for their Pakistan study. This was in response to Soedarmono, Hasan, and Arsyad (2017), who measured a threshold using the square of the private credit variable. Soedarmono et al. (2017) discovered that the effect of private credit is initially positive up to a particular threshold, which becomes negative. In contrast to the excessive finance hypothesis, Tariq et al. (2020) found that the impact of finance is initially negative but becomes positive once a certain threshold is reached. In a sample of 24 developed economies spanning 1923-2013, Swamy and Dharani (2019) embraced both the Hansen and

square term threshold models. They observed that the impact of finance on economic growth becomes negative beyond a threshold of 124 percent.

Ben-Naceur, De Groen and Ayadi (2013) explore the relationship between banking sector expansion and economic growth in northern and southern Mediterranean countries (Algeria, Egypt, Israel, Jordan, Lebanon, and Libya). Three of the world's most populous countries include Morocco, Palestine, and Syria. From 1985 to 2009, I worked in Tunisia and Turkey. Economic growth (Growth) is the dependent variable, which is defined as the log difference in real GDP per capita. The amount of bank credit to the private sector (as a percentage of GDP), the share of bank deposits (as a percentage of GDP), stock market capitalization (as a percentage of GDP), stock market total value traded (as a percentage of GDP), and stock market turnover (to measure stock market liquidity) are all included in this research.

The econometric studies with panel data are defined as follows:

$$\Delta log\ real\ GDP\ per\ capita_{i,t} = \alpha_0 + \gamma FD_{i,t} + \beta' X_{i,t} + \varepsilon_{i,t}$$

where FD is the financial development variables, *X* is a vector of control variables and *s* is the number of lag years.

The results are based on fixed effect panel regressions, but other estimators were also examined, including fixed effects with time dummies, random effects, and GMM models; nonetheless, fixed effects gave the most reliable results. The findings of the large sample demonstrate that credit to the private sector and bank deposits are negatively related to growth in numerous parameters, showing that the region has credit allocation concerns as well as weak financial regulation and oversight.

Maduka and Onwuka (2013) examined the long- and short-run relationships between financial structure and economic growth (covering 1970–2008) using time series data. The time series data were subjected to enhanced Dickey-Fuller and Philips–Perron tests to determine whether there was a unit root. The long-run relationship between the variables is estimated using Johansen and Juselius's (1990) maximum likelihood technique. In the short term, the dynamic coefficients are estimated using the vector error correction model. Their major findings, based on data from Nigeria, showed that financial market structure had a negative and significant impact on economic growth.

Popa and Andreea looked at the relationship between financial development and economic growth in Central and Eastern Europe (2013). All indicators of financial development include broad money growth (annual percent), domestic credit to the private sector (per cent GDP), domestic credit to the private sector (per cent GDP), annual growth, interest rate spread (lending rate minus deposit rate, percent), nonperforming loans (per cent total loans), and annual growth in GDP growth rates. We used a panel model for eight countries in Central and Eastern Europe from 1996 to 2011.

The econometric investigations with panel data are specified as follows:

$$GDP\ Cap_{i,t} = \beta + \alpha_{i,t}X_{i,t} + \delta_{i,t} + \gamma_{i,t} + \varepsilon_{i,t}$$

where GDP capita is the dependent variable and shows the real growth in country i at time t; β is the coefficient for the constant term; Xi, t is the vector of explanatory variables of the model; αi, t is the coefficient of explanatory variables (Nonperforming CR, Private credit, M2 growth, Interest rate spread); εi, t are error terms, random

variables; δi, t and γi, t are the values of cross-section or period-specific effects (random or fixed).

The main conclusions of the paper are that (1) increasing nonperforming loans and interest rate spreads has a negative impact on economic growth and (2) increasing domestic credit to the private sector has a negative impact on GDP growth but has a positive impact on GDP growth if the rate of growth is increased. (3) Wide money growth has a smaller impact on economic growth.

Taha, Anis, and Hassen (2013) used the approach of GMM estimation for dynamic panels to investigate the impact of banking intermediation on economic growth in ten countries in the MENA area from 1990 to 2009.

The econometric investigations with panel data are specified as follows:

$$Y_{i,t} = \alpha Y_{i,t-1} + \beta X_{i,t} + \mu_{i,t} + \varepsilon_{i,t}$$

where i and t index the country and year, respectively, X is the matrix of the control variables, $\mu_{i,t}$ represents the individual specific effects, and $\mathcal{E}$ is an error term.

The data show that all banking intermediation elements have a negative relationship with economic growth, while all banking intermediation variables have a positive relationship.

2.11 2.11 Sectoral allocation of credit

Many theorists and economists stressed that banks dominate the intermediary component of the financial system. They provide linkage for different competing sectors towards realising economic growth, a macroeconomic thrust of the

government. The financial role of the banking system affects capital allocation. This financial role influences savings by improving productivity and stimulating innovation and technical change and the economic growth rate (Sanusi, 2011). It has played a significant role in economic development (Sanusi, 2011). Banks act as intermediaries who stand between possessors of productive means and those who wish to form economic combinations for value addition and beneficiation. Therefore, banks promote the formation of new combinations and are the ephor of the exchange economy.

Some studies have focused on the sector-level effects of financial development. However, the majority of such studies conducted at the national level focused on a single sector. In Pakistan and Ukraine, Shahbaz, Shabbir, and Butt (2013) and Oliynk-Dunn (2017) examined the impact of private credit on the agriculture sector on economic growth and found it to be positive. Topcu and Coban (2017) supported the supply-leading hypothesis in their examination of the relationship between the financial sector and the industrial sector in Turkey and economic growth. In a recent study of 77 countries, Daway-Ducanes and Gochoco-Bautista (2019) discovered a nonlinear relationship between the service and manufacturing sectors, with finance contributing positively to economic growth after a certain threshold is reached.

In Sub-Saharan Africa, various indicators have been examined at the national and cross-national levels (Ho and Iyke, 2020; Elijah and Hamza, 2019). (An, Zou and Kargbo 2020; Walle, 2014). Most findings indicate that finance has a positive aggregate relationship with economic growth. Some studies also examined the potential causal relationship between aggregate credit and economic growth. Among them are Aluko, Adeyeye, and Oladele (2020) and Okunlola, Masade, Lukman, and

Abiodun (2020). Their outcomes were variable. Moreover, other authors continued investigating nonlinear interactions (Taiwo, 2020; Ibrahim & Alagidede, 2018). The majority of studies, however, focused on the effect of aggregate finance on growth. As a result, there is scant evidence as to whether the impact of sectoral credit may vary across economic sectors. Notable exceptions include Ogbonna, Mobosi, and Ugwuoke (2020), who disaggregated their growth measure into classes of oil and nonoil effects, and Asaleye, Adama, and Ogunjobi (2018), who only examined the influence of credit on manufacturing sector on economic growth in Nigeria.

The nexus between sectoral credit allocation and its effects is not new (Bezemer, 2014). Not all-sectoral capital is linked directly to productivity growth. Thus, the channels from credit to growth are tailored to expedite divergence of their multiplier coefficients. In contemporary financial development studies, however, this differential credit expansion and performance was neglected. Scholars of finance literature suggest that institutional structural reforms can advance resource provision and improve productivity volume, that is, structural change into higher-productivity sectors and improve financial allocation to individual sectors (Dabla-Norris *et al.*, 2013).

Beck, Buyukkarabacak, Rioja and Valev (2012), in a ground-breaking cross-country study, found that household credit or consumptive loans are costly to the economy. This was also confirmed by Bezemer *et al.* (2016). Additionally, Jappelli *et al.* (2008) collected microcredit data for the United Kingdom, United States, and German economies. The observation was that household loans led to the crisis of insolvencies, bankruptcy, default, and arrears (Jappelli *et al.*, 2008). Household credit was noted to have a negative role on GDP, destroying the growth potential of the economy

(Buyukkarabacak and Valev 2010). Sutherland *et al.* (2012) noted that recession possibilities also increase when household debt rises above the trend.

Rodrick (2008) documents the effect of sectoral credit allocation on economic performance. He concludes that credit resource rationalisation into the production of tradable goods causes this connection (Rodrick, 2008). Additionally, McMillan and Rodrick (2011) suggest that an alteration of productive capital resources into comparatively less productive sectors stifles growth. The study concluded that reallocation of credit out of the manufacturing sector slows down both output and productivity. The key novelty of the study was how the portion of productive capital allocated to the manufacturing sector performs. Each economy takes varied fundamentals that support or compromise the efficiency of capital and, eventually, the much-needed growth.

It is difficult for any economy, particularly developing economies, to realise visible growth and development without efficient and vibrant financial institutions. The objective of credit distribution is to stimulate sectors to make a joint contribution to the general growth rate of an economy. Sectors with a greater influence on the population and high employment sectors, such as industry, mining, and agriculture, lead to a better and growing economy in a country (Akpansung and Babalola, 2012). Wade (1990) argued that Taiwan's economic success was anchored on a sound distribution of credit to productive sectors. The control of how bank credit is distributed has played a recommendable role in boosting Japan, Korea, Taiwan, Japan, India, Indonesia, Malaysia, and Thailand's economies (Eastwood and Kohli 1997). Banks allocate credit in many ways to credit destinations, as this section seeks to explore.

According to the Central Bank of Nigeria (2003), financial resources and their equivalents advanced by the banking sector make up bank lending. Through bank lending, savings are channelled into high-yield investments to promote output. Bank lending has a fundamental responsibility of allocating funds to destinations of maximum utilisation. Therefore, credit access supports the character of intermediation to be conducted, which is important for output growth in the country. If these economies rely on bank credit for productive capital, banks are expected to channel financial resources towards productive sectors. As a result, extending credit towards weak sectors compromises both economic growth and the sustainability of the financial sector.

Using sectoral panel data for Kenya, Were *et al.* (2012) investigated the influence of accessibility to bank loans and credit of key sectors on economic performance. The authors found a positive relationship between credit access and real value added sectoral gross domestic product (Were *et al.*, 2012). The authors found that provisional access to capital by key sectors embraces great prospects for encouraging sectoral growth. Despite the conclusions, sector performance varies across countries or time. No sector has a unanimous conclusion that it fosters economic growth. An economy might be sector-based, yet that sector might not be necessarily statistically significant in explaining the growth. However, the relationship between sectoral credit allocation to key sectors and economic growth is not explored extensively in the Zimbabwean setting. This is a knowledge gap that this study seeks to fill.

From the finance literature, evidence on the impact of the sectoral allocation of credit and economic development is sparse and inconclusive. Only a few studies have analysed the relationship in the subject matter in Nigeria, the USA, and some limited

countries in Europe. However, their focus was on individual sectors such as agriculture, manufacturing, industrial performance, or production. This study is thus sensible and significant principally given the widespread distribution of loans across a range of sectors. To my understanding, no study has been conducted with the same line of thought in Zimbabwe. Therefore, the insights drawn after this scrutiny afford a sound foundation for determining future strategies and policy frameworks to improve Zimbabwean sustainable growth.

2.12 Time series methodology

It is difficult to establish cross-country data causality, as only average effects are considered in the analysis. However, this is practical, assuming the effects uphold notable constancy across countries. Objectively, this is contrary, as outliers are common in cross-country regressions. From a policy perspective, the results for nonoutliers' economies would be meaningless. These gross difficulties led this study to be examined using the time series approach. This approach supports using individual country statistical data with statistical appropriateness in procedure execution. It is accommodative in examining cointegration and the existence of both the long-run and short-run relationships between variables, not ignoring the causality inherent in those variables. Limitations exist, however, which are worth discussing.

The data set at my disposal is not enough to guarantee an extremely high degree of confidence in the estimates. Ideally, a season of at least 100 years would establish a high degree of confidence. Such data range, however, is rare to be at many countries' disposal because of shifting statistical procedures, lack of foresight and incompetence in administering such data. Additionally, the statistical procedures may be strictly

difficult to compare over time. Nonetheless, it is now possible to use monthly data to increase the reliability of the estimates.

Accordingly, considering time series studies, specified countries ought to be studied individually, as one size does not fit all in sight of bank lending decisions and growth relationships. Thus, it remains unclear to draw out reliable policy implications from the panel or the cross-country regressions. Conclusions drawn from the time series for specific countries cannot be generalised easily. It may be possible to use panels with increasing data availability with an average of over ten years instead of five, which is the generally preferred minimum. Therefore, confidence from the time series results would be both reasonable and acceptable. Meanwhile, to advance and strengthen the confidence and guarantee further work in this field is needed.

2.13 Cross-country, country-specific evidence and impact evaluations

Using a macro econometric model, agricultural credit significantly led to export growth in Nigeria. Anthony (2010) found that for the period 1986-2007 under study. Following this study, Tawose (2012) discovered that credit had a long-run relationship with industrial performance using error correction and cointegration techniques. The study covers the period from 1975 to 2009. In the short term, credit had no effect on growth. This conflicting evidence results in need to examine the Zimbabwean market to generate commensurate policies. Most of the studies were conducted with a specific reference to the sector in relation to economic growth. This study nevertheless determines the impact of many sectors on economic growth.

Akujuobi and Chimaijer (2012) found a connection between credit allocated to the production sector and the general upsurge rate of the economy. The study used the

OLS method of estimation covering the period 1960-2008. The subsectors of quarrying and mining made a significant contribution to economic growth. This author's work is in tandem with this study. Although the authors focus on production in relation to economic growth, they have bundled several sectors into production. What distinguishes this study from previous studies is its treatment of sectors. Bundling sectors together ignore the significance of each sector in explaining the dependent variable.

Nnamdi and Omojefe (2014) analysed the link in the role of private sector credit on economic growth and the corresponding causal directions using the Autoregressive Distributed Lag Bound (ARDL) and the Granger causality, respectively. The events pointed to a positive correlation between the two. However, the causal direction was not significant. Additionally, there was a positive contribution between credit by commercial banks and economic growth in Nigeria in a study carried out by Ogege and Shiro (2013). The study covered the period 1974-2010 using cointegration and the error correlation model. Yakubu and Affoi (2014) noted that bank credit was responsible for driving the economy forward in Nigeria between 1992 and 2012.

In a Latin American state, Trinadad and Tobago, Avinash and Mitchell-Ryan (2009) ascertain the correlation between credit and investment. The study noted a demand-following then supply-leading relationship in successive tests in the key sectors of the economy between 1960 and 1995. The study adopted the vector error correction model (VECM). Nazmi (2005) concluded that market liberalisation and financial deepening apt borrowing agents to boost production thereby by promoting economic expansion. Consensus seldom exists, however, on the reliability of cross-country analytical approaches. Therefore, the time-series approach adopted in this study

would be ideal. Demetriades and Hussein (1996) and Arestis and Demetriades (1997) found weaknesses in the cross-country approach because of the extreme positions of countries. Relying on country sample averages may not clearly explain a true impact of the variables on economic growth. Bell and Roussea (2000) discovered that pursuing an exclusive investigation between credit allocation and economic growth for countries such as Zimbabwe instead of adopting cross-sectional statistics is more reliable. Findings from such a study echo institutional structures and prevailing political and economic conditions (Bell and Roussea (2000), Arestis and Demetriades (1997)). According to Demeriades and Andrianova (2004), the time series analytical approach comes with the operation of statistical procedures concerning causality between the regressors and the regressing variables in both the short term and long run. Additionally, time series allows the appropriate use of cointegration to examine the longevity of the connection.

Toby and Peterside (2014) recommended an increase in the credit allocated to real sectors of the economy in Nigeria to grow the economy following a study in which banks finance manufacturing and agriculture sectors. Abou-Zeinab (2013) shows that the banking sector has improved the economy of Sweden by expanding credit to the trade and services sectors. The study was conducted covering the period 1736-2012 on patterns of credit allocation and economic growth.

Chinweoke, Egwu and Nwabeke (2015) examined the effect of Nigeria's agriculture and manufacturing credit on economic growth covering the period 1994-2013. The research using OLS concludes that the sectors are statistically significant in propelling the expansion of the economy. Therefore, these sectors' performances are economical for the growth of the general economy. This study uses the OLS technique

as a method of estimation. However, from the various methodologies employed above to ascertain the impact of the sectoral allocation of credit on economic growth, there is no conclusion of the best technique. The OLS technique was used above, but the results cannot leave a general conclusion. Under a study for the period of 1994-2013 using the OLS, the technique gave a positive and significant relationship between agriculture and manufacturing in relation to economic growth. However, another study on the impact of production on economic growth found no significance.

In examining the nexus between the effect of credit allocation and economic growth from various authors, many empirical, analytical approaches are employed. The approaches incorporate the cross-country growth regression used by King and Levine (1993), the panel technique used by Rioja and Valev (2003) and the time series employed by Diametriades and Hussein (1996).

From the empirical works, divergent conclusions were drawn based on different techniques. Rousseau and Wachtel (2000), Ang (2008), and Singh (2008) have all come up with different conclusions. The divergence of opinions and the inconclusive nature of the theoretical and empirical studies have been noted earlier. Therefore, this sets the basis for further investigation of the impact of sectoral allocation credit decisions on economic growth in Zimbabwe under the new monetary system of multicurrency covering the period 2010 to 2021. It is also necessary to discuss the financial indicators commonly used to understand the relationship between finance and economic growth. The following section thus presents a discussion of such indicators.

2.14 Analysis of financial indicators as proxies

Most research has been facing the fundamental problem of empirics and theory running parallel. They are comparatively disconnected. In a bid to improve the functions of the banking sector towards spurring economic growth, the theory focuses on data limitations and financial system efficiency, but empirics centre on financial size and profundity. Therefore, the findings of most studies that focus on economic growth can casually be labelled exaggerated or factually not true.

The monetary aggregates used in most research place weight on the financial system that can provide more liquidity as more efficient in its intermediary role. Economies that have limited liquidity, however, are less discussed or included in most studies. Some economies have operated without their own currencies, which makes them less liquid in pursuing their national objectives. This exceptional scenario has not been considered in previous research.

The growing convergence of financial development as measured by a ratio of credit in relation to GDP, is growing in many economies. The major challenge with this proxy, however, is that countries are always at various stages of growth, and comparisons should be of countries of similar economic growth stages. Trew (2006) also confirmed this observation.

The trend of the research on financial development has failed to distinguish between corporate loans and household or consumer loans. The major notable differentiation is in government or private sector loans. This inadequacy makes it difficult to make a fair analysis or conclusion on the exact area where productivity is genuinely generated. Beck *et al.* (2008) is an exception, as he differentiated corporate loans and consumer

loans in his study. It is also noted that private credit ignores government loans and public entities. Credit to the private sector as a proxy of bank efficiency is not adequate. It does not expose the efficiency of the banking sector and the portfolio sectors themselves, hence the need to explore credit allocation as a consolidated parameter.

Countries that have limited or no data are ignored in most studies, more precisely developing economies. A syndrome of bias seems to exist in studying economies of the developed world or those with available data. The mere inclusion of developing nations might distort the presented findings. As a result, it becomes crucial to play no ignorance to such marginalised countries. Tapping into such countries and individually studying them for ground-breaking is necessary. Socialist countries have been excluded in most research examining an expanded number of countries.

Financial development indicators are linked with investment and/or total factor productivity. Unfortunately, investment indicators differ from total factor productivity indicators, and their correlation also differs. Indicators that encourage investment are unique. Investment is necessary to stimulate growth. Quantity as a general measure of credit to the credit sector might be outweighed by quality (efficiency in resource allocation) in a greater thrust to resuscitate the dwindling economy. The banking quality channel contributes sufficiently more than the quantity does. Modern research should centre on financial system efficiency instead of financial deepening.

Demetriades and Law (2006) explored institutional quality indicators. The notable findings point out that long-term economic growth in low-income countries is determined robustly by institutional quality. The anticipated economic growth is weakened substantially and stagnated by the inferior quality of institutional operations.

Improvements in the quality of service or decisions interacted by the financial system are proposed to deliver many positive effects to economic growth rather than finance itself. China is an important example of such a case. It neither has a well-developed finance system nor its law but has grown drastically because of the quality of its decisions in channeling resources to more productive sectors ahead of consumption. Banks have a stewardship role for the entire nation on financial matters. Such stewardship is the same in the biblical context of Matthew 25 verses 14-30, where a Master entrusted his wealth to his three servants. The Master wanted them to put his treasures in the most productive and profitable avenues, as explained in verse 27. Likewise, the nation has entrusted the banking sector to allocate the national treasures to investable projects that would generate interest for the depositors, the banks themselves, the borrower, and the country at large. It is not the volume of the funds but the quality of investment by such banks that matters for economic growth.

Furthermore, the lack of distinction between investment (productive) loans and consumer loans in the financial development literature makes it difficult to develop fair and reasonable policy advice. The differentiation between consumer loans and productive loans is imperative, as also supported by Beck *et al.* (2008). It is the credit channelled to productive and profitable enterprises that positively impacts economic growth and not to households.

Empirical research has not clarified the intermediary importance of the banking sector for economic growth. Therefore, it is key to realise why some countries' economies are spurred by their finance systems while others fail. It is crucial, therefore, to determine whether the banking sector allocative decisions of financial resources are significant in explaining economic growth and under what circumstances economic

growth can be boosted. This study shifts the attention by changing the sample country from previous studies. This is unlike previous studies and choosing between the long run and short run of such lending decisions.

2.15 The trend of bank credit to the private sector in Zimbabwe

A sizeable portion of loans and advances is availed through the aid of the commercial banking system. However, other supplementary institutions exist, such as credit cooperative houses, savings banks, building societies, microfinance, and money lending institutions. The latter, however, were excluded from the study because of limited availability of time series data. Thus, only commercial bank credit to the private sector would be considered in this study.

Available data show that from the beginning of the study period, overall domestic credit has been increasing before it starts to decrease, as shown in Table 2.1. Priority sectors such as mining and construction received less domestic credit in comparison with other sectors, yet the consumption sector is among the top beneficiaries in the loan portfolio.

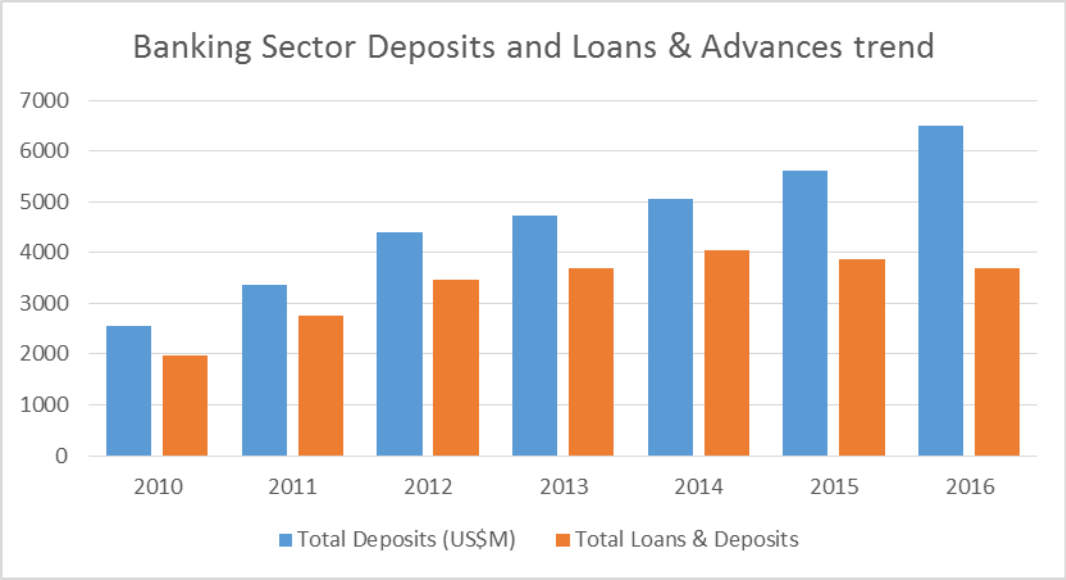
Table 2. 1: Sectoral Credit to Domestic economy as a percentage of deposits

Year	Agriculture	Construction	Distribution	Fin Firms	Manufacturing	Mining	Services	Transport	Individual	Others
2010	22	2	20		20	7	10	2.9	8	8.1
2011	16.32	4.17	16.9	1.84	18.08	6.42	15.21	3.04	15.81	2.21
2012	19	2	17		18	9	11	3.2	16	4.8
2013	15.12	3.69	6.84	2.54	15.03	4.97	18.42	1.79	23.8	7.8
2014	18	1	12	1	25	5	2	4	21	11
2015	16.36	0.92	12.8	2.5	24.31	4.34	1.24	2.49	24.28	10.76
2016	16.7	3.54	15.39	2.11	10.43	4.88	14.93	1.67	28.77	1.58
2017	12.3	1.9	11.3	2.7	11	13.1	14.3	0.8	18.4	14.2
2018	15.34	13.16	0.91	8.29	17.29	3.18	2.12	1.35	18.6	7.76
2019	16.34	11.12	10.52	1.78	7.68	3.52	15.33	1.06	17.75	6.24
2020	26.97	0.46	8.21	3.84	13.69	11.21	6.08	0.75	22.51	0.73
2021	27.97	0.54	11.84	10.89	12.12	9.62	7.09	1.98	14.75	2.69

Source: RBZ Monetary policy statements (2010-2021)

Against the backdrop of expanding depositor confidence, total bank deposits exhibited an upwards trend from 2010 to 2016. In concordance with a growing deposit base, total domestic credit expanded from US$1984.76 m in 2010 to US$4060 M in 2014 before a gradual decrease in the following years.

Figure 2. 6: Banking sector deposits and Loans & Advances trend (A snapshort)



Source: RBZ Monetary policy statements (2010-2021)

The ratio of credit to the private sector in relation to GDP in Zimbabwe has not significantly increased over the study period. The Zimbabwean banking sector witnessed massive changes from 2003 to 2009. Several banks closed due to high nonperforming loans (NPLs), poor corporate governance, high insider trading, and portfolio overconcentration, among other ills. This has led the government, through the bank regulator, to spearhead the resuscitation of the economy through efficient operationalisation of banks. Targeted focus points (sectors) were identified where priority lending was to be directed, although limits were also pegged to manage overexposure in such sectors. These reforms led to the discouragement of mostly consumptive credit. A substantial increase in credit to the private sector as a percentage of GDP emerged after such reforms were implemented in 2009. The economic growth rate remains low in Zimbabwe, averaging 4 per cent due to low credit

growth. To stimulate economic progress, credit should be increased to profitable sectors.

However, many unconducive demand-side factors exist that hinder the quick recovery of the economy. Factors such as investment policies, interest rates, political and economic situations, and the state of infrastructure and governance issues limit the anticipated demand and growth of credit to the private sector.

2.16 Chapter Summary

In summary, volumes of literature exist, empirically explaining the relationship between the role of lending decisions and economic growth utilising varied methodologies, different indicators, and different data sets. From the literature, a relationship between lending decisions and economic growth as measured by either a positive or negative relationship is established. Less known, however, is the nature of the relationship and its corresponding size. Less is known about the causal nature of the relationship between the role of lending decisions to economic sectors and economic growth. This, therefore, calls for further econometric research to establish with a reasonable degree of confidence that lending decisions lead to economic progress in countries. Meanwhile, some findings depict reverse causality since one-size-fits-all does not always hold. The results cannot be dismissed as countries go through diverse circumstances in their political, social, economic, and technological spheres, all of which hold diverse implications on the general economic headway of a country. Severe bents of banking and economic instability have caused many economies to yield varying results. This is not coincidental, and it is problematic. Financial market imperfections, government roles, institutional infrastructure, and supervisory policies,

among others, settle sound theoretical reasons to accept it. The next chapter discusses the research objectives and the methodology of this study.

3 CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the objectives and the methodology of the study. It is divided into several sections. The first part is the introductory section, followed by the research objectives, research questions, research hypotheses, research philosophy, research approach, data collection method and data sources. Further, the chapter discusses in details the appropriate techniques, aims, questions, and hypothesis of the study. This chapter outlines the research design, empirical model, definition, and justification of variables and the diagnostic tests carried out. Diagnostic tests included the Engle-Granger cointegration test and stationarity tests, such as the Dickey-Fuller and Phillips-Perron test. In this chapter, some drawbacks of the Engle-Granger approach and the strength of the vector autoregressive (VAR) model are discussed in detail.

This study's model considers Johansen's cointegration test and uses the appropriate lag duration for the variables. VAR and vector error correction models (VECMs) are used to achieve the study's aims. The application of the impulse response and variance decomposition is beneficial in discussing error correction and dynamic analysis. The research goals are stated in the following section. The focus then shifts to test selection, with the rationale for this decision addressed in detail.

3.2 Research Hypotheses

Following a thorough analysis of previous research, several expectations have been generated. This section details the hypotheses.

The null hypotheses for the first research question are stated as follows:

H_{101}:*No long-run (LR) significant relationship exists between GDP and loan allocations to the agriculture sector.*

H_{102}:*No LR significant relationship exists between GDP and loan allocations to the financial sector.*

H_{103}:*No LR significant relationship exists between GDP and loan allocations to the manufacturing sector.*

H_{104}:*No LR significant relationship exists between GDP and loan allocations to the mining sector.*

H_{105}:*No LR significant relationship exists between GDP and loan allocations to the individuals.*

H_{106}:*No LR significant relationship exists between GDP and loan allocations to the other sectors.*

The alternative hypotheses of the first research question are stated as follows:

H_{111}:*A long-term (LT) significant relationship exists between GDP and loan allocations to the agriculture sector.*

H_{112}:*LT significant relationship exist between GDP and loan allocations to financial sector.*

H_{113}:*A significant LT relationship exists between GDP and loan allocations to the manufacturing sector.*

H_{114}:*LT a significant relationship exists between GDP and loan allocations to the mining sector.*

H_{115}:*LT significant relationship exist between GDP and loan allocations to individuals.*

H_{116}:*LT significant relationship exist between GDP and loan allocations to other sectors.*

These hypotheses are tested on all sectors versus GDP. Many studies revealed a short-run connection between GDP and sectoral bank lending (Nasir, 2014; Simwaka, 2012; Ekone, 2010). However, other researchers, such as Carby et al. (2012), Ndlovu (2013), and Simwaka (2012), showed proof of a long-run association between GDP and sectoral bank lending.

The null hypotheses for the second research question were stated as follows:

H_{201}: *There is a substantial causality association between GDP and loan allocations to the agriculture sector.*

H_{202}: *There is a substantial causality association between GDP and loan allocations to the financial sector.*

H_{203}: *There is a substantial causality association between GDP and loan allocations to the manufacturing sector.*

H_{204}: *There is a substantial causality association between GDP and loan allocations to the mining sector.*

H_{205}: *There is a substantial causality association between GDP and loan allocations to individuals.*

H_{206}: *There is a substantial causality association between GDP and loan allocations to the other sectors.*

The alternative hypotheses for the second research question are stated as follows:

H_{211}: *No substantial causality association exists between GDP and loan allocations to the agriculture sector.*

H_{212}: *No substantial causality association exists between GDP and loan allocations to the financial sector.*

H_{213}: *No substantial causality association exists between GDP and loan allocations to the manufacturing sector.*

H_{214}: *No substantial causality association exists between GDP and loan allocations to the mining sector.*

H_{215}: *No substantial causality association exists between GDP and loan allocations to individuals.*

H_{216}: *No significant causality association exists between GDP and loan allocations to the other sectors.*

According to the reviewed literature, that is, Schumpeter Theory and Solow growth models, causal association is evident between sectoral loan allocations and economic growth, but there was no agreement on the direction of causality.

H_{301}: *GDP and loan allocations to the agriculture sector have a good predictive ability for the future of Zimbabwe.*

H_{302}*: GDP and loan allocations to the financial sector have a good predictive ability for the future of Zimbabwe.*

H_{303}*: GDP and loan allocations to the manufacturing sector have a good predictive ability for the future of Zimbabwe.*

H_{304}*: GDP and loan allocations to the mining sector have a good predictive ability for the future of Zimbabwe.*

H_{305}*: GDP and loan allocations to individuals have a good predictive ability in the future of Zimbabwe.*

H_{306}*: GDP and loan allocations to other sectors have a noble projecting ability in the future of Zimbabwe.*

The alternative hypotheses of the third research question are stated as follows:

H_{301}*: GDP and loan allocations to the agriculture sector have no good predictive ability in the future of Zimbabwe.*

H_{302}*: GDP and loan allocations to the financial sector have no good predictive ability in the future of Zimbabwe.*

H_{303}*: GDP and loan allocations to the manufacturing sector have no good predictive ability in the future of Zimbabwe.*

H_{304}*: GDP and loan allocations to the mining sector have no good predictive ability in the future of Zimbabwe.*

H_{305}*: GDP and loan allocations to individuals have no good predictive ability for future Zimbabwe.*

H_{306}*: GDP and loan allocations to other sectors have no good predictive ability in the future of Zimbabwe.*

3.3 Research philosophy

The research methodology is primarily determined by the research philosophy of the study. It is important to know how the researcher acquired the knowledge about a phenomenon and how he applied that phenomenon to a reality. Eventually, such information helps in crafting how the research would be piloted, including data collection. Research design assumptions can be deduced from positivism and phenomenology philosophies (Collins and Hussey, 2009).

3.3.1 Positivism

Sekaran and Bougie (2013) and Frankfort-Nachmias (2014) described the positivism approach as founded on both scientific and quantitative approaches. This philosophy is commonly used on matters of business, economics, and management. The main thrust of this philosophy is to do with investigative relationships and causal laws (Abgalia, 2011).

Remenyi, Wouldiams, Money and Swartz (1998) pointed out that a study of an observable population sample can produce a workable theory or generalisation that is close to tally with the findings of observing the physical, natural, or scientific reality.

The implication of the argument is that there exists independence between researchers and what they researched. Researchers should be well acquainted with what they ought to study, the processes, data collection techniques, methodologies, and data analysis work. Consequently, the researcher should set up a large and appropriate sample size, fit for generalisation of findings thereafter. Reasonable conclusions cannot be drawn appropriately from a small sample size due to its insufficient representation (Easterby-Smith et al., 2002).

Deductive and hypothesis analysis formulate the determination of the causal explanations. Positivism operates by reduction, which is breaking problems into researchable units instead of holistic view analysis. This idea was also seconded by Lewis, Thornhill, and Saunders (2009), who highlighted that a large sample calls for great attention to the formulation and administration of structural methodology and scientific and statistical analysis.

Table 3. 1: Research Implication of Positivism

Implication	**Description of Implications**
Methodological	Operates only on quantitative research. Scientific laws and generalisations are a preserve of quantitative research only.
Value-freedom	Human experience, preferences, beliefs, and interests are not the determinants of the choice of the area of study and

	how to carry out the research but should be based on objective.
Causality	Operates where there are at least two variables. The main objective is to establish the causal link and fundamental laws responsible for explaining behaviour in business, economics, and management faculties.
Deduction	Proposed hypotheses are founded on a process of logical deduction.
Operationalisation	There is need or breaking down of the variables under study in a way that permits quantitative measurements of facts
Independence	The researcher functions independently of the subject matter being examined.
Reductionism	The approach highlights that a holistic problem is better understood when it is broken down into sample elements, variables, or concepts.

Source: Johnson and Duberley (2000)

Table 3.1 shows the features accredited to the positivistic approach. Taking cognisance of the above, the current study is pursued under the same philosophy. The founding reasons for carrying out this study under positivism are highlighted as follows.

- ✓ A review of theories related to bank lending and economic growth was performed.
- ✓ The research hypotheses were stated.
- ✓ The theoretical framework was proposed
- ✓ The statistical tests for data analysis were determined.
- ✓ Determination of the time series analysis. The data adopted the time series simple regression, VAR and VECM models, including autoregression, and this time series analysis was determined. A simple time series regression, vector autoregression (VAR) and vector error correction models were applied in the model.

3.4 Phenomenology

Cohen and Manion (1987) defined phenomenology as a theoretical advocate of the human experiences compiled at face value. The facts show that a human's behaviour springs from historical experiences instead of the physically, objective or externally described reality (Fellows and Liu, 2015). The model aims to tell how people can make meaningful contributions in decision making from their own experiences. The human experience is believed to be purposive and meaningful. Gill and Johnson (2010) concurred that historical experiences are a more meaningful reality than the environment, social structures, or economic stimuli. Similarly, it is important for researchers to account for human experiences rather than solely considering causal

relationships and laws (Johnson and Duberley, 2000). Contrary to the positivism approach, this model is anchored on reductionism, which is, splitting the problem into simple researchable units. Remenyi *et al.* (1998) pointed out that such simple units are then examined to generalise the entire problem. The findings of the sectoral interactions with economic growth can be used to generalise whether the banking sector plays a role in spearheading economic growth.

Unlike in the positivism model, Lewis, Thornhill and Saunders (2009) assert that statistical generalisation is of less importance in phenomenology. They argued that each research carries its own characteristics, which cannot be randomly generalised for other cases. However, this research is built on time series enquiry; hence, the phenomenology approach cannot be adopted for this study.

3.5 Research design

The researcher has adopted several variables to be examined for their interaction with one another and GDP. The research design was meant to explain why certain outcomes are realised. Furthermore, the adopted research design was spearheaded because of its compatibility with the design of tests that support hypotheses and provide evidence of validity or nullity. Explanatory design is not limited to the above but also explains the reasons behind a certain phenomenon or theory. In this regard, the researcher adopted this design to explain financial theory related to the allotment of funds to specific uses, using the hypothesis in chapter 1 and designing statistical tests to authenticate the hypothesis.

3.6 Research methods

3.6.1 Quantitative research method

A quantitative research method was found to be appropriate for articulating a positive research philosophy. Moreover, the study was based on a large amount of monthly historical data from sectoral credit allocations across pressing needs for the period 2010–2021. In all fairness, quantitative research methods are most appropriate. The conducting of an economic or social research usually implies the application of quantitative research methods, which is attributed to the positivist research paradigm. The application of this method stimulates the explanation of the casual relationships. The method is materially objective in nature. The findings can be easily tabulated to draw conclusions and test hypotheses drawn based on existing theories (Zikmund, 2000).

3.7 Research approach

3.7.1 Inductive approach

An inductive approach is adopted for the purpose of condensing the collected raw data into a summary format. The approach establishes the relationship between the research objectives and the data findings. This fosters the development of a framework that reveals the inherent implications of the structure as evident in the raw data. The approach lays out simple and easy systematic procedures warranting reliable and valid findings that imply a more formulated data analysis. The inductive approach is not founded on known theories or patterns that have yet to be tested. New

theses or theories originate or are formulated with extra care based on observed patterns (Lodico et al., 2010, p. 10)

3.7.2 Deductive Approach

The deductive approach involves reasoning from a specific theory, extrapolating it and establishing a research strategy for the testing of the hypothesis. The approach relies on an established theory that only then is used to relate to a hypothesis being developed. A deductive test is used in any scenario where the causal relationship is implied by an already established theory to test for each existing relationship whether the decisions employed by financial institutions in criteria to allocate credit among sectors have an economic effect on the growth performance of the country. A deductive approach is fundamental in testing particular theories and patterns based on the association between the allocated financial resources and economic sectors and Zimbabwe's gross domestic product performance. The researcher set up hypotheses to test and validate them in this study.

3.8 Data source

This study depends on empirical data obtained from the RBZ monthly bulletin reports, online journals, RBZ statistical bulletins, Zimstats, Ministry of Finance and Economic Development. The trustworthiness of the data collected was established on the consistency of the statistical values and facts from the multiple data sources.

To address the research objectives, a quantitative analysis research design was embraced. The research made use of secondary data collected from January 2010 to December 2021 and consisted of monthly observations per variable. The thrust of this study was to analyse the sectoral credit decisions by lending institutions in relation to

economic growth in the bedrock of a multicurrency system in play. The focus is to identify whether the adoption of the multicurrency regime was ever helpful to economic reconstruction considering resource distribution across competing sectors. The sectoral allocation data and economic growth pattern were obtained from the RBZ and the Zimbabwe Statistical offices (Zimstats). The statistical models were preferred, as they present an objective approach to risk measurement and management, hence creating a firm foundation for economic policy crafting or realignment. Statistical models can be validated and improved over time as more data are gathered (Wu, 2008).

3.9 Explanatory Data Analysis

To gain valuable insight into the data set, the researcher extracted important variables and their patterns. Graphical and descriptive statistics are the most commonly used techniques in this section. It is imperatively common in social studies to take the natural logarithms (Nyangoro 2013). The variables are estimated in their natural logarithms to interpret both the first difference growth rates and the long-term elasticities through the coefficient of cointegration vectors. To ascertain the normality of the data distributional set, the Jarque-Bera (1980) test was conducted. The sectors of the economy that benefited from the credit portfolio became the independent variables tested in relation to GDP, which has been considered the dependent variable.

3.10 Descriptive Statistics

The data for the credit analysis as well as statistical features in relation to the series are presented. For a better appreciation of the type of the data and the implications of such order are described thereof.

3.10.1 Skewness

For $X_1, X_2 \ldots\ldots X_N$ **univariate** data series is calculated as follows.

$$Skewness = = \frac{\sum_{t=1}^{J}(Xi - m)^3}{(J-1)S^3}$$

where *m*, s, X_i and J represent the mean, standard deviation, data points and number of data points, respectively. Skewness is 0 in a normally distributed data series. Asymmetry in the data series is shown by negative or positive skewness.

3.10.2 Kurtosis

In measuring the flatness or skewness of time series data in relation to the normal distribution, kurtosis is used. High kurtosis data series have heavy tails and peak near the mean, while a low peak (flat top) is a characteristic of low kurtosis.

Kurtosis for the univariate data is computed as follows.

$$Kurtosis = \frac{\sum_{t=1}^{J}(Xi - m)^4}{(J-1)S^4}$$

where m, s, and J are the mean, standard deviation, and number of data points, respectively. The apriori shows that skewness and kurtosis must fulfil a normal distribution. Kurtosis is 3 where data series are normally distributed. The skewness of the data series is described by a kurtosis statistic greater than 3, while its flatness is

reflected by less than 3 series. This can be linearly portrayed as $3 < k < 3$, respectively.

The excess kurtosis is portrayed as follows.

$$Excess\ kurtosis = \frac{\sum_{t=1}^{J}(Xi - m)^4}{(J-1)S^4} - 3$$

3.11 The Model Specification

This study intends to explore the connection existing between bank sectoral lending and economic growth in Zimbabwe. This connection can be modelled in the following equation:

$$InGDP_t = \beta_0 + \beta_i \sum_{i=1}^{n} lnBL_i + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

where:$InGD\ is\ natural\ logarithm\ of\ gross\ domestic\ product$

$lnBL_i\ is\ the\ natural\ logarithim\ of\ bank\ lendings\ to\ various\ sectors\ in\ the\ economy$

$\beta_0\ and\ \beta_i\ are\ constants\ and\ \varepsilon_t\ is\ the\ error\ term$

Since econometric modelling cannot be perfectly and accurately specified, the principle of Occam's razor applies; that is, the simplest specification should be employed to avoid excessive assumptions that would cause it to lose degrees of freedom. The research considers the following key sectors: agriculture (agric), manufacturing (manf), finance (fin), mining (min), individuals (indv) and other sectors (other). Hence, the above equation is specified as follows:

$$LnGDP_t = \beta_0 + \beta_1 lnAgric_t + \beta_2 lnFin_t + \beta_3 lnManf_t + \beta_4 lnMin_t + \beta_5 lnIndv_t + \beta_6 other_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Most variables with properties of a time series nature exhibit nonstationary characteristics. The study aims to subject the series to a unit root test before introducing cointegration tests. This is done using the commonly used ADF unit root test in the determination of the stationarity and integration order of the variables. The research also adopted vector auto regression (VAR) to establish whether the variables under study share a common path in the long term, that is, whether cointegration exists. Based on the cointegration results, determination of the long-run connection between variables can then be tested. VECM can then be used for the evaluation of the dynamic interactions between variables. In addition to the Granger causality tests, the IRFs are applied to assess the further dynamic interactions of variables.

3.12 Unit root tests

Knowing the differences between stationary and nonstationary time series is essential. The shocks are temporary in a stationary series, and their effects fade over time as the series return to long-run mean values (Asteriou and Hall, 2011). A stationary series necessarily constitutes permanent components. Therefore, the mean and variance of a nonstationary series depends on time. Odekon (2015) noted that the series may turn to generate too many cases.

- ✓ The series has a short-run mean
- ✓ The variance depends on time; that is, as time approaches infinity, the variance also goes to infinity.

This study is supported by financial data of a time series nature; hence, there are two reasons why there is a great need to account for the unit roots. It is worthwhile to realise the need to avoid spurious regression. Moreover, there is a need to determine the order of integration of the variables. Determining the unit roots is considered the primary stage to pursue to understand the relationship between sectoral bank lending and economic growth in both the short and long run. Given this, two-unit root tests in the name of augmented Dickey Fuller (ADF, 1979) and Phillips-Perron (1988) are engaged to verify whether sectoral bank lending and gross domestic product have an integration of the same order or not. This is described in the next section.

3.12.1 The Dickey and Fuller (Dickey-Fuller) Unit Root Test

A much more formal procedure was developed by Dickey and Fuller (1979) for the testing of nonstationary data to understand the existence of the unit roots. Therefore, Asteriou and Hall (2011) presented a weightier test based on a simple autoregressive AR (1).

$$Y_t = \emptyset Y_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots (3.3)$$

Equation (3.3) analyses whether $\emptyset = 1$ (unity and hence unit root). Clearly, the null hypothesis is$(H_0: \emptyset = 1)$. The alternative hypothesis is $(H_1: \emptyset < 1)$. A more appropriate equation can be attained by deducting (Y_{t-1}) on both sides of equation (3.3):

$$Y_t - Y_{t-1} = \emptyset Y_{t-1} Y_{t-1} + \mu_t$$

$$\Delta Y_t = (\emptyset - 1) Y_{t-1} + \mu_t$$

$$\Delta Y_t = \gamma Y_{t-1} + \mu_t \dots\dots\dots\dots\dots (3.4)$$

where $\gamma = (\emptyset - 1)$

In equation (3.4), the null hypothesis is $(H_0: \gamma = 0)$, while the alternative hypothesis follows $(H_1 : \gamma < 0)$, where if $(\gamma = 0)$, then (Y_t) acts in accordance with a pure random walk model. Dickey and Fuller (1979), with the aim of testing the existence of a unit root, suggest optimal regression equations. The first scenario applies where a constant follows the random walk procedure as presented in Equation 3.5 below.

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots (3.5)$$

This scenario is exceedingly important, as it shows the series definite trend when $(\gamma = 0)$, especially in the analysis of macroeconomic variables. The alternative case applies where there is a nonstochastic time trend, which then generates the equation as follows.

$$\Delta Y_t = \alpha_0 + \theta_2 t + \gamma Y_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots (3.6)$$

The Dickey-Fuller test is no different from the simple normal (t) test obtained on the lagged dependent variables (Y_{t-1}) coefficients, as shown in models (3.4, 3.5 or 3.6). In using this test, there is no traditional (t) distribution. For this reason, the original specific critical values calculated by Dickey-Fuller must be used. Mackinnon (1990) presented a classified suitable critical value for the models above, as shown in Table 3.1. The focus of each model above is whether $(\gamma = 0)$. The Dickey-Fuller test t-statistic is the same as the lagged dependent variable t-statistic. In the case of a Dickey-Fuller statistic being less than the critical value and the p-probability greater than 5 percent, therefore, there is acceptance of the null hypothesis of a unit root. The conclusion is that (Y_t) is a nonstationary process. In contrast, if the Dickey-Fuller statistic is higher than the critical value and the p-probability is smaller than 5%, then

there is a rejection of the null hypothesis of a unit root. The conclusion is that (Y_t) is a stationary process (Asteriou and Hall, 2011).

Table 3. 1: Dickey Fuller Test Critical Values

Model	1 per cent	5 percent	10 percent
$\Delta Y_t = \gamma Y_{t-1} + \mu_t$	-2.56	-1.94	-1.62
$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \mu_t$	-3.43	-2.86	-2.57
$\Delta Y_t = \alpha_0 + \theta_2 t + \gamma Y_{t-1} + \mu_t$	-3.96	-3.41	-3.21
Standard critical values	-2.33	-1.645	-1.28

NB: Critical Values are extracted from Mckinnon (1991)

Dickey and Fuller (1981), to avoid autocorrelation, developed a test by adding extra lagged terms to the dependent variables. Asteriou and Hall (2011) suggest that the Schwartz Bayesian Criterion (SBC) or the Akaike Information Criterion (AIC), usually on these extra terms, determines the lag lengths. The following equations present the views of Dickey and Fuller.

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots (3.7)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + \mu_t \dots\dots\dots\dots (3.8)$$

$$\Delta Y_t = \alpha_0 + \theta_2 t + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + \mu_t \dots\dots\dots (3.9)$$

The presence of the deterministic elements (α_0) and ($\theta_2 t$) found the differences between the regressions. Table 3.1 presents the Dickey-Fuller test critical values. It may be difficult to estimate equation (3.7), (3.8) or (3.9) if the statistician lacks the understanding of the actual data generating process. Dolado, Jenkinson, and Sosvilla-Rivero (1990) discussed the estimation of a general model, which represents equation 3.9. Asteriou and Hall (2011), however, found fault with this procedure, citing that its design was not meant to be applied in a mechanical fashion. In most cases, data plotting and observing graphs is key in that they can indicate the presence or absence of deterministic explanatory variables (regressors). As such. This is the most ideal procedure of examining the unit roots where the data generating procedure is unknown.

3.12.2 The Phillips-Perron Unit Root Test

The distribution theory concurred with the Dickey-Fuller tests, which are anchored on the assumption of statistical independence of error terms and a constant variance (t). In using the Dickey Fuller test, it is important to remember that the error terms should be uncorrelated and have a variance that is constant. Asteriou and Hall (2011) describe Phillips and Perron (1988) to have developed the ADF assumptions to be mild in terms of the error distribution.

The equation below shows the Phillips-Perron (PP) regression test following the AR (1) process.

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots (3.10)$$

While the ADF is adjusted, by adding the lagged different terms, the higher the correlation. Accordingly, the PP test corrects the coefficient's (γ) t-statistic from the AR

(1) regression. This explains the serial correlation in (ε_t). The PP therefore modifies the ADF (t-statistic) by considering the fewest features of the error process. There is no difference between the asymptotic distributions (t-statistic) of the ADF test. The reason for this is that the Mackinnon (1990) findings are still applicable (Asteriou and Hall, 2011).

In absolute terms where the PP statistical value is less than the coefficient of variation (CV), while the p-probability is higher than 5 percent, then the null hypothesis of a unit root is accepted. The conclusion is that (Y_t) follows a nonstationary process. In contrast, in absolute terms where the PP statistical value is greater than the CV, while the p-probability is less than 5 percent, the null hypothesis of a unit root is rejected. The conclusion is that (Y_t) follows the stationary (Asteriou and Hall, 2011).

3.13 Lag order selection criteria

After testing for stationarity, the next step is to determine the lag lengths for inclusion in cointegration tests and thereafter the Vector Error Correlation Method (VECM). The Akaike information criterion (AIC) and Bayesian information criterion (BIC) are used to determine the choice of lag length to be used. The appropriate lag length is needed in the Granger causality test. The determination was done by minimising the AIC and BIC criteria, and lags being dropped until the last lag were found to be statistically significant. (Awe, 2012).

3.14 Information Criteria

Upon different feasible GARCH models, several measures can be applied to choose the most superior model. The Akaike information criterion (AIC) explains an information criterion of likelihood function as follows:

$$AIC(\ell) = ln\left(\hat{\delta}_{\ell}^{2}\right) + \frac{2\ell}{n}$$

where n is the number of observations in the sample and ℓ is the maximum likelihood (Akaike, 1981).

The alternate Bayesian information criterion proposed by Schwartz (1978) is defined as:

$$BIC\ (\ell) = \ln\left(\hat{\delta}_{\ell}^{2}\right) + \frac{\ell ln(n)}{n}$$

The models are made up of a measure of fit and a penalty measure and thereby provide guidance as to which specifications provide the best trade-off between accuracy and complexity. The smaller the values of the AIC and BIC are, the better the model fits the data; hence, the model with the smaller value of both is selected.

3.15 Test for cointegration

After establishing the unit root issue, the cointegration test was utilised. The theory of cointegration by Granger (1981), modified by Engle and Granger (1987), analyses the log run relationship by cointegrating short and long tẹrm relationships. If cointegration is present, then a linear relationship exists among variables in the long run.

This research employs Johansen and Juselius's (1990) multivariate cointegration method with the following merits:

i. In cases where the data set carries two or more time series, the estimation of one or more cointegrating relationships is possible.
ii. It allows cointegrating testing in one step as a system of equations.

iii. It does not migrate errors from one step to the others. The prior assumption of exogeneity and endogeneity of variables is not required (Bashir, 2003).

iv. The approach surpasses other approaches in some cases.

   a) Errors are not evenly distributed

   b) The dynamics of the vector error correction model remain unknown.

v. As highlighted by Hargreaves (1994), Johansen's method is more appropriate in a large sample size. The method explains the number of cointegrating vectors among variables in research. The approach tests the long-run relationship on nonstationary variables.

The Johansen and Juselius's (1990) test yields the unrestricted cointegration rank test (trace) and the maximum eigenvalue (unrestricted cointegration rank test). The trace test if H_0 tells us that at most there are 'S' cointegrated equations and H_1 tells us that the cointegration vectors are 'S' or more. Alternatively, the Max-Eigen statistic of H_0 tells the existence of 'X' cointegrating vectors, while H1 hypothesises x+1 cointegrating vectors. Johansen cointegration is reactive to the selection of lag lengths. For the sake of this study, the optimal lag length was employed.

The methodology of Johansen is anchored to the autoregressive (VAR) of order p, as presented below.

$$\Delta X_t = \beta_1 X_{t-1} + \cdots + \beta_{p-1} X_{t-p-1} + \beta_p X_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots . (3.11)$$

The study makes decisions based on trace statistics, primary results and Maxeigen values acquired from applying the Johansen cointegration test. This research would borrow the approach of Johansen and Juselius from previous studies by Carby *et al.*

(2012), Murty, Sailaja and Demissie (2012), Ndlovu (2013), Maduka and Onwuka (2013), Chipote and Makhetha-Kosi (2014) and Nasir, Ali and Khokhar (2014).

The investigation starts with a reduced form identical statistical system as follows:

$$X_t = \alpha + \sum_{i=1}^{p} \prod X_{t-i} + \epsilon_t \dots\dots\dots (3.12)$$

where $\epsilon_t \sim N(0; \Omega)$ and i=1, 2, 3... 67

where X_t is a (2 x 1) vector of order I (1) and/or of order I (0) variables and α is a (2 x 1) vector of constraints. By setting $\Delta X_t = X_t - X_{t-1}$, equation (2) becomes

$$X_t = \alpha + \sum_{i=n}^{p} \varphi \Delta X_{t-1} + \prod X_{t-1} + \epsilon_t \dots\dots\dots.. (3.13)$$

Since ϵ_t is stationary, the rank of the long-term matrix $\prod$ determines the number of linear contributions of X_t and is not nonstationary. If $r = n$, all X_t are not nonstationary, while if $r = 0$, then that $\prod = 0$, ΔX_t is stationary, even as are all linear combinations if X_t is of order I (1). For$0 < 1 < n$, there exist r cointegrating vectors, meaning r stationary linear combinations of X_t. If this is the scenario, since the study searches to investigate the long-run association between bank lending in sectors and economic growth in Zimbabwe, then the cointegration vectors' hypothesis is stated as $H_0: \prod = \alpha\beta$ where both α and β are nxr matrices. The cointegration vectors β are the error-correlation mechanisms in the system, while α contains the adjustment parameters. there is need to determine the order of integration vectors to test the hypothesis. This is done (cointegration r) through the construction of the trace statistics (λ_{trace}) and determining the characteristic roots of the eigenvalues (λ_{max}). Practically, the order of

cointegration r is unknown. To determine the value of r, Johansen (1991) developed two ways to determine the likelihood ratio tests with different assumptions with the alternative hypothesis. The calculations are as follows.

$$\lambda_{trace} = -T \sum_{t=r+1}^{n} ln\left(1 + \widehat{\lambda_{\iota}}\right)$$

where the null hypothesis is $r = q$ against an alternative$r \leq 1$

$$\lambda_{max} = -T \sum_{t=r+1}^{n} ln\left(1 - \widehat{\lambda_{\iota}}\right)$$

where the null hypothesis is $r = q$ cointegrating vectors with ($q = 0,1,2,3$ ....) against the alternative that exists only one additional cointegrating vector that is$(r \leq q + 1)$. The conducted tests are λ_{max} and λ_{trace} tests following the Johansen-Juselius process. Johansen and Juselius (1992) suggested that for any disagreements between the two tests, the λ_{max}test should be applicable for inference purposes.

In the context where the results show no cointegration the long run between sectoral bank lending and gross domestic product exist, the Vector Error Correction Model (VECM) should be engaged for the estimation of the short run relationship.

3.16 Vector Auto regression (VAR) Model

It is common knowledge in the field of economics that simultaneous models may be necessary in the identification of endogenous, exogenous, or predetermined variables. Some variables play a role not only as explanatory variables, given a dependent variable but also as explained variables. However, the differentiation among variables suffered much criticism from Sims (1980).

In simple terms, the idea is that variables both internal and external should be treated with no difference. The VAR models he developed consequently abandoned the differences between external and internal. Rather, he considered all variables endogenous, as they formed the same set of regressions regardless of whether they were internal or external variables. In addition, Asteriou and Hall (2011) partly concurred with Sims (1980) views that where one lacks confidence of whether the variables are exogenous, each variable must be treated asymmetrically. The assumption is that two time series exist with (X_t, Y_t), where the (Y_t) series is influenced by past and present values of the (X_t) time series and vice versa, the (X_t) series is influenced by the past and present values of the (Y_t) series.

The following VAR model is an estimate in first difference in the absence of cointegration among variables. The error correction terms are excluded as specified below.

$$\Delta \ln GDP_t = \alpha + \sum_{i=1}^{n} \mu_i \Delta lnBL_{t-i} + \varepsilon_t \dots\dots\dots\dots (3.14)$$

where Δ is the difference operator, ε_t is the white noise error term and $t - i$ is the time lag.

3.16.1 Advantages of the VAR Model

There are some advantages to using the VAR model approach. There is no need for the determination of which variables are external and internal because all variables are considered internal (Asteriou and Hall, 2011). The requirement of the structural models is that all the system's equations be identified. Brooks (2014) explained that

the operation of this model is that there is a treatment of some variables as internal and the equations, therefore, include different variables at the right-hand side (RHS).

Moreover, the estimation is not cumbersome, as the ordinary least squares regression model can be used to estimate each equation separately (Asteriou, 2011). In accordance with the views of Sims (1980), another advantage of the VAR model is that it has better forecasts than the traditional structural models since they can be done by testing the VAR model. Sims's argument was that there is substandard performance due to the out-of-sample forecast accuracy of the large-scale structural models (Olsson and Grigorenko, 2013). Finally, it is important to have the optimal lag length in the estimation of the cointegration models; hence, with this approach, they can be chosen from the VAR model (Brooks, 2014).

3.16.2 Disadvantages of VAR Model

The vector auto regression model has been criticised for various reasons. First, in guiding the model's specifications, the VAR model is theoretical, that is, it engages little theoretical information concerning the variables' relationships similar to the ARMA model. In contrast, Brooks (2014) explained that the exclusions of key facts necessary for the equation identifications adjust the structure of the model. Ultimately, there is limited theoretical analysis in VAR models as well as policy prescriptions. Moreover, there is a probability of attaining a spurious relationship from data mining since the interpretation of the estimated VAR coefficients is not clear.

There is also loss of freedom degrees. For example, an assumption of a VAR model of 3 variables with 12 lags each implies that 36 parameters must be estimated in each

equation plus the equation constant. Estimation problems are created in the event of a small sample size, since the parameters would consume the degrees of freedom.

The third shortfall is on the interpretation of the coefficients. They are difficult to interpret due to their lack of a complete theoretical background. To overcome this criticism, the VAR model supporters estimated the IRFs (Asteriou and Hall, 2011). The authors noted that the IRFs examine the response of the VAR model's dependent variable to error term shocks. Defining the shocks is a complicated issue. Separation of structural errors (identification problem), therefore, is needed.

Finally, it is crucial to have the VAR model stationary. This is the case when hypothesis tests are used, singly or jointly, in examining whether the coefficients are statistically significant.

Nevertheless, VAR model supporters do not recommend the application of differencing to induce stationarity of variables. Their argument is that differencing throws away facts explaining the long-run relationship between series, yet the aim of VAR model estimation is purely the examination of the relationships between variables. There is also a possibility at first differencing VECM of mixing conditions and levels together (Brooks, 2014)

3.17 The Granger Causality Test

In the usual sense, the Granger causality has more focus on prediction than causation. The suggestion is that the past has a probability of being able to cause/predict future outcomes, but the future has limited space to do the same for the past. M Granger causes N if the past M values can more accurately predict N instead of merely using the past values of N. Testing for causality has been widely pursued using Granger

causality. The traditional Granger test between sectoral credit allocation (bank lending) and economic growth (GDP) can be expressed as follows.

$$GDP_t = \sum_{i=1}^{p} \beta_i BL_{t-i} + \sum_{i=1}^{p} \lambda_i GDP_{t-i} + \delta_t \dots\dots\dots\dots (3.15)$$

$$BL_t = \sum_{i=1}^{p} \mu_i BL_{t-1} + \sum_{i=1}^{p} \theta_i GDP_{t-i} + \varepsilon_t \dots\dots\dots. (3.16)$$

where BL is sectoral credit allocation (Bank Lending)

The test indicates that there is no Granger causality to the null hypothesis. Therefore, the following conditions may hold.

- If the lagged BL coefficients are significantly different from zero, that is,

$$\sum_{i=1}^{n} \beta_i \neq 0$$

, and the lagged GDP is not significantly different from zero, that is,

$$\sum_{i=1}^{n} \lambda_i \neq 0$$

Then, there is unidirectional causality running from *BL* to GDP (sectoral credit allocation to GDP).

- If the lagged coefficients of GDP coefficients are significantly different from zero, the lagged coefficients of *BL* coefficients are not significantly different from zero, that is,

$$\sum_{i=1}^{n} \mu_i \neq 0 \ and \ \sum_{i=1}^{n} \theta_i \neq 0$$

respectively. This signifies unidirectional causality stretching from GDP to *BL.*

If both coefficients are estimated to be different from zero, it implies a bilateral causality, that is,

$$\sum_{i=1}^{n} \beta_i = 0 \ and \ \sum_{i=1}^{n} \lambda_i \neq 0$$

- Independent causality exists when the GDP and BL coefficient sets are not statistically significant in either equation, that is,

$$\sum_{i=1}^{n} \beta_i = 0 \ and \ \sum_{i=1}^{n} \lambda_i = 0$$

Therefore, the Granger causality made use of a simple and easy F test statistic as follows to test the hypothesis.

$$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)}$$

where m represents the number of lagged BL terms,

K is the number of estimated parameters in the regression (unrestricted)

(n-k) is the degrees of freedom.

As such, a rejection decision of the null hypothesis is made if the calculated *F* values surpass the critical value at a specified level of confidence.

3.18 Impulse responses and variance decomposition

The impulse response acts as an indicator of the reaction of the dynamic system because of the response from external changes. Specifically, VAR's impulse response determines how the explained variable responds to the shock exerted by the independent variable. The cumulative effects of the individual impulse coefficients are therefore summed up for measurement (Lin, 2006). However, the outcomes vary depending on how the variables are ordered in the VAR. The higher residuals correlations indicate the greater importance of the variable ordering. Pesaran and Shin (1998), to combat the problem of higher correlation of residuals, developed a generalised impulse response function that regulates the effect of the variables' different ordering on IRFs. The impulse responses are plotted according to their responses to shocks. It becomes difficult to observe the effects of the exogeneous shocks on variables, however, when more equations or lags are included in the VAR models. Variance decomposition (VD) is applicable in a thrust to indicate the reciprocal action of equations. Brooks (2002) suggests that VD functions to trace the degree of reaction in the dependent variable emanating from its own shocks versus shocks to the next variables. It clearly breaks down the components of the dependent variable's variance. Meanwhile, VD analysis acts as a powerful predictive tool for changes in future financial series. However, this does not concern us. VD is regarded as a confirmation of the existence of impulse responses. The impulse response analysis and VD carry the same information

3.18.1 Impulse Response Function (IRF)

The IRF explains the contagious effects of a shock in one variable to the movement in the other variable. A unit shock in variable at affects the behaviour of variable B_t. As explained by the following equation, a unit shock is put forward to determine the differences in the VAR system at a given time as represented by the VAR as a vector moving average (VMA).

$$R_{it} = b_{11}^{0}\varepsilon_{i,t} + b_{11}^{1}\varepsilon_{1,t-1} + b_{11}^{1}\varepsilon_{2,t-1} + \cdots (3.18)$$

where $b_{ij}is$ is the coefficient of a normalised innovation vector of IRF. This follows the Cholesky normalisation factor (Diebold, 2004), while $b_{11}^{0}$is the simultaneous impression to $\varepsilon_{i,t}$ of a unit shock. The simultaneous innovation is presented in a standard deviation form. It carries a nonunit coefficient, contrary to its unit coefficient, as shown in the equation.

3.18.2 Variance Decomposition (VD)

VD analysis can examine the economic time series' interaction (Sims 1980). VD shows the quantity of information one variable reflects to the next variable in autoregression. The VD helps in the determination of how much forecast error variance of a single variable is explained by exogeneous shocks to the next variables, while the IRF focuses on tracing the effects of such shocks in the exogeneous variables. VD promotes further analysis, which enhances the separation of the *h-step* error variations. Consequently, the VD brings much insight regarding the relative importance of the effects of individual random innovations to the variables in the VAR

system. Decomposition of the variance is vital in that the shock of one variable not only affects its own prospective outcomes but also affects other variables.

3.19 Chapter Summary

The chapter provided a discussion of the fundamental econometric methodology, running from descriptive statistics to stationary tests to determine which research methods to adopt. This is because when a scenario of time series data is stationary at level I ~ (0), use of the OLS method is appropriate. In contrast, if it is stationary at first difference I ~ (1), then the cointegration test is ideal. The cointegration test (Engel-Granger & Johansen's) was used to investigate the existence of a short- or long-term relationship between SCA and economic growth.

Moreover, detailed explanations of tests are appropriate if a cointegration relationship exists (the Granger causality under VECM) and which tests are permissible where no cointegration relationship exists in the long run (the Granger causality under VAR). Since the abovementioned methodological tests and techniques are the most mentioned in the literature and practically used for measuring the reliability of variables for model development, the study made use of these methods. In the following chapter, the study provides a more detailed discussion of the practical aspects of data presentation.

4 CHAPTER FOUR: EMPIRICAL RESULTS

4.1 Introduction

This chapter presents empirical results and analysis in line with the objectives of the study. The first objective of examining the short-run relationship is followed by the objective of detecting the long-run relationships between sectoral bank lending and GDP in Zimbabwe. The third objective is to detect the direction of the relationship between sectoral allocation and economic growth. Section 4.2 presents descriptive statistics, while section 4.3 presents a line graph of each model. Section 4.3 also presents unit root tests, while section 4.4 shows optimal lag lengths. The VAR model is presented in section 4.5, while section 4.6 provides the results of the cointegration test. Section 4.7 presents the short-run analysis, while section 4.8 refers to the long-run analysis involving the results of the vector error correction model (VECM).

Figure 4. 1: Fundamental Tests

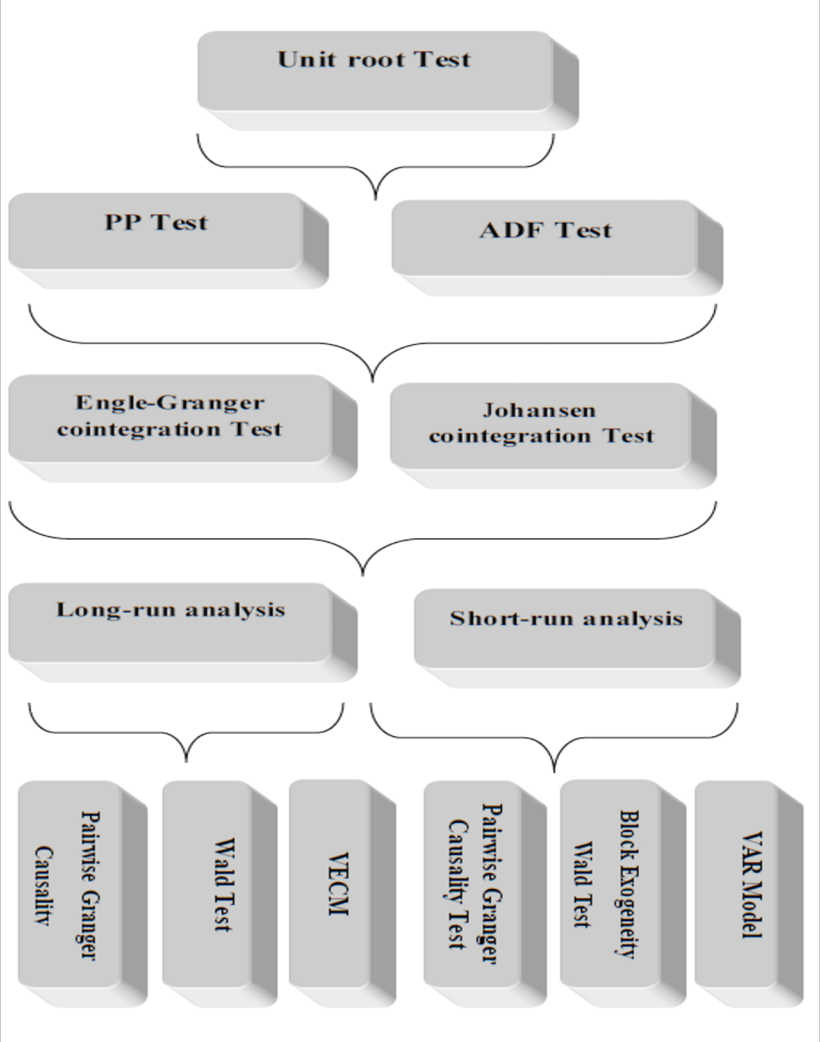


Figure 4.1 presents a plethora of tests necessary for detecting short-run and long-run relationships between sectoral bank lending and economic growth. Most of the models included in the above figure were explained in the previous chapter as they are applied in this research.

This figure shows that the first step is to investigate the connection existing between sectoral bank allocations and economic growth by applying unit root tests. Unit root tests are employed to ensure that all variables are stationary. The augmented Dickey-

Fuller (ADF) unit root test and Phillip Peron unit root test are used to check the unit root.

Furthermore, Figure 4.1 displays a descriptive statistic. Cointegration test results reveal whether sectoral bank allocations and economic growth are integrated. Variables that are integrated with the same order move in the short run.

Figure 4.1 shows that in the case of a short–run relationship between sectoral bank allocations and economic growth, the Wald, Block Exogeneity Wald, and Pairwise Granger causality tests under the Vector Auto Regression (VAR) Model and Pairwise Granger causality test were used to answer the second research question by investigating the hypothesis. The current research aims to determine the direction of the association between sectoral bank allocations and economic growth over time. Furthermore, Figure 4.1 shows that there is a lengthy relationship between sectoral bank allocations and economic growth, necessitating the use of the Wald, block exogeneity Wald, and pairwise Granger causality tests under the vector error correction (VEC) model to answer the second research issue.

4.2 Descriptive Statistics

To obtain the descriptive statistics, the researcher used the natural log values of sectoral bank loans and gross domestic product on a monthly basis. The results are presented in Table 4.1 below.

Table 4. 1: Descriptive Statistics

	lnGDP	lnAgric	lnFin	lnManf	LnMin	lnIndv	lnOther
Mean	0.02	0.02	0.01	0.01	0.02	0.04	0.02
Median	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Maximum	0.79	0.40	5.36	0.17	0.41	0.43	1.48
Minimum	-1.21	-0.17	-5.75	-0.18	-0.21	-0.22	-1.49
Jarque-Bera	5.55	300	1081	2.61	41.72	101.65	92.48
Standard Deviation	0.48	0.01	1.07	0.06	0.09	0.09	0.41
Excess Kurtosis	0.32	8.46	17.77	0.866	3.18	4.734	5.191

Source: Author's Calculations (2022)

4.2.1 Standard Deviation

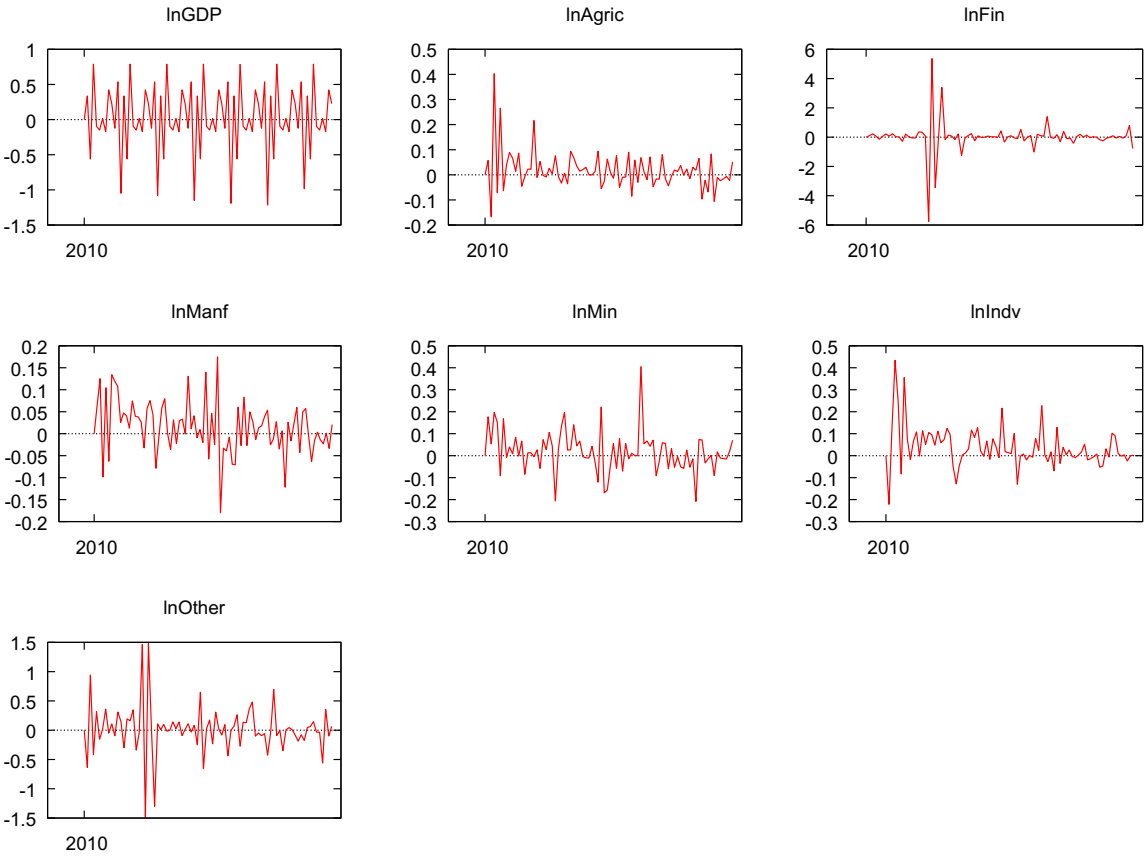
Standard deviation is a standard measure of variation around a mean of the series. Table 4.1 summarises the mean, median, maximum, minimum values and standard deviations. The monthly data from January 2020 to December 2021 make 82 observations for each sector. lnGDP, which is a representation of the growth rate in GDP, showed a standard deviation of 48%, meaning that Zimbabwean economic growth has not been stable but has shown such high volatility over the years. From the above table, it can be noted that the highest standard deviation is the loan allocations to the financial sector, which is 107 percent, followed by other sectors with 41 percent; third comes allocations to the mining sector and individuals with standard deviations of 9 percent; manufacturing comes fourth with a standard deviation of 6 percent; and finally, the lowest is allocations to the agriculture sector with a standard deviation of 1 percent. This shows that loan allocations to agriculture have been more stable than any other sector over the period January 2010 to December 2021 because for a developing economy such as Zimbabwe, this sector is the backbone; hence, the government policy to consistently finance it. Loan allocations to the financial sector

mean that these are loans between banks or other financial institutions, such as microfinance and insurance companies, which are highly volatile. This might be because these loan allocations are once off not recurring since they are meant to create stability and later self-sustenance.

4.2.2 Kurtosis

Kurtosis measures the flatness of the frequency of the sectoral loan allocations and gross domestic product of the sectoral loan allocations and gross domestic product. Kurtosis is normally distributed when it equals three. Any value greater than 3 is a peaked distribution, while kurtosis values less than three are treated as flat. According to Figure 4.2, all variables are peaked (leptokurtic), meaning they face kurtosis exceeding 3.

Figure 4. 2: Line graphs for the variables



Gross domestic product growth rates showed some consistent upwards and downwards movement throughout the time of the study; these frequent high spikes can be confirmed by the high standard deviation of 48 percent. The highest economic growth rate was experienced in January 2016, which was 0.79%, and the lowest was in January 2015, which was a rate of -1.21%. This has been consistently the problem faced since the end of the Government of National unity since the new government came in and introduced new local currency moving away from the multicurrency which made the market lose confidence and hence a significant drop in the GDP.

The bank loan allocations to the agriculture sector have been very consistent, showing some significant growth in 2010 of 4 per cent and decreasing to an average of approximately 2 percent, making it the most consistent sector in terms of loans

allocated by the Zimbabwean banks. The financial sector has been the most volatile sector; that is, the borrowings to this sector were not consistent, as shown by the spike in loans to this sector between 2010 and 2013. The sector reached its lowest (-5.75 percent) early 2010 and later in the same a spike up to its maximum (5.36 percent), which can be explained by the policies that were introduced by the government, which came into power in 2009. This gave confidence to both the lenders and borrowers, hence an injection into the sector, which was almost dying.

All the other sectors that mining, individual, manufacturing, and other showed some consistency over the years with not much wide variance and hence some element of normality and no growth over time. The consistent up and down in growth of loans allocated into these sectors might be experienced by policy inconsistencies experienced in Zimbabwe, which erodes the confidence of the banks as well as the borrowers.

4.2.3 The Results of Augmented Dickey-Fuller and Phillip Peron Unit Root Tests

All variables were transformed into natural logs, and unit root tests were applied to determine whether the time series data of the Zimbabwe GDP, sectoral loans (agricultural, manufacturing, mining, finance, people, and other sectors) are stationary. If the prior variables' time series data are nonstationary, the regression analysis between GDP and sectoral loans may produce meaningless regression, biasing the research conclusions. The unit root test is used to eliminate the effects of seasons, which might lead to skewed results.

Most of the economic time series can be made stationary through differencing. However, the first difference of the absolute variables (GDP, Manf, Agric, Min, Indiv, Fin and Other) would produce the absolute change in them. The absolute changes are difficult to interpret in a meaningful way. Therefore, the log difference of the time series is taken. The log difference of the time series is a relative measure, and it shows the continuously compounded (logarithmic) growth rate. Hence, the transformation to lnGDP, lnManf, lnAgric, lnMin, lnFin, lnIndiv and lnOther were used and assumed to be stationary at their level, and the ADF tests can be used to confirm.

The augmented Dickey-Fuller (ADF) (1981) and Phillips-Perron (PP) (1988) tests were used to check the unit root presents. The monthly data were for the period of January 2010 to December 2021. Table 4.2 explains the results of the augmented Dickey-Fuller Philips-Peron tests at the level series and at the first differences.

Table 4. 2: ADF Test Results

Variable	**No constant**		**With Constant**		**With Constant and trend**		**First diff, no trend**	
	t-statistic	C.Values	t-statistic	C.Values	t-statistic	C.Values	t-statistic	C.Values
LnGDP	-6.87	-1.95	-10.78	-2.88	-10.24	-3.43	-13.11	-2.88
LnAgric	-2.09	-1.95	-1.22	-2.88	-2.60	-3.43	-5.82	-2.88
LnManf	-6.19	-1.95	-6.18	-2.88	-6.14	-3.43	-6.14	-2.88
LnMin	-2.98	-1.95	-3.28	-2.88	-3.88	-3.43	-3.05	-2.88
LnFin	-6.21	-1.95	-6.18	-2.88	-6.14	-3.43	-6.61	-2.88
LnIndiv	-2.25	-1.95	-4.94	-2.88	-5.27	-3.43	-5.84	-2.88
LnOther	-10.36	-1.95	-10.42	-2.88	-10.76	-3.43	-4.83	-2.88

The results of the ADF test on the model are shown in Table 4.2. By differencing, variables were made stationary. Even at a 5 per cent significance level, the null hypothesis of a unit root is rejected when the same test is applied to their first differences. The test findings support the idea of treating all the separate series as level stationary. All variables are viewed as integrated of order one based on these results.

Table 4. 3: PP Test Results

Variable	**No constant**		**With Constant**		**With Constant and trend**		**First diff, no trend**	
	t-statistic	C.Values	t-statistic	C.Values	t-statistic	C.Values	t-statistic	C.Values
LnGDP	-21.80	-1.95	-18.66	-3.004	-19.57	-3.61	-17.24	-3.64
LnAgric	-13.90	-1.95	-15.13	-3.004	-16.68	-3.61	-13.64	-3.64
LnManf	-10.87	-1.95	-12.51	-3.004	-2.67	-3.61	-10.58	-3.64
LnMin	-8.88	-1.95	-10.03	-3.004	-9.45	-3.61	-9.45	-3.64
LnFin	-16.42	-1.95	-18.17	-3.004	-18.37	-3.61	-17.56	-3.64
LnIndiv	-8.912	-1.95	-9.60	-3.004	-8.48	-3.61	-8.48	-3.64
LnOther	-16.04	-1.95	-18.99	-3.004	-17.47	-3.61	-16.01	-3.64

The conclusions of the augmented Dickey-Fuller test are confirmed by the results of the Phillips-Perron statistic test. Table 4.3 displays the results of the (pp) test over sample time series data starting from January 2010 to December 2021, that is, the Zimbabwean GDP growth rate *(lnGDP)* and the sectoral loan allocations (*lnManf, lnAgric, lnMin, lnFin, lnIndiv and lnOther*).

4.3 Optimal Lag Lengths of the VAR Model

The best lag length was performed after variables became stationary. For this purpose, the researcher uses the vector auto regression (VAR) lag order selection method using the GretL Statistics Software package. This technique uses five different criteria:

- Sequential modified likelihood ratio (LR) test statistic
- The Akaike information criterion (AIC)
- the Schwarz information criterion (SIC)
- the Hannan-Quinn information criterion (HQ)

The results of the lag specification criterion are shown in Table 4.5. The researcher analysed in-sample monthly time series data in the logarithmic form of the various loans awarded to the sectors from January 2010 to December 2021 to calculate the optimal lag lengths.

This study discovered that the best lag length for GDP and various economic sectors is lag twelve. Furthermore, SIC, BIC, and HQC criteria were used to create automatic specification lags. The best lag with the Johanson test was first used to see if there was any long-run association between Zimbabwe's GDP and sectoral bank loans. If there is a short-run relationship between GDP and sectoral bank loans, the optimal lag could also be used with the vector autoregression model (VAR). Furthermore, if there exists a long-run relationship, the vector error correction (VECM) model cannot be calculated without defining the appropriate lag.

Table 4. 4: Lag specification criteria results

VAR system, maximum lag order 24

The asterisks below indicate the best (that is, minimized) values
of the respective information criteria, AIC = Akaike criterion,
BIC = Schwarz Bayesian criterion and HQC = Hannan-Quinn criterion.

lags	loglik	p(LR)	AIC	BIC	HQC
1	-26.01351		1.207363	1.527086	1.331901
2	-26.00591	0.90184	1.241583	1.596832	1.379960
3	-23.00238	0.01425	1.172496	1.563269	1.324710
4	-8.18714	0.00000	0.696108	1.122407	0.862160
5	-8.17771	0.89075	0.730266	1.192089	0.910155
6	-7.55118	0.26297	0.743144	1.240492	0.936871
7	-2.90021	0.00229	0.617249	1.150122	0.824813
8	-1.07860	0.05630	0.588917	1.157315	0.810320
9	34.61985	0.00000	-0.607581	-0.003658	-0.372341
10	40.04248	0.00099	-0.760085	-0.120638	-0.511008
11	70.74676	0.00000	-1.784371	-1.109398	-1.521455
12	120.65900	0.00000	-3.471000*	-2.760502*	-3.194247*
13	120.66049	0.95643	-3.436569	-2.690546	-3.145978
14	120.66791	0.90304	-3.402342	-2.620794	-3.097913
15	120.74045	0.70328	-3.370360	-2.553288	-3.052094
16	120.74253	0.94859	-3.335949	-2.483352	-3.003845
17	120.75759	0.86223	-3.301986	-2.413864	-2.956044
18	120.76270	0.91946	-3.267679	-2.344032	-2.907900
19	120.86431	0.65213	-3.236700	-2.277529	-2.863084
20	120.87437	0.88723	-3.202564	-2.207868	-2.815110
21	123.00043	0.03920	-3.241394	-2.211173	-2.840102
22	123.57473	0.28384	-3.226715	-2.160968	-2.811585
23	124.71876	0.13037	-3.231681	-2.130410	-2.802714
24	125.15390	0.35088	-3.212203	-2.075407	-2.769398

*** Shows lag order selected by the criterion**

LR: sequential modified LR test statistic (each test at the 5 per cent level)

FPE: Final prediction error

AIC: Akaike information criterion

HQ: Hannan-Quinn information criterion

4.4 Results of Cointegration Tests

Below are cointegration tests to answer the research questions:

Is there any long-run relationship between GDP and sectoral bank loans in Zimbabwe?

Through investigation of the following hypothesis:

H_0*: There is no significant long-run relationship between GDP and sectoral bank loans in Zimbabwe.*

H_1: *There is a significant long-run relationship between GDP and sectoral bank loans in Zimbabwe.*

The prerequisites for applying the cointegration tests are met because all logarithms of sectoral bank loans and GDP are integrated of the same order I (1). This research used traditional methods to decide whether there is a cointegrating link between sectoral bank loans and GDP in Zimbabwe. The Engle and Granger (1987) two-step cointegration test is the first. Johansen's cointegration test was used by the researcher (Johansen, 1988; Johansen and Juselius, 1990).

4.4.1 Empirical Results of the Engle-Granger Cointegration Test

The cointegration requirement was met when sectoral bank loan allocations and GDP were integrated at order one. The second stage was to investigate the causal relationship between GDP and sectoral bank loan allocations. The Engle-Granger two-step test (1981) was used to determine whether there was a long-term relationship.

The Engle-Granger cointegration test results in table 4.5 show that the tau-statistic, also known as the t-statistic, and the normalised autocorrelation coefficient, also known as the z-statistic, both accept the null hypothesis of the Engle-Granger, which is that there is no cointegration between GDP and bank lending allocations for all sectors in the study sample at the 5 per cent significance level because the probability value, also known as the prob* in the Engle-Granger test, is greater than zero.

Table 4. 5: Cointegration Results

Null Hypothesis: No Cointegration				
	tau-statistic	Prob*	Z-statistic	Prob*
LnGDP	-1.093	0.7205	-0.817	0.93
LnAgric	-1.225	0.6659	1.826	0.072
ln GDP	-1.093	0.7205	-0.817	0.93
ln Fin	-3.648	0.0049	0.6038	0.548
ln GDP	-1.093	0.7205	-0.817	0.93
lnManf	-1.903	0.3311	0.0529	0.958
ln GDP	-1.093	0.7205	-0.817	0.93
lnMin	-2.816	0.055	0.0068	0.9945
ln GDP	-1.093	0.7205	-0.817	0.93
lnIndv	-2.48	0.119	0.413	0.68
ln GDP	-1.093	0.7205	-0.817	0.93
lnOther	-2.222	0.198	-2.57	0.012

NB: Lag length was chosen by AIC, SIC & BIC

*Mackinnon (1996) p value.

The results of the Engle-Granger cointegration test listed in Table 4.5 show that the tau-statistic, denoted by the t-statistic, and the normalised autocorrelation coefficient, denoted by the z-statistic, both accept the Engle-Granger null hypothesis of no cointegration between all sectoral bank loans and economic growth in Zimbabwe at the 5 per cent significance level because the probability value, denoted by the prob* in Table 4.5, is greater than 0.

The Conclusion of the Engle-Granger cointegration test is that sectoral bank loans do not move together with GDP in the long run in Zimbabwe.

Table 4. 6: The results of Johansen's cointegration test for cointegrating vectors

Hypothesis		**Eigen Value**	**Trace Statistic**	**5 per cent Critical Value**
H_0	H_1			
$r = 0$	$r \geq 1$	0.5540	49.2411	47.856
$r = 1$	$r \geq 2$	0.4890	37.232	29.797
$r = 2$	$r \geq 3$	0.4350	24.211	15.494
$r = 3$	$r \geq 4$	0.3754	19.104	3.841
$r = 4$	$r \geq 5$	0.3208	11.704	1.695
$r = 5$	$r \geq 6$	0.26519	6.639	0.0145

The trace test examines the null hypothesis that the number of cointegrating vectors is less than or equal to r, where r is one of the following numbers: 0, 1, 2, 3, 4, and 5. The null hypothesis is tested against a broad alternative in each circumstance. The maximum eigenvalue test, on the other hand, tests the null hypothesis r =0 against the alternative that r =1, r =1 against the alternative r =2.

The reported trace test statistic for the null hypothesis of no co integration (H-0.: r =0) is (49.2411), which is more than the critical value of (47.856) at the five per cent (5 percent) significance level, rejecting the null hypothesis of no co integration (r =0) and favoring the general alternative r≤1. However, because the reported trace statistic of (29.15060) is smaller than the crucial value of (29.79707) at the 5 per cent significance level, the null hypothesis of r≤1, that the system has at most one (r≤1) co integrating

vector, cannot be rejected at the 5 per cent significance level. This test reveals that the variables have only one cointegrating connection. This test concludes that there is only one cointegrating relationship among the variables $lnGDP\ lnManf, lnAgric, lnMin, lnFin, lnIndiv\ and\ lnOther$.

The maximum eigenvalue statistic testing the null hypothesis of no co integration (H0: r = 0) is accepted at the 5 per cent significance level, as the reported maximum eigenvalue statistic of (0.5540) is less than the critical value at the 5 per cent significance level. The trace test statistics reject the null hypothesis of $H_0: r = 0$ at the 5 per cent significance level and suggest that there is only one cointegrating vector.

Based on Johansen's cointegration process, the Zimbabwean monthly data from January 2010 to December 2021 appear to support the presence of a long-run link between GDP and sectoral bank loans (agricultural, mining, finance, manufacturing, individual, and others). This further implies that $lnGDP$ maintains a stable equilibrium with $lnAgric, lnManf, lnFin, lnMin, lnIndiv\ and\ lnOther$ in the long run for the entire period of the study.

In this regard, bank lending can be used to explain economic growth in accordance with the classical growth theory described in section 2.1.1.2. If properly executed, the banking sector's services have the potential to stimulate economic expansion. However, according to the study's findings, this expansion is limited to certain industries, such as agriculture, mining, and manufacturing. Individual (household) and financial sectors failed to provide support for the theory. The study's findings are consistent with those of Arcand, Berkes, and Panizza (2012), who assert that bank financing fosters growth. The authors pointed out that this occurs when credit to private sector entities falls below one hundred per cent (100%).

According to Schumpeter, the relationship between the finance and household sectors and economic growth was inverse. However, the study did not focus on determining the threshold facility that begins to propel the economy; it is possible that the two sectors above that had been deemed nondrivers of the economy could become so due to inadequate funding. This supported Parkin's (2012) conclusions. It is crucial to determine the amount of loanable funds required to stimulate economic expansion. This subject should also be considered in future research.

4.4.2 Long Run VAR Estimation

As previously presented, the long-run equilibrium relationship between variables was examined using cointegration tests. The VAR model estimates the long-run relationships of variables. In Tables 4.7 to 4.8, the results of the estimated VAR model for each variable are presented.

Table 4. 7: Estimated VAR Results

$lnGDP = f(lnAgric, lnFin, lnMin, lnManf, lnIndiv, lnOther)$				
Repressors	**Coefficients**	**Std.Error**	**t-Statistics**	**Prob.**
$lnAgric$	0.943922	0.409265	2.306	0.0606
$lnFin$	−0.0596039	0.0294220	−2.026	0.0892
$lnManf$	0.224156	0.578619	0.3874	0.7118
$lnMin$	0.618646	0.237916	2.600	0.0406
$lnIndiv$	−0.636068	0.305405	−2.083	0.0824
$lnOther$	0.0339527	0.0501085	0.6776	0.5233
R-squared	**Adj –Rsquared**	**SS Residuals**	**SE of Equation**	**F-Statistic**
0.928638	0.679334	0.020668	0.058692	1.239334
LLR	**AIC**	**SIC**		
807.55053	-13.9300	-3.6512		

The estimated results of the lnGDP equation above display a high statistical significance of all the coefficients at the 5 per cent significance level. There exists a positive relationship between loans to agriculture, manufacturing, mining and other sectors and GDP. The explanatory variables (ln Agric, lnFin, lnManf, lnMin, lnIndiv and lnOther) explained approximately 68 per cent of the ln GDP, as reflected by the adjusted coefficient of determination (R^2). The relative elasticity of lnGDP to ln Agric is 0.943, telling us that by increasing loan allocation to the agriculture sector by 10 percent, GDP grows by 9.43 percent. The relative coefficient of lnGDP to lnFin (-0.0596) reflects that any slight increase by a marginal 10 per cent implies a reduction in Zimbabwe GDP by approximately 6 percent.

Likewise, the relative elasticity of lnGDP to lnManf is 0.224, showing that an increase in loan allocation towards the manufacturing sector by 1 percent triggers GDP to grow by 0.224 percent. The relative elasticity of lnGDP to the mining sector is 0.6186, implying that an increase in credit towards the mining sector by 10 percent increases GDP by 6.2 percent. However, the relative elasticity of lnGDP to consumption (lnIndiv) is -0.636. This shows an inverse relationship, contrary to Banu and Madalina (2013), who found that credit offered to households contributes greatly to economic growth. An increase in funds towards consumption (lnIndiv) by 1 percent costs the economy by 0.636 percent. In conclusion, loan amounts to an individual borrower's sector reduce the GDP. Accordingly, bank lending to different portfolios acts as a significant factor in propelling the local economy, in line with empirical literature on the relationship between finance and economic growth (Coporalea, *et al.,* 2016). This finding is consistent with classical growth theory, detailed in section 2.1.1.2, supporting

the need to invest in economic sectors to promote innovativeness, employment and technological development, all leading to economic development.

4.4.3 Vector Error Correction Model (VECM)

Table 4. 8: Estimated VECM results

Variable	Correction Term Coefficient	ECM-P Value	R-Squared	F-Statistic
$lnAgric$	0.0605152	<0.0001	0.808393	0.712590
$lnFin$	-12.048	0.2458	0.847675	0.771513
$lnManf$	0.54322	<0.0001	0.683180	0.524770
$lnMin$	-0.83883	0.4406	0.554283	0.331425
$lnIndv$	-0.066616	0.9324	0.654329	0.481494
$lnOther$	1.1830	0.7423	0.842668	0.712590

Table 4.8 above shows the VECM estimated results. There is a positive error correction term of 0.0605 for lnAgric. Ln Agric in this context is significant, with a p value of less than 0.0001 (<0.0001), implying that there is a long-run causality. However, the long-run causality runs from economic growth to lnAgric in Zimbabwe. The variables included in the VECM model explain approximately 80.8 per cent of the GDP, as shown by the R^2 (coefficient of determination).

There is a negative value of -12.048 for the VECM of lnFin and is an insignificant variable in the model, as shown by the p value of 0.2458. From the result, there is no long-run causality moving from lending allocations to the finance sector (lnFin) to GDP.

The coefficient of determination (R^2) states that 85 per cent of the responses in economic growth (lnGDP) are explained by the variable (lnFin).

There is a positive value of 0.377065 for the VECM of lnManf and is a significant variable in the model, as shown by a p value of less than 0.001. From the results, there is long-run causality that runs from lending allocations to the manufacturing sector to economic growth. The coefficient of determination (R^2) reveals that 70 per cent of the response in economic growth (dependent variable) is explained by the variables included in the VECM.

There is a positive value of 0.348689 for the VECM of lnMin and is a significant variable in the model, as shown by a p value of less than 0.001. From the results, there is existence of long-run causality that runs from lending allocations to the mining sector to economic growth. The coefficient of determination (R^2) reveals that 64 per cent of the response in economic growth (dependent variable) is explained by the variables included in the VECM.

Presently, it is a positive value of 0.83397 for the VECM of lnIndiv and is an insignificant variable in the model, as shown by a p value of 0.2985. From the results, there is existence of long run causality that runs from lending allocations to individuals' sector to economic growth. The coefficient of determination (R^2) reveals that 71 per cent of the response in economic growth (dependent variable) is explained by the variables included in the VECM.

There is a positive value of 2.5866 for the VECM of lnOther and is a significant variable in the model, as revealed by a p value of 0.04687. The results show that there is long-run causality that runs from lending allocations to other sectors to economic growth.

The coefficient of determination (R^2) reveals that 86 per cent of the response in economic growth (dependent variable) is explained by the variables included in the VECM. Above all else, the objective of the study to ascertain the interactions of sectoral credit allocation and economic growth clearly shows that there exists a relationship between these variables, although the results are mixed regarding the relationship.

4.4.4 Granger Causality Test Results

The table below is a summary of the Granger causality test results covering the sample period under study from January 2010 to December 2021 among the variables in the study. For this test, the researcher used the first differenced variables. As previously discussed in sections 4.2 and 4.3, the Granger causality test works on the assumption of stationary variables. At first log differencing, all the variables were observed to be stationary.

Table 4. 9: Granger Causality Results

Direction of Causality	Decision
$lnAgric \leftrightarrow ln\ GDP$	Bidirectional Causality
$lnManf \rightarrow lnGDP$	Causality
$lnGDP \rightarrow lnManf$	No Causality
$lnFin \rightarrow lnGDP$	No Causality
$lnGDP \rightarrow lnFin$	No Causality
$lnMin \rightarrow lnGDP$	Causality
$lnGDP \rightarrow lnMin$	No Causality
$lnIndiv \rightarrow lnGDP$	No Causality
$lnGDP \rightarrow lnIndiv$	Causality
$lnOther \leftrightarrow lnGDP$	Bidirectional Causality

The causality between GDP and loan allocations to the agriculture sector is bidirectional and positive; that is, it runs from GDP to agricultural sector loans, and loan allocations to the agriculture sector positively influence Zimbabwean GDP. The finding of this study on causality perfectly concurred with the findings of Yazdi and Khanalizadeh (2013), who identified a bidirectional causality between agriculture and economic growth.

Table 4.9 The Granger causality results showed a sign of no causal link between GDP and loan allocations to the finance sector. The lack of evidence might emanate from the fact that the loans to finance sector are further channelled out towards other sectors as loans too; hence, the two variables might fail to relate.

Loan allocations to the manufacturing sector Granger cause growth in GDP but not vice versa; hence, in Zimbabwe over the period of study, we can conclude that there is unidirectional causality from loans allocated to the manufacturing sector to GDP. The loan allocations allocated to the manufacturing sector positively lead to an increase in output in the sector and hence push up the Zimbabwean GDP.

The same results as in the manufacturing sector can be mentioned for the credit allocated to the mining sector positively running from the manufacturing sector to GDP and not vice versa. This implies that growth in money supplied and allocated to the mining sector positively contributes to GDP in Zimbabwean; hence, the mining sector is a driver and positive contributor to GDP growth.

A negative Granger causal relationship is reported in the results from loans allocated to individuals to GDP, and there is no causal relationship from GDP to loan allocations to individual sectors. The finding here concurs with that of Beck et al. (2012). In a

cross-country groundbreaking study, it was found that household credit or consumptive loans are costly to the economy and have no positive effect. This can be described by the two theories. The first is the high-interest rates experienced in Zimbabwe, which would eventually push individuals to default and hence this has an inverse impact on the economy. The second theory is due to the high rate of unemployment and inflation rates, individuals are borrowing for consumption, for example, for school fees, rentals, food and so on, which does drive the GDP compared to a situation when these loans are allocated to productive sectors.

Bidirectional Granger causality is reported between loan allocation to other sectors, such as construction and tourism, and GDP, which is the combined causality of these sectors running either way with GDP.

With reference to the above analysis of empirical findings, there is circumstantial evidence that bank lending supports economic growth. Zimbabwe's economic expansion can be attributed to bank lending. Sectors are heterogeneous, as demonstrated by causality Table 4.9. However, the results demonstrate a positive and statistically significant relationship between sectoral credit allocation and long-term economic growth. This research supports the findings of Nwaru and Okorontah (2014), Owolabi et al. (2013), Ndlovu (2013), and Carby (2012). This relationship does not appear to be stable in the short term. The findings support the research conducted by Nasir et al. (2014) and Ekone (2010).

It has been discovered that sectoral allocations stimulate economic growth. Using the Granger causality findings, it was determined that the relationship between lnAgric & GDP and lnOther & GDP is bidirectional. It is a bilateral system. In addition, there is a causal relationship between sectors such as manufacturing and mining and GDP,

excluding the household sector, which has a causal relationship with GDP. Zimbabwe's less developed economic sectors may account for the absence of causality between lnGDP lnManf, lnFin lnGDP, lnGDP lnFin, lnGDP lnMin, and lnIndiv lnGDP. The results contradict previous studies conducted by Caporalea et al. (2016) and Cecchetti and Kharroubi (2012). This necessitates the implementation of growth-enhancing policies across all sectors. The findings suggest that the banking industry plays a crucial role in the growth of the economy. In other words, bank lending contributes significantly to the explanation of economic growth.

4.4.5 Dynamic analysis

Causality tests are performed to determine what kind of relationship exists between variables. The impact of shocks to Zimbabwe's gross domestic product on sectoral loan distributions is investigated. The responses are estimated using impulse response functions and forecast error variance decompositions.

Conducting causality tests is particularly important in economic analysis. However, it has its own shortfalls. Causal tests do not factor the strength of the variables' relationship. Moreover, it does not explain the connection over time of these variables. It is not a comprehensive measure. Taking these facts into consideration, the response of Zimbabwe's gross domestic product to shocks to the sectoral loan allocations shocks is examined. To estimate these responses, the use of the forecast error variance decompositions (VDs) and the impulse response functions (IRFs) were employed.

4.4.6 Analysis of the IRFs

The IRFs are important, as they track over time the responses to the VAR system after a shock to the variables. The degree to which the systems return to equilibrium is shown by the persistence of a shock to the variables. To analyse the size of innovations in sectoral loan allocation flows, IRF estimations can be used to explain the movements in GDP. This allows the determination of the extent, direction and time taken for GDP to react to a shock from sectoral loan allocation flows in the system. The estimation of the IRFs is performed using the Cholesky decomposition.

For one to draw conclusions from the VDs and IRFs, there is need for the VAR model to be stable. In this study, the stability of the VAR model is easy to check, as data are integrated of order zero.

Figure 4. 3: Inverse Roots and Impulse Response (lnGDP and lnAgric)

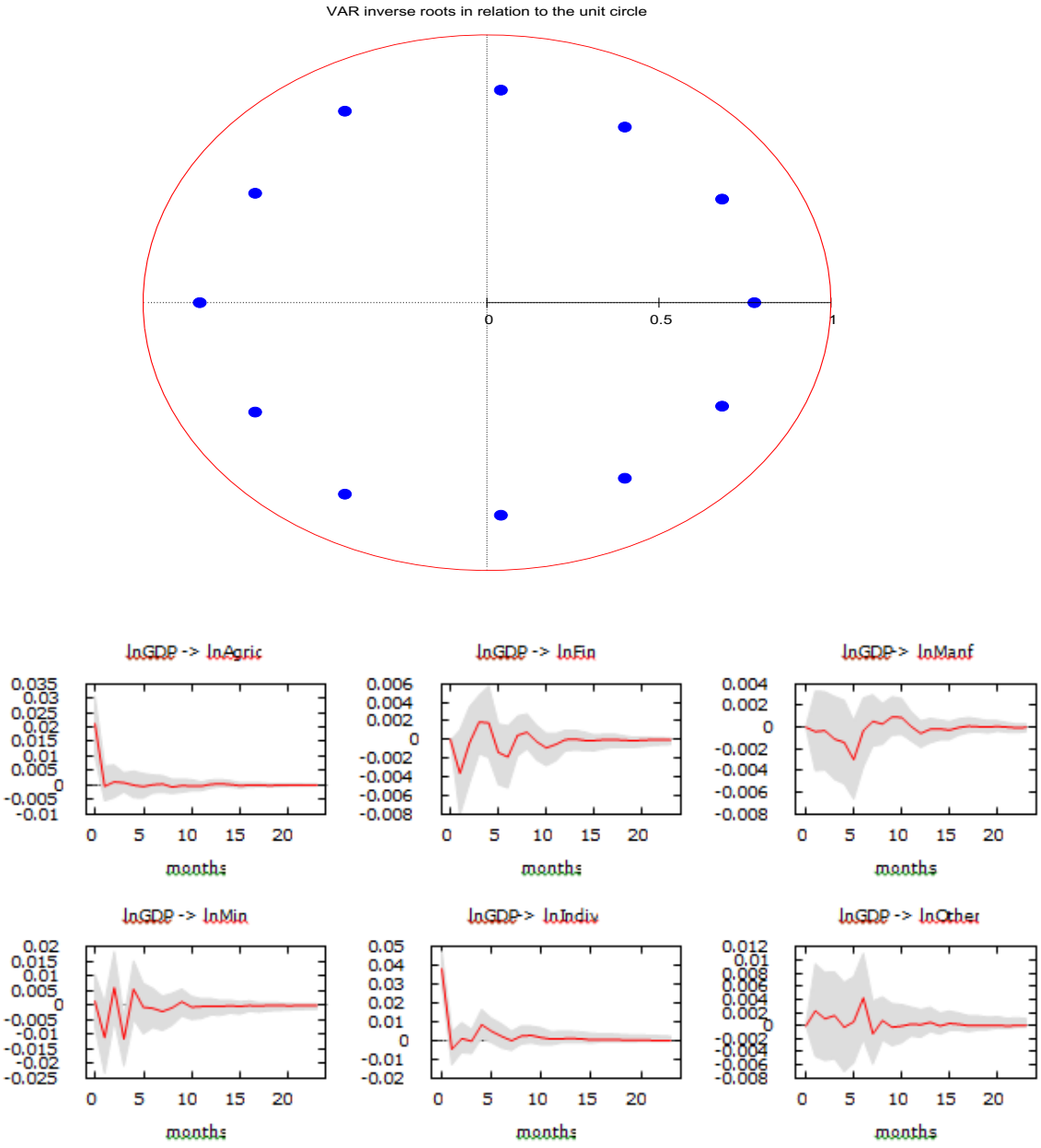


Figure 4.6 (a) above shows that the stability condition is satisfied at 12 lags in the VAR model since all the roots lie inside the unit circle in each model. There is an additional confirmation, as shown by the IRFs declining to zero within a short space of time of the system being shocked. Within a space of only nine (9) months, it is easy for one

to realise stability in the estimated VAR model. It is necessary to note that the LR at the 5 per cent significance level has determined the 12 lags.

NOTE:

- On plotting the line graphs, the X-axis represents the time (lagged number of months), while the Y-axis shows the percentage changes.

- The IRFs are statistically significant on whether the standard error bands are below or above zero on the Y-axis.

Figure 4.6 (b) presents the estimated IRFs at the 95 per cent confidence bands, as shown by the dotted line. All the panels in the figure depict the response of lnGDP to a transitory shock connected with the sectoral loan allocations (lnAgric, lnFin, lnManf, LnMin, lnIndiv and lnOther) in the VAR system. The IRF confidence bands were generated by 1000 repetitions using Monte Carlo simulations. Therefore, the results of the IRFs show that the short-run relationship between Zimbabwe GDP and sectoral loan allocations is statistically insignificant. In short, the effects of the shocks of the variables do not occur at the same time as loan allocations on Gross Domestic Product.

4.4.6.1 Analysis of the Forecast Error Variance Decompositions (FEVDs)

The FEVDs act as an indicator of the relative prominence of the variables structural shock in the system. FEVDs details the percentage of variation in forecasting error, that is, forecasting error of Zimbabwe's GDP caused by own shocks versus the relative shocks of bank loan sectoral allocations. The reason for estimating the variance of the

forecast error was to show how best sectoral loan allocation shocks in the entire system.

Table 4. 10: FEVDs Results

Period	Std. error	lnGDP	lnAgric	lnFin	lnManf	lnMin	lnIndiv	lnOther
1	0.01602	100.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.01649	95.750	0.577	0.590	0.058	0.859	1.511	0.656
3	0.01726	87.402	0.831	0.766	0.445	2.168	2.531	5.857
4	0.01805	79.941	2.218	0.718	1.886	6.985	2.865	5.388
5	0.01826	78.620	3.270	0.799	1.920	6.926	2.839	5.627
6	0.01969	67.592	2.811	0.744	5.035	6.066	8.922	8.829
7	0.02013	65.066	3.045	1.630	5.322	7.950	8.535	8.452
8	0.02048	63.955	3.103	1.637	5.846	7.684	9.600	8.175
9	0.02070	62.586	4.312	1.604	6.098	7.695	9.563	8.142
10	0.02120	60.050	4.924	2.276	6.354	7.916	9.134	9.347
11	0.02133	59.574	4.864	3.032	6.302	7.947	9.035	9.246
12	0.02143	59.105	4.974	3.045	6.272	7.874	9.129	9.601

Table 4.10 reports the FEVDs for the lnGDP over the time of study, seeing the same IRF analysis identification restrictions, that is, ordering the variables. The first month, as expected, contributes nothing from all the sectoral loans to the GDP's variance forecast error. In GDP, shocks acted as the main driver of lnGDP, that is, 95.75 per cent in the 2nd month, which implies that *lnGDP* can be predicted by its earlier behaviour, that is, there is a strong lagging effect. Four months ahead, the Zimbabwe

GDP variation is the result of the greatest influence from *lnMin* at 7 percent, followed by lnOther at 5.38 percent, *lnIndiv* at 2.86 percent, *lnAgric* at 2.218 per cent , *lnManf at* 1.89 per cent and *lnFin* at 0.718 percent.

Eight months ahead the variations in GDP were because of 64 per cent of the influence from lnGDP itself and the rest was from the following bank sectoral allocations which contributed as follows 9.6 per cent from individual loans lnIndiv, lnOther with 8.17 percent, *lnMin* with a contribution of 7.7 percent, *lnManf* with 5.84 percent, *lnAgric* with 3.103 per cent and finally lnFin with 1.637 per cent contribution to variations in *lnGDP.*

The size of the contribution of lnFin and lnAgric did not vary significantly over the 12 months, indicating that these two sectors have been consistently affecting the level of GDP in Zimbabwe with the same size over the 12 months. This may be because agricultural loans have been made a major priority by the government over the years; hence, the amount allocated was being maintained. Since the financial sector is the one supplying the loans to other sectors and as found in earlier sections, this sector's contribution is insignificant to influence GDP and hence the minor change over the forecasted 12 months.

Loans allocated to other sectors *(lnOther)* showed some significant changes during the forecasted period a jump from 0.656 per cent to 9.6 per cent contribution to variance in GDP, this could be explained by the significant impact of these others towards GDP as confirmed by VAR estimations above hence the continued increase in impact. The same results have also been portrayed by lnMin from 0.859 per cent to 7.87 per cent and lnMan from 0.058 to 6.27 per cent influence in variations in

forecasted GDP. These two sectors have also been labelled the main positive contributors to Zimbabwe GDP together with the agriculture sector.

Loans allocated to the individuals showed a huge spike from 1.51 per cent to 9.129 per cent in their contribution towards variations in GDP. From the results, it has been proven that this sector negatively impacts GDP, and there is a huge appetite of loans from this sector, of which the loans are not put into the productive sector but into consumption. Hence, these loans show a huge negative impact on Zimbabwean GDP over the forecasted 12 months.

4.5 Chapter Summary

A general breakdown (outline) of the plan to analyse the data in line with the research objectives and questions is introduced in this chapter. Hypotheses were tested. An analysis of the time series followed, beginning with some texts considering the short- and long-term relationship; for example, descriptive statistics of the SCA and economic growth, lag length (optimal) and the tests for the unit roots. In analysing the time series data, the researcher used the ADF and the PP unit root tests, concluding that all SCAs and economic development are stationary at level; that is, the ADF results conclude that all series are stationary at level. The results showed that all variables were integrated of order one, *I~ (1).* The results of the PP test statistic confirmed the results of the ADF outcomes. The results obtained from the study support the view that economic growth in Zimbabwe is promoted by sectoral allocation to agriculture, mining, and manufacturing. It was noted that developing economies have heterogeneous political, socioeconomic, and institutional backgrounds that make it difficult for them to generalise among themselves and among their developed

counterparties. This variation, according to Carby *et al.* (2012), has given room for the existence of reverse causality in linking finance and growth.

Positive and statistical significance between sectoral loans and economic growth were noted in the long run. These results confirmed the findings of Liang (2011), Simwaka (2012), Carby et al. (2012), AlFara (2012), Sami (2013), Owolabi (2013), Ndlovu (2013), and Nwaru and Okorontah (2014).

However, the findings are valid in the long run and not in the short run. This is in support of the findings of Ekone (2010), Simwaka (2012) and Nasir (2014). By drawing favour from the Granger causality test, economic growth is confirmed to drive bank loans in manufacturing, agriculture, mining, and other sectors. As such, economic growth is critical for the development of Zimbabwe's loan portfolio.

This association does not hold in the short term, and it is consistent with the findings of (Nasir, 2014), (Simwaka, 2012), and (Nasir, 2014). (Ekone, 2010). Using Granger causality tests, it is discovered that economic expansion promotes bank lending in industries such as manufacturing, agriculture, and mining. These findings suggest that economic growth is critical for the banking sector's development in Zimbabwe.

5 CHAPTER FIVE: DISCUSSION OF THE FINDINGS

5.1 Introduction

This section discusses the findings of the research. It analyses the results obtained from examining data in line with available literature concerning the area of study. This analysis was done to investigate the impact of the association between SCA and economic growth in Zimbabwe. In a quest to obtain the answers to this aim, the four goals were formulated

i) *Explore the relationship between economic growth and sectoral loan allocations in Zimbabwe.*
ii) *Investigate the causal relationship between sectoral credit and economic growth in Zimbabwe, both in the long and short run.*
iii) *Examine whether bank lending can be used to explain economic growth in the context of zimbabwe.*
iv) *Determine policy recommendations in line with the findings.*

Specifically, this section of the thesis is grouped into three subsections centred around the three main objectives. First, the aim was to find the relationship (nature and size) between SCA and economic growth in both the short run and long run in accordance with the Engle-Granger (1987) and Johansen (1991) tests of cointegration. Second, the research aimed to determine the direction of the relationship.

Thereafter, the researcher analysed the nature of causality between the variables forming the SCA and economic growth in the short run and long run, respectively, based on the outcome of the Granger causality tests. Further, the researcher

examined whether the banking sector lending function could be used to explain economic growth.

5.2 The relationship of SCA and economic growth

This section discusses whether the main objective of this research has been achieved.

H_0: There is a significant long-run relationship between SCA and economic growth.

To achieve the first objective, the research hypothesis was tested by determining whether the variables move together or not. The hypothesis classical approach was adopted to test for a cointegrating relationship between SCA and economic growth. The first approach was the Engle and Granger (1987) test, and the last was Johansen's (1988) and Johansen and Juselius's (1990) tests.

Employing Johansen and Engle-Granger's cointegration tests for the sample data suggests that the economic sectors lacked evidence of a relationship; hence, this study does not accept the alternative hypothesis, which says there is a significant long-run relationship between SCA and economic growth. Moreover, the rate of movements in sectoral credit as an independent variable lacks significance to explain economic growth movements.

In contrast, this study accepts the null hypothesis that there is no long-term relationship between SCA and economic growth, thus accepting the null hypothesis that *H_0: There is no significant long-term relationship between SCA and economic growth.*

The study result is inconsistent with the findings of Ndlovu (2013), who accepts the hypothesis that cointegration exists between financial development and economic

growth in the long term. The conclusion of this study for the Engle-Granger cointegration test is that long-term bank loans in Zimbabwe do not move in tandem with economic growth. Using the Engle-Granger cointegration model, the study indicate that bank-based economies are stable only in the short term (Ibrahim et al., 2017; Lee, 2012). Lee (2012) provided evidence that market-based economies derive growth from the stock market, whereas bank-based economies derive growth from the banking sector. The evidence suggests that the banking sector drives the economy in the short term (during the early stages of development) and that the stock market takes over as the economy develops. In a sample of stock markets and banks from both developed and developing economies, Ibrahim et al. (2017) discovered that both stock markets and banks contribute positively to economic growth. However, the author noted that the impact of banks was more persistent than that of the stock market. Using a sample of 60 countries, Boadi et al. (2019) found that market-based financial systems drive economic growth more effectively than bank-based systems.

In contrast, Johansen's cointegration tests revealed a long-term relationship among the variables. Positive and statistical significance between sectoral loans and economic growth were noted in the long run. This study, however, adopted the findings of Johansen's (Johansen, 1988; Johansen and Juselius, 1990) cointegration test since the cointegration tests by Engle-Granger carry their own drawbacks, as previously mentioned in Chapter 3. The Engle-Granger model lacked sufficient significance to explain economic growth movements. As such, this study accepts the alternative hypothesis of cointegration that there is a cointegrating relationship between SCA and economic growth. These results confirmed the findings of Liang (2011), Kisu (2012),

Carby et al. (2012), AlFara (2012), Sami (2013), Owolabi. (2013), Ndlovu, (2013), and Ndubuisi M. Nwaru and Okorontah, (2014).

From the estimated results in Table 4.7, the *lnGDP* equation above displays a high statistical significance of all the coefficients at the 5 per cent significance level. There exists a positive relationship between loans to agriculture, manufacturing, mining, and other sectors and economic growth. The explanatory variables explained approximately 68 per cent of the economic growth, as reflected by the adjusted coefficient of determination (R^2). However, despite the positive achievements in all the other sectors, there is an inverse relationship between GDP and sectors of finance and individuals. The elasticity of loans to individuals and finance sectors showed a contrary relationship.

The results of the Engle-Granger test are inconsistent with the results found by Johansen's (1988; 1991) cointegration tests because, as highlighted in Chapter 3, the Engle-Ginger test has some weaknesses. Most studies showed a relationship between bank credit and economic growth.

5.3 The direction of the relationship between SCA and economic growth

The VAR model is usually applicable in circumstances where variables have no cointegration, while the VECM model is often applicable in scenarios of variables being cointegrated. The question *of whether there is any long-run relationship between GDP and SCA in Zimbabwe* is answered in this section of the chapter. The answer is to be derived through an investigation of the following hypothesis.

H_0: There is a nonsignificant long-run relationship between GDP and SCA in Zimbabwe.

H_1: There is a significant long-run relationship between GDP and SCA in Zimbabwe.

The conditions for the application of the cointegration tests are met since all the variables are cointegrated in the same order I~ (1). To identify any relationship between the variables, the Engle-Granger (1987) two-step test with automatic lags in line with BIC, SIC, and HQC criteria, the results accept the null hypothesis of Engle-Granger that there exists no cointegration between GDP and bank lending allocations. The findings through the Engle-Granger cointegration test conclude that sectoral bank loans do not move together with GDP in the long run.

Comparatively, Johansen's trace test was also used to find the cointegrating vectors. Therefore, the Zimbabwe monthly data from January 2010 to December 2021 appear to support the existence of a long-run relationship between GDP and SCA (agriculture, manufacturing, mining, finance, individuals, and others) in accordance with Johansen's cointegration procedure. As such, it implies that *lnGDP* maintains a stable equilibrium with *ln Agric, lnManf, lnFin, lnMin, lnIndiv and lnOthers* in the long run for the entire sample period of study.

For the purposes of the first secondary objectives, the long-run VECM estimation was used to estimate the long-run relationship of variables. The estimated results shown in Table 4.7 display a high statistical significance of all the variables at the 5 per cent level of confidence and display a long-run statistical relationship, as displayed in the following equation.

$$\boldsymbol{lnGDP = f(lnAgric, lnFin, lnMin, lnManf, lnIndiv, lnOther)}$$

$$\boldsymbol{lnGDP = f(0.944lnAgric - 0.060lnFin + 0.619lnMin + 0.224lnManf - 0.636lnIndiv + 0.034lnOther)}$$

There exists a positive relationship between loans for agriculture, manufacturing, mining, individuals, finance, and other sectors. The explanatory variables were privileged to explain approximately 68 per cent of the GDP, as shown by the adjusted coefficient of determination (R^2).

The findings of this study are consistent with the findings of Levine *et al.* (2000), who, by shifting from a time series perspective to a dynamic panel analysis for 1960 to 1995, found a strong positive relationship between finance and economic growth. The sample study data consisted of five-year averages for seventy-four countries. The notable results prove the existence of a strong positive correlation. In the same vein, it was suggested as policy advice that more financial resources should be allocated to boost the financial system to act as a special purpose vehicle that stimulates or accelerates economic growth.

This association does not remain in the near run, according to research by (Ekone, 2010), (Simwaka, 2012), and others (Nasir, 2014). According to Granger causality tests, economic expansion stimulates bank lending in industries such as manufacturing, agriculture, and mining. This suggests that economic growth is critical for the development of Zimbabwe's banking sector.

5.4 The direction of causality between SCA and GDP

The VAR model is usually applicable in circumstances where variables have no cointegration, while the VECM model is often applicable in scenarios of variables being cointegrated. In seeking to answer objective number 3, the estimated results of the VECM are ready to explain it all. In the context of agriculture, the sector is significant and displays long-run causality. However, the causality runs from economic growth to

agriculture in Zimbabwe. The VECM model GDP was explained to 80.8 per cent by the included variables, as shown by the coefficient of determination.

The VECM results for the finance sector show insignificance of the variable in the model and a lack of long-run causality moving from the finance sector to GDP. The findings almost reflect Aliero's (2013) findings on the relationship between private sector lending and economic growth in Nigeria. A time series data set spanning the years 1974 to 2010 was used. The dependent variable was the real gross domestic product, while the explanatory variable was the private sector. The econometric formula is as follows:

$$Y = \beta_0 + \beta_1 PSC_t + \mu_t$$

where Y stands for real gross domestic product, β_0 is a constant parameter, PSC_t is private sector credit, and β_1 is a vector of the coefficient of private sector credit. For cointegration, Aliero used the ARDL bound F test. The findings confirmed that the private sector and economic growth have a long-run equilibrium relationship. However, causality findings revealed no link between Nigeria's private sector and economic growth. The absence of evidence could be because loans to the finance sector are also channelled out to other sectors as loans, causing the two variables to be unrelated.

Sectors such as manufacturing and mining prove their significance in the model and a long-run causality that runs from the manufacturing, mining, and other sectors to GDP. This implies that the inclusion of these sectors is not coincidental, but it is crucial in explaining the character of economic growth in Zimbabwe. However, loans allocated to individuals were shown to be insignificant in explaining economic growth. However,

long-run causality has been highlighted running from loans to the individuals' sector to economic development.

As the industrial sector is capital intensive, however, the level of financial resources would need to reach a certain threshold for the sectors to have the greatest impact on the economy. Investing in sectors such as agriculture, manufacturing, and mining requires a high level of capital; therefore, more capital should be directed in their direction. This result is in line with recent research by Daway-Ducanes and Gochoco-Bautista (2019). It is confirmed that the banking industry is a significant factor in driving local economic growth. This result is consistent with the empirical literature on the relationship between finance and economic growth (Caporalea et al., 2016).

5.5 Interactive relationships among variables used in this research

The extent of the link between the variables across time is determined via causality tests. The impact of shocks to Zimbabwe's gross domestic product on sectoral loan distributions was investigated. Impulse response functions and forecast error variance decompositions were used to estimate responses.

Conducting causality tests is important in economic analysis. However, it has its own shortfalls. Causal tests do not determine the strength of the variables' relationship. Moreover, it does not describe the relationship over time between these variables because it is not a comprehensive measure. Therefore, the response of Zimbabwe's gross domestic product was examined to shocks to the sectoral loan allocations shocks. To estimate these responses, the study employed forecast error variance decompositions (VDs) and impulse response functions (IRFs).

The IRFs are important, as they track over time the responses to the VAR system after a shock to the variables. The degree to which the systems return to equilibrium is shown by the persistence of a shock to the variables. To analyse the size of innovations in sectoral loan allocation flows, IRF estimations can be used to explain the movements in GDP. This allows determining the extent, direction and time taken for GDP to react to a shock from sectoral loan allocation flow in the system. The estimation of the IRFs is performed using the Cholesky decomposition. Therefore, the results of the IRFs, as displayed in Figure 5.3 (b), show that the short-run relationship between Zimbabwe GDP and sectoral loan allocations is statistically insignificant. In short, the effects of the shocks of the variables do not occur at the same time as loan allocations on Gross Domestic Product.

The forecast error variance decompositions (FEVDs) are an indicator of the relative importance of the variables' structural shock in the system. FEVDs detail the percentage of variation in forecasting error, that is, forecasting error of Zimbabwe's GDP because of its own shocks versus the relative shocks of bank loan sectoral allocations. The reason for estimating the variance of the forecast error was to determine the relative importance of the sectoral loan allocation shocks in the entire system. It is necessary to find how the variable shocks affect the entire interaction of the other variables and the model at large. Table 5.9 displays the size of the contribution of the variables to each other and to the rate at which the economy grows. In the first month, virtually all sectors contributed nothing to GDP's variance forecast error. However, all the variables have a quantitative significance in shocks towards other variables; as a result, one cannot understand if a given shock from one variable account for a gross variation in another. This section implies a practical consideration

in assessing the contributions of recognised shocks to differences in forecast errors at given time horizons. In the first month of the study period, the rest of the explanatory variables imposed no shock at all on GDP but started as time progressed.

5.6 Policy implications from differences in causality

In many countries, the decision-making conundrum creates ambiguity in the economy and prevents it from improving. Demetriades and Hussein both emphasised the lack of consensus on the causality direction (1996). They determined that the link between these variables varies across countries, leaving little room for generalisation. As a result, the cross-country regression findings are far from correct despite the widespread agreement. Cross-section results are insufficient in revealing changes in institutional characteristics, governmental or regulatory policies, and monetary regime operations and implementation. All these distinctions play a significant part in the banking sector's operations and the process of financial development. Demetriades and Hussein's perspectives were not restricted to themselves; Ram (1999) also bought the perspective.

The focus of this research is on individual countries. Between 1960 and 1989, forty six out of ninety five countries had positive correlations between the two variables, forty-six out of ninety-five countries had negative correlations while three countries registered no correlation. He later questioned the validity of prior research that used cross-country estimations after running different approaches to verify his conclusions. Prior research such as is likely to be bogus and should not be trusted. Using cross-country research to draw broad judgments about countries is not practical. Each country has its own factors that either help or hinder economic development. As a

result, making a broad assertion that the financial sector fosters economic growth is skewed. In many smaller economies, the causal association is empirically weak. Some conclusions have been drawn based on the findings.

i) The understanding of the relationship between SCA and economic growth is critical for the development of the financial system, as it allows authorities to properly allocate resources and obtain proportionate returns. As a result of the findings, loan allocation should be decided by the extent of each sector's contribution to economic development.

ii) Bank management, regulators, investors, and the government can obtain insight into the causative relationship between SCA and economic growth in the Zimbabwean environment by analysing the causal association between SCA and economic growth. These are directly or indirectly responsible for the smooth operation of the financial market and economic progress. Even for diversified portfolios and credit risk management, the problem of causality is critical.

5.7 Chapter Summary

Many economists are cautious about claiming that finance is a driver of economic growth. Their findings reveal that economic sectors differ, making it ineffective to prescribe a uniform lending policy. In this chapter, the study's findings were discussed with respect to the research goals. The findings revealed a long-term relationship between sectoral loans and economic growth. Furthermore, the analyses revealed that causality existed but that it did not run in the same direction across all sectors. This

chapter also covered the results of the VAR and VECM forecasts used in this investigation.

The study examines the interactions of bank lending through sectoral credit allocation on economic growth in Zimbabwe between 2010 and 2021. Following the first secondary objective and the multivariate cointegration method of Johansen and Juselius (1990), the detailed time series revealed that

1. bank lending can be used to explain economic growth;
2. there is a reasonable correlation between economic expansion and the banking industry; and
3. a mixed causal relationship exists.

Given these findings, policymakers should place a high value on bank lending so that it can be restructured and directed toward sustainable and productive economic activities as opposed to household and interbank loans. This may increase the rate at which banks grow the economy and help achieve the eighth Millennium Development Goals.

Using sectoral bank lending data has added to the originality of this study. Nonetheless, future research should focus on longer time series of sectoral data and identify the sectoral threshold that initiates economic growth. The following chapter discusses the conclusions, policy implications, and future research.

6 CHAPTER SIX: CONCLUSIONS, POLICY IMPLICATIONS AND FURTHER RESEARCH

6.1 Introduction

This concluding chapter summarizes the findings, policy implications, and research issues. The contents of this chapter begin with a discussion of the study objectives met. The study's weaknesses are also explored. Some research concepts are highlighted to be useful to other economists and financial experts. The chapter concludes with the theoretical and practical implications of the study's findings.

6.2 Achieving Research Objectives

The study objectives, research questions, and hypothesis testing were all accomplished using monthly time series data from January 2010 to December 2021. The data were used to achieve the study's first three goals, which were developed through establishing research hypotheses. Before running any tests on the data set, the researcher ran descriptive statistics on a sample of it. The researcher then details unit root testing and finding the best lag lengths for sectoral loan allocations and GDP. This set the stage for fulfilling the study objectives in an acceptable timeframe.

The study's first purpose was to establish a link between various sectoral loans and Zimbabwe's GDP. To achieve this purpose, the researcher used monthly data from January 2010 to December 2021. Cointegration tests included the two-step Engle-Granger (1987) and Johansen cointegration (Johansen, 1988; Juselius, 1990) models. The findings of the two models revealed a short-run relationship between financial and individual sectors, as well as economic growth. Despite the short-term outcomes, the Johansen model came to different conclusions in the mining, agriculture,

manufacturing, and other sectors with a long-term relationship with GDP. As such, objectives one and three can unconditionally be explained by the fact that bank lending can be used in the explanation of economic growth and that there is a relationship between sectoral credit and economic growth.

Second, the purpose of the study was to determine how the link between sectoral bank loan allocations and GDP in Zimbabwe was going. The study discovered a bidirectional relationship between agricultural, mining, and manufacturing loans and GDP in Zimbabwe. Unidirectional causality between financials and individual sectors and GDP was established in Zimbabwe, and it was discovered to be negative between financials and individual sector loan allocations and GDP.

Finally, this study examined the impact of loan distribution by industry on Zimbabwe's economic growth (2010–2021). The purpose is to determine if bank loans to various sectors of the economy contributed to economic growth. Based on credit granted to agriculture, mining, manufacturing, finance, individuals, and other sectors, the observed findings have a mixed impact on economic growth. By supplying foreign money, banks can assist the country in achieving long-term economic prosperity. Mining, agriculture, industry, and other industries have positively impacted the economy and played a key role in its expansion.

6.3 Recommendations

- With a correct bias toward agriculture, mining, manufacturing, and other sectors, the RBZ's monetary policy should emphasize SCA.
- Similarly, the government should employ fiscal policy to establish revolving facilities to assist mining, manufacturing, agricultural, and other industries in

meeting their long-term financing requirements. Financial institutions can, therefore, not be excluded from the recommendations.

- Additionally, the banking industry must develop new strategies to increase the availability of financial resources to economically productive industries.
- The banking sector should lend productively for the stabilization and expansion of the economy in accordance with monetary and government policies.
- The Zimbabwean monetary authorities should focus on all sectors of the economy in general, keeping in mind that agriculture, manufacturing, mining, and other sectors are the primary economic drivers.
- Through fiscal policy, the government should limit excessive deficits and private sector borrowing. This crowds out the private sector.
- When formulating policies for sectoral growth, policymakers should carefully consider the optimal level of financial support.
- A stable monetary framework is required to develop financial institutions and financial markets to maximize the benefits.

6.4 Further Research Suggestions

The findings provide some intriguing research suggestions, which are presented below for fellow academics interested in this topic. The future research can examine the relationship between GDP and some macroeconomic parameters across countries; these parameters include interest rate, gross fixed capital formation, trade openness, human capital, inflation, and exchange rate. Future studies should also investigate the causal relationships between GDP and macroeconomic variables.

The relationship between sectoral bank lending and economic growth is a fascinating study that touches on a variety of topics; therefore, further research should focus on the following areas:

- ✓ The impact of external debt on economic growth.
- ✓ The correlation between credit growth and the expected returns of bank stocks.
- ✓ The impact of weighted loans on economic growth.
- ✓ Determination of the equilibrium threshold that can initiate economic growth.

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8 APPENDICES

8.1 Summary Statistics

	Mean	Median	Minimum	Maximum
lnGDP	0.018645	0.0071944	-1.2147	0.78846
lnAgric	0.017051	0.0053121	-0.16731	0.40245
lnFin	0.0098668	0.021742	-5.7511	5.3604
lnManf	0.014789	0.013048	-0.18007	0.17456
lnMin	0.018241	0.013118	-0.20828	0.40586
lnIndv	0.037287	0.012690	-0.22151	0.43380
lnOther	0.016801	0.0067869	-1.4868	1.4772

	Std. Dev.	C.V.	Skewness	Ex. kurtosis
lnGDP	0.47920	25.701	-0.61661	0.32405
lnAgric	0.075410	4.4225	2.0119	8.4637
lnFin	1.0732	108.77	-0.41153	17.770
lnManf	0.060320	4.0788	-0.059690	0.86640
lnMin	0.092893	5.0925	0.72245	3.1821
lnIndv	0.093148	2.4981	1.3545	4.7342
lnOther	0.41246	24.549	0.16904	5.1919

	5% perc.	95% perc.	IQ range	Missing obs.
lnGDP	-1.0729	0.78846	0.51160	0
lnAgric	-0.083214	0.093977	0.071912	0
lnFin	-0.99243	0.75232	0.19198	0
lnManf	-0.077499	0.12975	0.072984	0
lnMin	-0.15126	0.19349	0.087949	0
lnIndv	-0.081051	0.22697	0.085894	0
lnOther	-0.62279	0.69006	0.23452	0

8.2 Unit Root Test Results

Augmented Dickey-Fuller test for lnGDP

testing down from 2 lags, criterion AIC

sample size 81

unit-root null hypothesis: a = 1

test with constant

including 0 lags of (1-L) lnGDP

model: (1-L) y = b0 + (a-1) *y(-1) + e

estimated value of (a - 1): -1.59827

test statistic: tau_c (1) = -17.696

p-value 0.0001

1st-order autocorrelation coeff. for e: 0.036

with constant and trend

including 0 lags of (1-L) lnGDP

model: (1-L) y = b0 + b1*t + (a-1)*y(-1) + e

estimated value of (a - 1): -1.59836

test statistic: tau_ct (1) = -17.5846

p-value 9.092e-012

1st-order autocorrelation coeff. for e: 0.036

Augmented Dickey-Fuller test for lnAgric

testing down from 2 lags, criterion AIC

sample size 80

unit-root null hypothesis: a = 1

test with constant

including one lag of (1-L) lnAgric

model: (1-L) y = b0 + (a-1)*y(-1) + ... + e

estimated value of (a - 1): -1.09856

test statistic: tau_c (1) = -5.87022

asymptotic p-value 2.443e-007

1st-order autocorrelation coeff. for e: 0.013

with constant and trend

including 0 lags of (1-L) lnAgric

model: (1-L) y = b0 + b1*t + (a-1)*y(-1) + e

estimated value of (a - 1): -1.53311

test statistic: tau_ct (1) = -15.9485

p-value 1.918e-013

1st-order autocorrelation coeff. for e: 0.027

Augmented Dickey-Fuller test for lnFin

testing down from 2 lags, criterion AIC

sample size 80

unit-root null hypothesis: a = 1

test with constant

including one lag of (1-L) lnFin

model: (1-L) y = b0 + (a-1)*y(-1) + ... + e

estimated value of (a - 1): -2.08806

test statistic: tau_c (1) = -11.0202

asymptotic p-value 1.648e-022

1st-order autocorrelation coeff. for e: 0.040

with constant and trend

including one lag of (1-L) lnFin

model: (1-L) y = b0 + b1*t + (a-1)*y(-1) + ... + e

estimated value of (a - 1): -2.08817

test statistic: tau_ct (1) = -10.9488

asymptotic p-value 9.527e-024

1st-order autocorrelation coeff. for e: 0.040

Augmented Dickey-Fuller test for lnManf

testing down from 2 lags, criterion AIC

sample size 80

unit-root null hypothesis: a = 1

test with constant

including one lag of (1-L)lnManf

model: (1-L)y = b0 + (a-1)*y(-1) + ... + e

estimated value of (a - 1): -0.93423

test statistic: tau_c(1) = -5.4694

asymptotic p-value 2.029e-006

1st-order autocorrelation coeff. for e: -0.009

with constant and trend

including 0 lags of (1-L)lnManf

model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

estimated value of (a - 1): -1.28747

test statistic: tau_ct(1) = -11.8895

p-value 1.174e-013

1st-order autocorrelation coeff. for e: 0.027

Augmented Dickey-Fuller test for lnMin

testing down from 2 lags, criterion AIC

sample size 81

unit-root null hypothesis: a = 1

test with constant

including 0 lags of (1-L)lnMin

model: (1-L)y = b0 + (a-1)*y(-1) + e

estimated value of (a - 1): -1.01583

test statistic: tau_c(1) = -9.01463

p-value 1.639e-007

1st-order autocorrelation coeff. for e: 0.005

with constant and trend

including 0 lags of (1-L)lnMin

model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

estimated value of (a - 1): -1.07238

test statistic: tau_ct(1) = -9.46075

p-value 4.112e-011

1st-order autocorrelation coeff. for e: 0.011

Augmented Dickey-Fuller test for lnIndv

testing down from 2 lags, criterion AIC

sample size 81

unit-root null hypothesis: a = 1

test with constant

including 0 lags of (1-L)lnIndv

model: (1-L)y = b0 + (a-1)*y(-1) + e

estimated value of (a - 1): -0.870438

test statistic: tau_c(1) = -7.80339

p-value 4.39e-008

1st-order autocorrelation coeff. for e: -0.006

with constant and trend

including one lag of (1-L)lnIndv

model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e

estimated value of (a - 1): -1.15526

test statistic: tau_ct(1) = -8.08419

asymptotic p-value 1.022e-012

1st-order autocorrelation coeff. for e: 0.023

Augmented Dickey-Fuller test for lnOther

testing down from 2 lags, criterion AIC

sample size 80

unit-root null hypothesis: a = 1

test with constant

including one lag of (1-L)lnOther

model: (1-L)y = b0 + (a-1)*y(-1) + ... + e

estimated value of (a - 1): -1.9213

test statistic: tau_c(1) = -10.4226

asymptotic p-value 1.442e-020

1st-order autocorrelation coeff. for e: 0.053

with constant and trend

including one lag of (1-L)lnOther

model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e

estimated value of (a - 1): -1.97001

test statistic: tau_ct(1) = -10.7599

asymptotic p-value 6.116e-023

1st-order autocorrelation coeff. for e: 0.039

Phillips-Perron unit-root test for lnGDP, Bartlett bandwidth 2:

Z_t = -17.6246 (p-value = 0.0000)

Test regression (OLS, dependent variable lnGDP, T = 81):

	coefficient	std. error	z	p-value
const	0.0356703	0.0894672	0.3987	0.6901
time	-0.000170990	0.00186070	-0.09190	0.9268
lnGDP(-1)	-0.598361	0.0908955	-6.583	4.61e-011 ***

Sample variance of residual 0.15329

Estimated long-run error variance 0.14648

Phillips-Perron unit-root test for lnAgric, Bartlett bandwidth 2:

Z_t = -16.0268 (p-value = 0.0000)

Test regression (OLS, dependent variable lnAgric, T = 81):

	coefficient	std. error	z	p-value
const	0.0805568	0.0152128	5.295	1.19e-07 ***
time	-0.00129600	0.000309634	-4.186	2.84e-05 ***
lnAgric(-1)	-0.533109	0.0961286	-5.546	2.93e-08 ***

Sample variance of residual 0.00394551

Estimated long-run error variance 0.00372906

Phillips-Perron unit-root test for lnFin, Bartlett bandwidth 2:

Z_t = -18.8109 (p-value = 0.0000)

Test regression (OLS, dependent variable lnFin, T = 81):

	coefficient	std. error	z	p-value
const	0.0158712	0.207469	0.07650	0.9390
time	0.000120751	0.00431634	0.02798	0.9777
lnFin(-1)	-0.558974	0.0943577	-5.924	3.14e-09 ***

Sample variance of residual 0.824851

Estimated long-run error variance 0.520681

Phillips-Perron unit-root test for lnManf, Bartlett bandwidth 2:

Z_t = -11.7852 (p-value = 0.0000)

Test regression (OLS, dependent variable lnManf, T = 81):

	coefficient	std. error	z	p-value	
const	0.0601630	0.0137888	4.363	1.28e-05	***
time	-0.000975268	0.000279353	-3.491	0.0005	***
lnManf(-1)	-0.287472	0.108287	-2.655	0.0079	***

Sample variance of residual 0.00316258

Estimated long-run error variance 0.00325866

Phillips-Perron unit-root test for lnMin, Bartlett bandwidth 2:

Z_t = -9.45629 (p-value = 0.0000)

Test regression (OLS, dependent variable lnMin, T = 81):

	coefficient	std. error	z	p-value	
const	0.0601069	0.0219624	2.737	0.0062	***
time	-0.000961111	0.000449467	-2.138	0.0325	**
lnMin(-1)	-0.0723765	0.113350	-0.6385	0.5231	

Sample variance of residual 0.00845852

Estimated long-run error variance 0.00832997

Phillips-Perron unit-root test for lnIndv, Bartlett bandwidth 2:

Z_t = -8.48096 (p-value = 0.0000)

Test regression (OLS, dependent variable lnIndv, T = 81):

	coefficient	std. error	z	p-value	
const	0.0849177	0.0227615	3.731	0.0002	***
time	-0.00116368	0.000447714	-2.599	0.0093	***
lnIndv(-1)	0.0451882	0.112478	0.4018	0.6879	

Sample variance of residual 0.00813654

Estimated long-run error variance 0.00661752

Phillips-Perron unit-root test for lnOther, Bartlett bandwidth 2:

Z_t = -17.2141 (p-value = 0.0000)

Test regression (OLS, dependent variable lnOther, T = 81):

	coefficient	std. error	z	p-value	
const	0.103558	0.0831941	1.245	0.2132	
time	-0.00186777	0.00172938	-1.080	0.2801	
lnOther(-1)	-0.500665	0.0980414	-5.107	3.28e-07	***

Sample variance of residual 0.131749

Estimated long-run error variance 0.0836733

8.3 Cointegration Results

Johansen test:

Number of equations = 2

Lag order = 12

Estimation period: 2011:01 - 2016:10 (T = 70)

Case 3: Unrestricted constant

Log-likelihood = 438.194 (including constant term: 239.543)

Rank Eigenvalue Trace test p-value Lmax test p-value

0 0.57769 61.600 [0.0000] 60.341 [0.0000]

1 0.017824 1.2589 [0.2619] 1.2589 [0.2619]

Corrected for sample size (df = 45)

Rank Trace test p-value

0 61.600 [0.0000]

1 1.2589 [0.2761]

eigenvalue 0.57769 0.017824

beta (cointegrating vectors)

lnGDP 110.47 52.527

lnAgric 8.3978 -65.581

alpha (adjustment vectors)

lnGDP -0.061307 -0.0018129

lnAgric -0.0080734 0.0046735

renormalized beta

lnGDP 1.0000 -0.80095

lnAgric 0.076019 1.0000

renormalized alpha

lnGDP -6.7726 0.11889

lnAgric -0.89187 -0.30649

long-run matrix (alpha * beta')

lnGDP lnAgric

lnGDP -6.8679 -0.39596

lnAgric -0.64639 -0.37429

Johansen test:

Number of equations = 2

Lag order = 12

Estimation period: 2011:01 - 2016:10 (T = 70)

Case 3: Unrestricted constant

Log-likelihood = 222.61 (including constant term: 23.9591)

Rank Eigenvalue Trace test p-value Lmax test p-value

0 0.70286 99.382 [0.0000] 84.950 [0.0000]

1 0.18631 14.432 [0.0001] 14.432 [0.0001]

Corrected for sample size (df = 45)

Rank Trace test p-value

0 99.382 [0.0000]

1 14.432 [0.0002]

eigenvalue 0.70286 0.18631

beta (cointegrating vectors)

lnGDP 87.608 17.614

lnFin 3.7720 -12.727

alpha (adjustment vectors)

lnGDP -0.086920 -0.0074749

lnFin -0.13752 0.34022

renormalized beta

lnGDP 1.0000 -1.3840

lnFin 0.043055 1.0000

renormalized alpha

lnGDP -7.6149 0.095132

lnFin -12.048 -4.3300

long-run matrix (alpha * beta')

lnGDP lnFin

lnGDP -7.7466 -0.23273

lnFin -6.0549 -4.8487

Johansen test:

Number of equations = 2

Lag order = 12

Estimation period: 2011:01 - 2016:10 (T = 70)

Case 3: Unrestricted constant

Log-likelihood = 410.313 (including constant term: 211.662)

Rank Eigenvalue Trace test p-value Lmax test p-value

0 0.62457 73.517 [0.0000] 68.578 [0.0000]

1 0.068136 4.9398 [0.0262] 4.9398 [0.0262]

Corrected for sample size (df = 45)

Rank Trace test p-value

0 73.517 [0.0000]

1 4.9398 [0.0309]

eigenvalue 0.62457 0.068136

beta (cointegrating vectors)

lnGDP 97.158 32.011

lnManf -4.2625 -58.766

alpha (adjustment vectors)

lnGDP -0.078362 -0.00076646

lnManf -0.0055911 0.012615

renormalized beta

lnGDP 1.0000 -0.54472

lnManf -0.043872 1.0000

renormalized alpha

lnGDP -7.6136 0.045041

lnManf -0.54322 -0.74132

long-run matrix (alpha * beta')

	lnGDP	lnManf
lnGDP	-7.6381	0.37906
lnManf	-0.13941	-0.71749

Johansen test:

Number of equations = 2

Lag order = 12

Estimation period: 2011:01 - 2016:10 (T = 70)

Case 3: Unrestricted constant

Log-likelihood = 378.96 (including constant term: 180.309)

Rank	Eigenvalue	Trace test p-value	Lmax test p-value
0	0.69562	99.400 [0.0000]	83.263 [0.0000]
1	0.20588	16.137 [0.0001]	16.137 [0.0001]

Corrected for sample size (df = 45)

Rank	Trace test p-value
0	99.400 [0.0000]
1	16.137 [0.0001]

eigenvalue	0.69562	0.20588

beta (cointegrating vectors)

lnGDP	84.576	30.354
lnMin	8.6950	-32.709

alpha (adjustment vectors)

lnGDP	-0.086082	-0.0062056
lnMin	-0.0099182	0.039122

renormalized beta

lnGDP	1.0000	-0.92801
lnMin	0.10281	1.0000

renormalized alpha

lnGDP	-7.2804	0.20298
lnMin	-0.83883	-1.2796

long-run matrix (alpha * beta')

	lnGDP	lnMin
lnGDP	-7.4688	-0.54550
lnMin	0.34869	-1.3659

Johansen test:

Number of equations = 2

Lag order = 12

Estimation period: 2011:01 - 2016:10 (T = 70)

Case 3: Unrestricted constant

Log-likelihood = 418.367 (including constant term: 219.716)

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.51010	61.496	[0.0000]	49.949	[0.0000]
1	0.15207	11.547	[0.0007]	11.547	[0.0007]

Corrected for sample size (df = 45)

Rank	Trace test	p-value
0	61.496	[0.0000]
1	11.547	[0.0010]

eigenvalue	0.51010	0.15207

beta (cointegrating vectors)

lnGDP	105.42	45.989
lnIndv	0.76123	-41.640

alpha (adjustment vectors)

lnGDP	-0.055994	0.00015283
lnIndv	-0.00063192	0.019583

renormalized beta

lnGDP 1.0000 -1.1044

lnIndv 0.0072211 1.0000

renormalized alpha

lnGDP -5.9028 -0.0063638

lnIndv -0.066616 -0.81542

long-run matrix (alpha * beta')

lnGDP lnIndv

lnGDP -5.8957 -0.048988

lnIndv 0.83397 -0.81590

Johansen test:

Number of equations = 2

Lag order = 12

Estimation period: 2011:01 - 2016:10 (T = 70)

Case 3: Unrestricted constant

Log-likelihood = 288.679 (including constant term: 90.0279)

Rank Eigenvalue Trace test p-value Lmax test p-value

0 0.68626 86.992 [0.0000] 81.143 [0.0000]

1 0.080163 5.8491 [0.0156] 5.8491 [0.0156]

Corrected for sample size (df = 45)

Rank Trace test p-value

0 86.992 [0.0000]

1 5.8491 [0.0189]

eigenvalue 0.68626 0.080163

beta (cointegrating vectors)

lnGDP	86.323	17.656
lnOther	2.8391	-20.760

alpha (adjustment vectors)

lnGDP	-0.088927	-0.00038754
lnOther	0.013704	0.079498

renormalized beta

lnGDP	1.0000	-0.85047
lnOther	0.032890	1.0000

renormalized alpha

lnGDP	-7.6764	0.0080453
lnOther	1.1830	-1.6504

long-run matrix (alpha * beta')

	lnGDP	lnOther
lnGDP	-7.6833	-0.24443
lnOther	2.5866	-1.6114

8.4 VECM Results

VECM system, lag order 12

Maximum likelihood estimates, observations 2011:01-2016:10 (T = 70)

Cointegration rank = 1

Case 3: Unrestricted constant

beta (cointegrating vectors, standard errors in parentheses)

lnGDP	1.0000
	(0.00000)
lnAgric	0.076019
	(0.071702)

alpha (adjustment vectors)

lnGDP	-6.7726
lnAgric	-0.89187

Log-likelihood = 238.91328

Determinant of covariance matrix = 3.7197733e-006

AIC = -5.3975

BIC = -3.7915

HQC = -4.7596

Equation 1: d_lnGDP

	Coefficient	*Std. Error*	*t-ratio*	*p-value*

Const	0.0605152	0.0120742	5.012	<0.0001	***
d_lnGDP_1	5.19152	0.825616	6.288	<0.0001	***
d_lnGDP_2	4.69283	0.747485	6.278	<0.0001	***
d_lnGDP_3	4.13820	0.681565	6.072	<0.0001	***
d_lnGDP_4	3.57906	0.614911	5.820	<0.0001	***
d_lnGDP_5	3.05234	0.528813	5.772	<0.0001	***
d_lnGDP_6	2.47144	0.452809	5.458	<0.0001	***
d_lnGDP_7	1.89242	0.375201	5.044	<0.0001	***
d_lnGDP_8	1.33252	0.287823	4.630	<0.0001	***
d_lnGDP_9	0.729445	0.216977	3.362	0.0016	***
d_lnGDP_10	0.164725	0.151059	1.090	0.2812	
d_lnGDP_11	−0.379983	0.0774010	−4.909	<0.0001	***
d_lnAgric_1	0.363288	0.211551	1.717	0.0927	*
d_lnAgric_2	0.300352	0.323685	0.9279	0.3583	
d_lnAgric_3	0.0640393	0.399633	0.1602	0.8734	
d_lnAgric_4	−0.215629	0.481957	−0.4474	0.6567	
d_lnAgric_5	−0.358076	0.527070	−0.6794	0.5003	
d_lnAgric_6	−0.454620	0.535410	−0.8491	0.4002	
d_lnAgric_7	−0.671701	0.513899	−1.307	0.1977	
d_lnAgric_8	−0.763930	0.447252	−1.708	0.0944	*
d_lnAgric_9	−0.983005	0.357773	−2.748	0.0085	***

d_lnAgric_10	−0.666545	0.285605	−2.334	0.0240	**
d_lnAgric_11	−0.205562	0.161394	−1.274	0.2092	
EC1	−6.77264	0.881966	−7.679	<0.0001	***

Mean dependent var	−0.004413	S.D. dependent var	0.891450
Sum squared resid	0.205243	S.E. of regression	0.066797
R-squared	0.996257	Adjusted R-squared	0.994385
Rho	0.544594	Durbin-Watson	0.797330

Equation 2: d_lnAgric

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	0.000880633	0.00795605	0.1107	0.9123
d_lnGDP_1	0.753953	0.544022	1.386	0.1725
d_lnGDP_2	0.760013	0.492539	1.543	0.1297
d_lnGDP_3	0.679341	0.449102	1.513	0.1372
d_lnGDP_4	0.487369	0.405182	1.203	0.2352
d_lnGDP_5	0.456342	0.348450	1.310	0.1968
d_lnGDP_6	0.363217	0.298368	1.217	0.2297
d_lnGDP_7	0.199913	0.247230	0.8086	0.4229
d_lnGDP_8	0.204313	0.189655	1.077	0.2870

d_lnGDP_9	0.131699	0.142972	0.9211	0.3618	
d_lnGDP_10	0.00835110	0.0995371	0.08390	0.9335	
d_lnGDP_11	0.0508557	0.0510017	0.9971	0.3239	
d_lnAgric_1	−1.15391	0.139397	−8.278	<0.0001	***
d_lnAgric_2	−1.03180	0.213285	−4.838	<0.0001	***
d_lnAgric_3	−1.24066	0.263330	−4.711	<0.0001	***
d_lnAgric_4	−1.09610	0.317575	−3.451	0.0012	***
d_lnAgric_5	−0.920437	0.347301	−2.650	0.0110	**
d_lnAgric_6	−0.883460	0.352797	−2.504	0.0159	**
d_lnAgric_7	−0.446604	0.338622	−1.319	0.1937	
d_lnAgric_8	−0.165049	0.294707	−0.5600	0.5782	
d_lnAgric_9	−0.259214	0.235747	−1.100	0.2773	
d_lnAgric_10	−0.308989	0.188193	−1.642	0.1074	
d_lnAgric_11	−0.0701246	0.106347	−0.6594	0.5129	
EC1	−0.891875	0.581152	−1.535	0.1317	

Mean dependent var	−0.000493	S.D. dependent var	0.082100
Sum squared resid	0.089114	S.E. of regression	0.044014
R-squared	0.808393	Adjusted R-squared	0.712590
Rho	−0.031914	Durbin-Watson	2.050475

Cross-equation covariance matrix:

	lnGDP	lnAgric
lnGDP	0.0029320	-0.00011351
lnAgric	-0.00011351	0.0012731

determinant = 3.71977e-006

VECM system, lag order 12

Maximum likelihood estimates, observations 2011:01-2016:10 (T = 70)

Cointegration rank = 2

Case 3: Unrestricted constant

beta (cointegrating vectors)

lnGDP	1.0000	0.00000
lnFin	0.00000	1.0000

alpha (adjustment vectors)

lnGDP	-7.7466	-0.23273
lnFin	-6.0549	-4.8487

Log-likelihood = 23.959071

Determinant of covariance matrix = 0.0017288497

AIC = 0.7440

BIC = 2.3501

HQC = 1.3820

Portmanteau test: LB(17) = 98.1282, df = 20 [0.0000]

Equation 1: d_lnGDP

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	0.0716119	0.0120173	5.959	<0.0001	***
d_lnGDP_1	6.11014	0.716638	8.526	<0.0001	***
d_lnGDP_2	5.50906	0.639065	8.620	<0.0001	***
d_lnGDP_3	4.77252	0.587029	8.130	<0.0001	***
d_lnGDP_4	4.12916	0.522905	7.897	<0.0001	***
d_lnGDP_5	3.51541	0.450676	7.800	<0.0001	***
d_lnGDP_6	2.81882	0.395625	7.125	<0.0001	***
d_lnGDP_7	2.23089	0.324817	6.868	<0.0001	***
d_lnGDP_8	1.62502	0.251788	6.454	<0.0001	***
d_lnGDP_9	0.900561	0.202411	4.449	<0.0001	***
d_lnGDP_10	0.329242	0.137634	2.392	0.0210	**
d_lnGDP_11	−0.250338	0.0645213	−3.880	0.0003	***
d_lnFin_1	0.216751	0.111100	1.951	0.0573	*
d_lnFin_2	0.194590	0.102873	1.892	0.0650	*
d_lnFin_3	0.174915	0.0942730	1.855	0.0701	*
d_lnFin_4	0.147302	0.0866197	1.701	0.0959	*
d_lnFin_5	0.114402	0.0767720	1.490	0.1432	

d_lnFin_6	0.0893722	0.0642572	1.391	0.1711	
d_lnFin_7	0.0720680	0.0526435	1.369	0.1778	
d_lnFin_8	0.0549509	0.0440120	1.249	0.2183	
d_lnFin_9	0.0343965	0.0364653	0.9433	0.3506	
d_lnFin_10	0.0117513	0.0256539	0.4581	0.6491	
d_lnFin_11	−0.00171195	0.0122802	−0.1394	0.8898	
EC1	−7.74658	0.781075	−9.918	<0.0001	***
EC2	−0.232732	0.116024	−2.006	0.0509	*

Mean dependent var	−0.004413	S.D. dependent var	0.891450
Sum squared resid	0.240655	S.E. of regression	0.073129
R-squared	0.995611	Adjusted R-squared	0.993270
Rho	0.578887	Durbin-Watson	0.698149

Equation 2: d_lnFin

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	0.0890024	0.146874	0.6060	0.5476
d_lnGDP_1	5.46551	8.75863	0.6240	0.5358
d_lnGDP_2	4.62046	7.81055	0.5916	0.5571
d_lnGDP_3	4.93861	7.17457	0.6883	0.4948

d_lnGDP_4	4.07473	6.39086	0.6376	0.5270	
d_lnGDP_5	3.15758	5.50809	0.5733	0.5693	
d_lnGDP_6	3.70614	4.83527	0.7665	0.4474	
d_lnGDP_7	3.16284	3.96986	0.7967	0.4298	
d_lnGDP_8	1.69546	3.07731	0.5510	0.5844	
d_lnGDP_9	2.12389	2.47383	0.8585	0.3951	
d_lnGDP_10	1.62083	1.68214	0.9635	0.3404	
d_lnGDP_11	0.119599	0.788569	0.1517	0.8801	
d_lnFin_1	3.01183	1.35785	2.218	0.0316	**
d_lnFin_2	2.65406	1.25730	2.111	0.0404	**
d_lnFin_3	2.64685	1.15219	2.297	0.0263	**
d_lnFin_4	2.30235	1.05865	2.175	0.0349	**
d_lnFin_5	1.63039	0.938296	1.738	0.0891	*
d_lnFin_6	0.996051	0.785341	1.268	0.2112	
d_lnFin_7	0.757553	0.643400	1.177	0.2452	
d_lnFin_8	0.745423	0.537908	1.386	0.1726	
d_lnFin_9	0.536537	0.445673	1.204	0.2349	
d_lnFin_10	0.235379	0.313538	0.7507	0.4567	
d_lnFin_11	0.0770108	0.150087	0.5131	0.6104	
EC1	−6.05489	9.54618	−0.6343	0.5291	
EC2	−4.84869	1.41803	−3.419	0.0013	***

Mean dependent var	−0.007062	S.D. dependent var	2.047215
Sum squared resid	35.94748	S.E. of regression	0.893774
R-squared	0.875694	Adjusted R-squared	0.809397
Rho	−0.017215	Durbin-Watson	2.032255

Cross-equation covariance matrix:

	lnGDP	lnFin
lnGDP	0.0034379	-0.0060539
lnFin	-0.0060539	0.51354

determinant = 0.00172885

VECM system, lag order 12

Maximum likelihood estimates, observations 2011:01-2016:10 (T = 70)

Cointegration rank = 2

Case 3: Unrestricted constant

beta (cointegrating vectors)

lnGDP	1.0000	0.00000
lnManf	0.00000	1.0000

alpha (adjustment vectors)

lnGDP	-7.6381	0.37906
lnManf	-0.13941	-0.71749

Log-likelihood = 211.66187

Determinant of covariance matrix = 8.1033255e-006

AIC = -4.6189

BIC = -3.0128

HQC = -3.9810

Portmanteau test: LB(17) = 109.391, df = 20 [0.0000]

Equation 1: d_lnGDP

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	0.0640527	0.0134245	4.771	<0.0001	***
d_lnGDP_1	5.99641	0.856234	7.003	<0.0001	***
d_lnGDP_2	5.41598	0.768130	7.051	<0.0001	***
d_lnGDP_3	4.71638	0.699070	6.747	<0.0001	***
d_lnGDP_4	4.06747	0.627501	6.482	<0.0001	***
d_lnGDP_5	3.47707	0.541997	6.415	<0.0001	***
d_lnGDP_6	2.79807	0.471055	5.940	<0.0001	***
d_lnGDP_7	2.18533	0.392639	5.566	<0.0001	***
d_lnGDP_8	1.58869	0.304927	5.210	<0.0001	***
d_lnGDP_9	0.891306	0.237229	3.757	0.0005	***
d_lnGDP_10	0.298822	0.163720	1.825	0.0746	*
d_lnGDP_11	−0.276859	0.0780013	−3.549	0.0009	***

d_lnManf_1	−0.338642	0.519158	−0.6523	0.5175	
d_lnManf_2	−0.294395	0.494599	−0.5952	0.5547	
d_lnManf_3	−0.162582	0.472689	−0.3440	0.7325	
d_lnManf_4	−0.189543	0.439165	−0.4316	0.6681	
d_lnManf_5	−0.246333	0.401595	−0.6134	0.5427	
d_lnManf_6	−0.192171	0.379195	−0.5068	0.6148	
d_lnManf_7	−0.204840	0.360471	−0.5683	0.5727	
d_lnManf_8	−0.126763	0.338924	−0.3740	0.7101	
d_lnManf_9	0.136844	0.302934	0.4517	0.6536	
d_lnManf_10	0.0497654	0.254679	0.1954	0.8460	
d_lnManf_11	−0.0303489	0.172696	−0.1757	0.8613	
EC1	0.379065	0.927484	−8.235	<0.0001	***
EC2	-7.425314	0.534209	0.7096	0.4816	

Mean dependent var	−0.004413	S.D. dependent var	0.891450
Sum squared resid	0.258945	S.E. of regression	0.075857
R-squared	0.995278	Adjusted R-squared	0.992759
Rho	0.582370	Durbin-Watson	0.678275

Equation 2: d_lnManf

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	0.00658753	0.0103414	0.6370	0.5273
d_lnGDP_1	0.147847	0.659591	0.2241	0.8237
d_lnGDP_2	0.0909500	0.591721	0.1537	0.8785
d_lnGDP_3	0.101802	0.538522	0.1890	0.8509
d_lnGDP_4	0.125122	0.483389	0.2588	0.7969
d_lnGDP_5	0.0895405	0.417522	0.2145	0.8312
d_lnGDP_6	0.0704853	0.362872	0.1942	0.8469
d_lnGDP_7	0.100253	0.302466	0.3315	0.7418
d_lnGDP_8	0.0535125	0.234898	0.2278	0.8208
d_lnGDP_9	0.0325182	0.182747	0.1779	0.8596
d_lnGDP_10	0.0598870	0.126120	0.4748	0.6372
d_lnGDP_11	0.0143987	0.0600875	0.2396	0.8117
d_lnManf_1	−0.357541	0.399928	−0.8940	0.3761
d_lnManf_2	−0.242838	0.381010	−0.6374	0.5271
d_lnManf_3	−0.324951	0.364131	−0.8924	0.3769
d_lnManf_4	0.00560772	0.338307	0.01658	0.9868
d_lnManf_5	0.0473411	0.309365	0.1530	0.8791
d_lnManf_6	−0.0788172	0.292109	−0.2698	0.7885
d_lnManf_7	−0.0790011	0.277685	−0.2845	0.7773
d_lnManf_8	−0.106589	0.261087	−0.4082	0.6850

d_lnManf_9	0.0209171	0.233362	0.08963	0.9290	
d_lnManf_10	0.0549136	0.196189	0.2799	0.7808	
d_lnManf_11	0.0894364	0.133034	0.6723	0.5048	
EC1	−0.139412	0.714478	−0.1951	0.8462	
EC2	−0.717486	0.411523	−1.743	0.0881	*

Mean dependent var	−0.000290	S.D. dependent var	0.086826
Sum squared resid	0.153664	S.E. of regression	0.058436
R-squared	0.704594	Adjusted R-squared	0.547044
Rho	0.019169	Durbin-Watson	1.960960

Cross-equation covariance matrix:

	lnGDP	lnManf
lnGDP	0.0036992	0.00013113
lnManf	0.00013113	0.0021952

determinant = 8.10333e-006

VECM system, lag order 12

Maximum likelihood estimates, observations 2011:01-2016:10 (T = 70)

Cointegration rank = 2

Case 3: Unrestricted constant

beta (cointegrating vectors)

lnGDP	1.0000	0.00000

lnMin 0.00000 1.0000

alpha (adjustment vectors)

lnGDP -7.4688 -0.54550

lnMin 0.34869 -1.3659

Log-likelihood = 180.3086

Determinant of covariance matrix = 1.9847579e-005

AIC = -3.7231

BIC = -2.1170

HQC = -3.0852

Portmanteau test: LB(17) = 108.038, df = 20 [0.0000]

Equation 1: d_lnGDP

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	0.0774716	0.0124466	6.224	<0.0001	***
d_lnGDP_1	5.82741	0.718195	8.114	<0.0001	***
d_lnGDP_2	5.23801	0.643739	8.137	<0.0001	***
d_lnGDP_3	4.55885	0.588100	7.752	<0.0001	***
d_lnGDP_4	3.92873	0.526588	7.461	<0.0001	***
d_lnGDP_5	3.34596	0.454983	7.354	<0.0001	***
d_lnGDP_6	2.70674	0.396156	6.833	<0.0001	***

d_lnGDP_7	2.12517	0.328030	6.479	<0.0001	***
d_lnGDP_8	1.53694	0.255521	6.015	<0.0001	***
d_lnGDP_9	0.864945	0.201140	4.300	<0.0001	***
d_lnGDP_10	0.287499	0.137621	2.089	0.0424	**
d_lnGDP_11	−0.293168	0.0663367	−4.419	<0.0001	***
d_lnMin_1	0.568517	0.275095	2.067	0.0446	**
d_lnMin_2	0.584762	0.264749	2.209	0.0323	**
d_lnMin_3	0.536263	0.254903	2.104	0.0410	**
d_lnMin_4	0.542213	0.243730	2.225	0.0312	**
d_lnMin_5	0.553042	0.232893	2.375	0.0219	**
d_lnMin_6	0.487774	0.221960	2.198	0.0332	**
d_lnMin_7	0.485548	0.208290	2.331	0.0243	**
d_lnMin_8	0.401350	0.191666	2.094	0.0419	**
d_lnMin_9	0.316571	0.170511	1.857	0.0699	*
d_lnMin_10	0.206281	0.144655	1.426	0.1608	
d_lnMin_11	0.0588300	0.100833	0.5834	0.5625	
EC1	−7.46881	0.780031	−9.575	<0.0001	***
EC2	−0.545505	0.293799	−1.857	0.0699	*

Mean dependent var	−0.004413	S.D. dependent var	0.891450
Sum squared resid	0.237368	S.E. of regression	0.072628

R-squared	0.995671	Adjusted R-squared	0.993362
Rho	0.558197	Durbin-Watson	0.730079

Equation 2: d_lnMin

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	0.0150074	0.0164823	0.9105	0.3674
d_lnGDP_1	−0.414260	0.951065	−0.4356	0.6652
d_lnGDP_2	−0.482246	0.852468	−0.5657	0.5744
d_lnGDP_3	−0.418959	0.778788	−0.5380	0.5933
d_lnGDP_4	−0.402194	0.697331	−0.5768	0.5670
d_lnGDP_5	−0.433916	0.602509	−0.7202	0.4751
d_lnGDP_6	−0.362491	0.524607	−0.6910	0.4931
d_lnGDP_7	−0.274674	0.434392	−0.6323	0.5304
d_lnGDP_8	−0.221494	0.338372	−0.6546	0.5161
d_lnGDP_9	−0.150857	0.266359	−0.5664	0.5740
d_lnGDP_10	−0.137656	0.182244	−0.7553	0.4540
d_lnGDP_11	−0.0752615	0.0878460	−0.8567	0.3961
d_lnMin_1	0.244642	0.364292	0.6716	0.5053
d_lnMin_2	0.241574	0.350592	0.6890	0.4943
d_lnMin_3	0.264341	0.337554	0.7831	0.4377

d_lnMin_4	0.379036	0.322758	1.174	0.2464	
d_lnMin_5	0.454302	0.308408	1.473	0.1477	
d_lnMin_6	0.506478	0.293929	1.723	0.0917	*
d_lnMin_7	0.613010	0.275827	2.222	0.0313	**
d_lnMin_8	0.581857	0.253813	2.292	0.0266	**
d_lnMin_9	0.649252	0.225798	2.875	0.0061	***
d_lnMin_10	0.630389	0.191558	3.291	0.0019	***
d_lnMin_11	0.347891	0.133527	2.605	0.0124	**
EC1	0.348689	1.03295	0.3376	0.7373	
EC2	−1.36588	0.389062	−3.511	0.0010	***

Mean dependent var	0.001030	S.D. dependent var	0.130454
Sum squared resid	0.416254	S.E. of regression	0.096177
R-squared	0.645520	Adjusted R-squared	0.456464
Rho	0.054068	Durbin-Watson	1.881732

Cross-equation covariance matrix:

	lnGDP	lnMin
lnGDP	0.0033910	-0.00056284
lnMin	-0.00056284	0.0059465

determinant = 1.98476e-005

VECM system, lag order 12

Maximum likelihood estimates, observations 2011:01-2016:10 (T = 70)

Cointegration rank = 2

Case 3: Unrestricted constant

beta (cointegrating vectors)

lnGDP	1.0000	0.00000
lnIndv	0.00000	1.0000

alpha (adjustment vectors)

lnGDP	-5.8957	-0.048988
lnIndv	0.83397	-0.81590

Log-likelihood = 219.71556

Determinant of covariance matrix = 6.4376856e-006

AIC = -4.8490

BIC = -3.2429

HQC = -4.2111

Portmanteau test: LB(17) = 107.122, df = 20 [0.0000]

Equation 1: d_lnGDP

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	0.0551502	0.0142780	3.863	0.0004	***

d_lnGDP_1	4.42395	0.861449	5.135	<0.0001	***
d_lnGDP_2	3.94770	0.777477	5.078	<0.0001	***
d_lnGDP_3	3.42011	0.701920	4.873	<0.0001	***
d_lnGDP_4	2.96922	0.621777	4.775	<0.0001	***
d_lnGDP_5	2.50839	0.540670	4.639	<0.0001	***
d_lnGDP_6	1.98968	0.469011	4.242	0.0001	***
d_lnGDP_7	1.55420	0.387741	4.008	0.0002	***
d_lnGDP_8	1.07674	0.305887	3.520	0.0010	***
d_lnGDP_9	0.531769	0.236004	2.253	0.0292	**
d_lnGDP_10	0.0714511	0.164445	0.4345	0.6660	
d_lnGDP_11	−0.426865	0.0885008	−4.823	<0.0001	***
d_lnIndv_1	0.154895	0.326673	0.4742	0.6377	
d_lnIndv_2	0.117138	0.303348	0.3861	0.7012	
d_lnIndv_3	0.134295	0.293677	0.4573	0.6497	
d_lnIndv_4	0.143001	0.280206	0.5103	0.6123	
d_lnIndv_5	0.235833	0.259325	0.9094	0.3680	
d_lnIndv_6	0.104652	0.227587	0.4598	0.6479	
d_lnIndv_7	0.288676	0.217203	1.329	0.1905	
d_lnIndv_8	0.108372	0.211426	0.5126	0.6108	
d_lnIndv_9	−0.147061	0.198540	−0.7407	0.4627	
d_lnIndv_10	−0.274416	0.156427	−1.754	0.0862	*

d_lnIndv_11	−0.0765478	0.110994	−0.6897	0.4940	
EC1	−5.89574	0.940835	−6.267	<0.0001	***
EC2	−0.0489882	0.340683	−0.1438	0.8863	

Mean dependent var	−0.004413	S.D. dependent var	0.891450
Sum squared resid	0.210788	S.E. of regression	0.068441
R-squared	0.996156	Adjusted R-squared	0.994106
Rho	0.382785	Durbin-Watson	1.100743

Equation 2: d_lnIndv

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	0.0126376	0.0120329	1.050	0.2992
d_lnGDP_1	−0.693853	0.725993	−0.9557	0.3443
d_lnGDP_2	−0.776100	0.655225	−1.184	0.2424
d_lnGDP_3	−0.738531	0.591548	−1.248	0.2183
d_lnGDP_4	−0.620990	0.524008	−1.185	0.2422
d_lnGDP_5	−0.650397	0.455654	−1.427	0.1604
d_lnGDP_6	−0.555754	0.395263	−1.406	0.1666
d_lnGDP_7	−0.368607	0.326772	−1.128	0.2653
d_lnGDP_8	−0.395943	0.257788	−1.536	0.1316

d_lnGDP_9	−0.289874	0.198894	−1.457	0.1519	
d_lnGDP_10	−0.0931148	0.138587	−0.6719	0.5051	
d_lnGDP_11	−0.0852220	0.0745848	−1.143	0.2592	
d_lnIndv_1	−0.112882	0.275306	−0.4100	0.6837	
d_lnIndv_2	0.0346423	0.255649	0.1355	0.8928	
d_lnIndv_3	0.0637440	0.247498	0.2576	0.7979	
d_lnIndv_4	0.0342382	0.236145	0.1450	0.8854	
d_lnIndv_5	0.127968	0.218548	0.5855	0.5611	
d_lnIndv_6	−0.213000	0.191801	−1.111	0.2727	
d_lnIndv_7	−0.115611	0.183049	−0.6316	0.5309	
d_lnIndv_8	−0.0658775	0.178181	−0.3697	0.7133	
d_lnIndv_9	0.156505	0.167322	0.9354	0.3546	
d_lnIndv_10	0.155394	0.131830	1.179	0.2447	
d_lnIndv_11	0.181773	0.0935414	1.943	0.0583	*
EC1	0.833967	0.792896	1.052	0.2985	
EC2	−0.815904	0.287114	−2.842	0.0067	***

Mean dependent var	0.000056	S.D. dependent var	0.086037
Sum squared resid	0.149711	S.E. of regression	0.057679
R-squared	0.706886	Adjusted R-squared	0.550558
Rho	0.111940	Durbin-Watson	1.771438

Cross-equation covariance matrix:

	lnGDP	lnIndv
lnGDP	0.0030113	5.0670e-005
lnIndv	5.0670e-005	0.0021387

determinant = 6.43769e-006

VECM system, lag order 12

Maximum likelihood estimates, observations 2011:01-2016:10 (T = 70)

Cointegration rank = 2

Case 3: Unrestricted constant

beta (cointegrating vectors)

lnGDP	1.0000	0.00000
lnOther	0.00000	1.0000

alpha (adjustment vectors)

lnGDP	-7.6833	-0.24443
lnOther	2.5866	-1.6114

Log-likelihood = 90.027905

Determinant of covariance matrix = 0.00026178683

AIC = -1.1437

BIC = 0.4624

HQC = -0.5057

Portmanteau test: LB(17) = 129.382, df = 20 [0.0000]

Equation 1: d_lnGDP

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	0.0752091	0.0126849	5.929	<0.0001	***
d_lnGDP_1	6.02719	0.726575	8.295	<0.0001	***
d_lnGDP_2	5.41742	0.650696	8.326	<0.0001	***
d_lnGDP_3	4.70112	0.596262	7.884	<0.0001	***
d_lnGDP_4	4.06084	0.532052	7.632	<0.0001	***
d_lnGDP_5	3.46661	0.460093	7.535	<0.0001	***
d_lnGDP_6	2.81395	0.402771	6.986	<0.0001	***
d_lnGDP_7	2.23285	0.333607	6.693	<0.0001	***
d_lnGDP_8	1.63953	0.260206	6.301	<0.0001	***
d_lnGDP_9	0.935545	0.206170	4.538	<0.0001	***
d_lnGDP_10	0.336472	0.142682	2.358	0.0228	**
d_lnGDP_11	−0.254620	0.0690918	−3.685	0.0006	***
d_lnOther_1	0.251458	0.183468	1.371	0.1773	
d_lnOther_2	0.255010	0.178512	1.429	0.1600	
d_lnOther_3	0.243695	0.172099	1.416	0.1637	
d_lnOther_4	0.246934	0.162403	1.521	0.1354	
d_lnOther_5	0.237211	0.150186	1.579	0.1212	

d_lnOther_6	0.207806	0.136714	1.520	0.1355	
d_lnOther_7	0.152037	0.121812	1.248	0.2184	
d_lnOther_8	0.0869524	0.106750	0.8145	0.4196	
d_lnOther_9	0.0516688	0.0885881	0.5832	0.5626	
d_lnOther_10	0.0266112	0.0621814	0.4280	0.6707	
d_lnOther_11	0.0209010	0.0321411	0.6503	0.5188	
EC1	−7.68329	0.789950	−9.726	<0.0001	***
EC2	−0.244431	0.187853	−1.301	0.1998	

Mean dependent var	−0.004413	S.D. dependent var	0.891450
Sum squared resid	0.253195	S.E. of regression	0.075010
R-squared	0.995382	Adjusted R-squared	0.992920
Rho	0.618749	Durbin-Watson	0.596565

Equation 2: d_lnOther

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	−0.0196911	0.0568318	−0.3465	0.7306
d_lnGDP_1	−2.40150	3.25525	−0.7377	0.4645
d_lnGDP_2	−2.23115	2.91530	−0.7653	0.4481
d_lnGDP_3	−2.08347	2.67141	−0.7799	0.4395

d_lnGDP_4	−2.00304	2.38374	−0.8403	0.4052	
d_lnGDP_5	−1.87163	2.06134	−0.9080	0.3687	
d_lnGDP_6	−1.87905	1.80452	−1.041	0.3033	
d_lnGDP_7	−1.92020	1.49465	−1.285	0.2055	
d_lnGDP_8	−1.59317	1.16580	−1.367	0.1785	
d_lnGDP_9	−1.61750	0.923696	−1.751	0.0867	*
d_lnGDP_10	−1.35446	0.639253	−2.119	0.0397	**
d_lnGDP_11	−0.471775	0.309550	−1.524	0.1345	
d_lnOther_1	−0.0132432	0.821985	−0.01611	0.9872	
d_lnOther_2	−0.325719	0.799782	−0.4073	0.6857	
d_lnOther_3	−0.240223	0.771049	−0.3116	0.7568	
d_lnOther_4	−0.278127	0.727607	−0.3822	0.7041	
d_lnOther_5	−0.376802	0.672875	−0.5600	0.5783	
d_lnOther_6	−0.395882	0.612514	−0.6463	0.5214	
d_lnOther_7	−0.370511	0.545752	−0.6789	0.5007	
d_lnOther_8	−0.225505	0.478269	−0.4715	0.6396	
d_lnOther_9	−0.0294625	0.396899	−0.07423	0.9412	
d_lnOther_10	0.140286	0.278590	0.5036	0.6170	
d_lnOther_11	0.173586	0.144001	1.205	0.2343	
EC1	2.58661	3.53919	0.7308	0.4687	
EC2	−1.61145	0.841631	−1.915	0.0619	*

Mean dependent var	−0.003485	S.D. dependent var	0.713382
Sum squared resid	5.082332	S.E. of regression	0.336067
R-squared	0.855266	Adjusted R-squared	0.778075
Rho	−0.024025	Durbin-Watson	2.045574

Cross-equation covariance matrix:

	lnGDP	lnOther
lnGDP	0.0036171	-0.00091068
lnOther	-0.00091068	0.072605

determinant = 0.000261787

8.5 Impulse Response Results

Responses to a one-standard error shock in lnGDP

period	lnGDP	lnAgric
1	0.054118	-0.001941
2	-0.031513	-0.0061105
3	-0.007891	0.0064718
4	-0.010035	-0.0047748
5	-0.00080225	-0.0034326
6	8.3525e-005	0.0030582

7	-0.0045031	-0.001749
8	0.0019406	-0.00187
9	0.0013798	0.0019123
10	-0.0036069	-0.00089466
11	0.0038925	3.6585e-005
12	-0.0039211	0.0016129
13	0.051124	-0.0026586
14	-0.027201	-0.00092095
15	-0.0066061	0.0009022
16	-0.012703	-0.0019093
17	0.00080179	-0.0034222
18	0.00013625	0.0026098
19	-0.0068419	-0.00095744
20	0.0039642	-0.001254
21	0.0016926	0.0020956
22	-0.0046187	-0.00084354
23	0.0060912	-0.00015892
24	-0.0049321	0.0012912

Responses to a one-standard error shock in lnAgric

period	lnGDP	lnAgric

1	0	0.035319
2	-0.0051381	-0.0083845
3	0.0022427	0.0063419
4	-0.0072748	-0.010782
5	-0.00034449	0.01053
6	0.00073009	-0.00014258
7	0.0037195	0.0030703
8	-0.0034642	0.011324
9	0.00065219	0.0040181
10	-0.0053508	-0.0034169
11	0.019377	-0.0032866
12	0.0040311	0.0084228
13	-0.00020333	0.0039281
14	-0.015384	0.0031066
15	-0.0014742	-0.0023183
16	-0.0063605	0.005237
17	-0.00018437	-0.00094868
18	0.0055509	-0.00049444
19	0.007795	0.0041759
20	-0.0057339	0.0064304
21	-0.0062979	0.00082946

22	-0.0040956	-0.0023626
23	0.021504	0.0026607
24	0.0060066	0.0022684