

**ECONOMETRIC ANALYSIS OF FINANCIAL MARKET AND ECONOMIC GROWTH IN
RWANDA: A CAUSALITY TEST**

By

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DECLARATION

I, NDORIYOBJIYA Emmanuel, solemnly declare that the research thesis presented is entirely my own work. I have followed the guidelines provided by the university in its completion, and it has not been published anywhere before. Any published articles that have been referenced in the thesis have been appropriately cited using the APA referencing style, following the guidelines of the 7th edition. I take full responsibility for the authenticity and originality of this research work.

Signature-----Date-----

NDORIYOBJIYA Emmanuel



APPROVAL SHEET

This thesis entitled “Econometric analysis of financial markets and economic growth in Rwanda: a causality test” written and submitted by NDORIYOBJIYA Emmanuel

Dr. Kalisa M. Thierry



DEDICATION

To The Almighty God,

My Wife,

My children



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ABSTRACT

This study investigates the relationship between financial markets and economic growth in Rwanda, considering its unique socio-economic conditions and policy environment, evidence from data spanned from 1980 to 2022.

Using regression models, Granger causality tests, and a Vector Error Correction Model (VECM) analysis, the study reveals significant associations and causal relationships between key variables such as financial market development, government expenditure, price stability, and real GDP growth.

The study emphasizes the importance of financial market development in Rwanda's economic growth and the need for sustained efforts to nurture and expand the country's financial markets. It also highlights the positive impact of government expenditure on economic growth, suggesting the need for prudent fiscal policies and efficient resource allocation.

The bidirectional causality between financial market development and real GDP growth suggests a potential for a virtuous cycle of economic development. The coefficient of the Financial Institutions in percent change (FI) is statistically significant at the 10% level (*). Hence, we can determine its specific positive effect on economic growth in the context of Rwanda from the available information.

The study recommends policymakers prioritize initiatives promoting financial market development, enhancing government spending efficiency, and maintaining price stability, as well as coordinated economic policies and further research to understand these dynamics within Rwanda's unique context.

Keywords: financial market development, economic growth, Granger causality,



Vector Error Correction Model (VECM), bidirectional causality, price stability



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LIST OF ABBREVIATION

ULK	Kigali Independent University
WDI	World Bank Development Indicator
IMF	International Monetary Fund
NISR	National Institute Statistics of Rwanda
BNR	National Bank of Rwanda
CEPGL	Communauté Économique des Pays des Grands Lacs
EG	Economic Growth
IT	International Trade
EAC	East African Community
AD-AS	Aggregate Demand and Aggregate supply
SSA	Sub-Saharan Africa
FDI	Foreign Direct Investment
DCP	Domestic credit to private sector
BDL	Bank Deposit Liability
BCP	Bank credit to Private sector



CHAPTER1: INTRODUCTION OF THE STUDY

1.0 General introduction

The development of financial markets plays a crucial role in shaping a nation's economic growth. This study aims to examine the causal relationship between financial market development and economic growth in the context of Rwanda. With its remarkable economic progress over the past decades, Rwanda presents an interesting case study for understanding the interplay between financial markets and economic development.

Analysing the causal relationship between financial market development and economic growth is crucial for policymakers and stakeholders, as it helps identify the channels through which financial markets impact economic activity. Furthermore, understanding this relationship can guide policymakers in formulating effective strategies to foster financial market development, ultimately driving sustainable economic growth.

The financial market is a broader term that encompasses various institutions, instruments, and activities involved in the intermediation of funds and the exchange of financial assets. It includes not only the stock market but also other segments such as the bond market, money market, foreign exchange market, derivatives market, and the banking sector.

Stock market development, on the other hand, specifically refers to the growth, size, liquidity, efficiency, and effectiveness of the stock market within the overall financial market. It focuses on the development and functioning of the market where shares of publicly traded companies are bought and sold (Levine & Zervos, 1996).

The indicators and measurements are relevant for assessing the development of the stock market within the broader context of financial market development.



The size of the stock market, as measured by the market capitalization to Gross domestic product (GDP) ratio, provides insights into the extent to which the stock market plays a significant role in mobilizing capital for investment purposes.

A larger stock market suggests a more developed and robust financial market, capable of facilitating efficient capital allocation.

Furthermore, the liquidity of the stock market, measured by the ratio of total value of trades on major stock exchanges to GDP, reflects the ease and efficiency with which market participants can buy and sell stocks. Higher liquidity indicates a more active and accessible market, which is a crucial aspect of financial market development (Ngare et al., 2014).

In summary these indicators offer a glimpse into the size, liquidity, and risk diversification within the stock market, all of which contribute to evaluating the overall development and effectiveness of the financial market. However, it is important to note that financial market development encompasses other dimensions beyond the stock market, such as the bond market, money market, banking sector, and other financial intermediaries. A comprehensive assessment of financial market development requires considering a range of indicators related to the various segments and institutions within the financial system.

1.1 Background of the study

Bloch & Tang (2003) examined the relationship between financial development and economic growth. They argued that financial markets can contribute to economic growth by improving the allocation of resources and facilitating the accumulation of savings and investment. Calderón & Liu (2003) conduct a study to investigate the direction of causality between financial development and economic growth using

panel data for a sample of countries. They find that there is bidirectional causality between financial development and economic growth.

This implies that financial development can contribute to economic growth, but economic growth also creates the conditions for further financial development.

Kumar (2022) examines the causality of financial development and economic growth using a sample of selected countries from 1980 to 2019. The study uses Granger causality tests and confirms the existence of bi-directional causality between financial development and economic growth. The study also finds that the causality runs from financial development to economic growth, and from economic growth to financial development, suggesting that financial development and economic growth reinforce each other.

Financial development and economic growth have been the subject of various studies in the economic literature. Researchers have sought to establish the direction and magnitude of causality between the two variables. One strand of research focuses on examining the role of financial development in economic growth, exploring how financial intermediation can spur investment, innovation, and economic activity (Bloch & Tang, 2003). Another strand of research investigates the direction of causality between financial development and economic growth, seeking to determine whether financial development leads to economic growth or vice versa (Calderón & Liu, 2003; Kumar, 2022).

Studies have been conducted in different countries and regions to understand the relationship between financial development and economic growth. In Africa, researchers have explored the linkages between financial development, financial instability, financial liberalization, and economic growth (Batuo et al., 2018). They have also studied the relationship between financial development and economic

growth in the CEPGL stands for Communauté Économique des Pays des Grands Lacs, which is a French term that translates to “Economic Community of the Great Lakes Countries (Biringanine & Mzee, 2021).

To fully understand the relationship between financial market development and economic growth in Rwanda, further research is necessary.

While previous studies have examined this relationship, there is a need for more in-depth analysis to determine the direction of causality and the specific channels through which financial development affects economic growth in the country. This study aims to contribute to the existing literature by investigating the causal relationship between financial market development and economic growth in Rwanda. Despite being considered one of Africa's fastest-growing economies, Rwanda's financial sector remains underdeveloped, hindering economic growth. The government has implemented economic reforms to promote private sector growth, attract foreign investment, and diversify the economy.

The findings of this study on the causal relationship between financial market development and economic growth in Rwanda can inform policy decisions related to financial sector development. Understanding the appropriate sequencing of financial sector reforms can be crucial in promoting Rwanda's economic development. If financial market development drives economic growth in Rwanda, policies should prioritize promoting financial market development. Conversely, if economic growth drives financial market development, policies should focus on promoting economic growth to support the development of the financial sector.

Rwanda has made significant progress in the development of its financial markets in recent years. However, there are still some challenges that need to be addressed in order to ensure that these markets continue to support economic growth in the

country. Rwanda's financial markets and economic growth have faced several challenges, including the Covid-19 pandemic, the Russia-Ukraine war, and climate change.

According to the National Bank of Rwanda's (NBR) Monetary Policy Reports for all quarters of 2022, the Covid-19 pandemic has had a significant impact on Rwanda's economy.

The pandemic has disrupted global trade and caused a decline in tourism, which is a major source of foreign exchange earnings for the country.

The pandemic has also led to a decline in economic activity and a rise in unemployment, which has had negative effects on Rwanda's financial markets.

The Russia-Ukraine war has also had an impact on Rwanda's economy, although it is indirect. The war has led to an increase in global oil prices, which has led to inflation in Rwanda. This has resulted in an increase in the cost of living for Rwandans, which has affected their ability to save and invest in the financial markets.

Climate change has also had an impact on Rwanda's economy and financial markets. Rwanda is vulnerable to the effects of climate change, including droughts and floods, which have a significant impact on agricultural production. Agriculture is a major source of income for Rwandans, and any disruption to it affects their ability to save and invest in the financial markets. Additionally, climate change has led to an increase in the cost of energy, which has affected Rwanda's overall economic growth.

In conclusion, Rwanda's financial markets and economic growth have faced several challenges, including the Covid-19 pandemic, the Russia-Ukraine war, and climate change. These challenges have had negative impacts on the economy, including a decline in economic activity, rising inflation, and increased costs of energy and living. The NBR's Monetary Policy Reports for 2023 likely provide updates on how these challenges continue to affect Rwanda's economy.

1.2 Problem statement

The lack of empirical evidence on the causal relationship between financial market development and economic growth in Rwanda is a critical problem that limits policymakers' ability to make informed decisions to promote sustainable economic

development.

Although Rwanda has made significant strides in economic growth, it remains unclear whether financial market development has played a significant role in this growth.

Therefore, there is a need to investigate the causal link between financial market development and economic growth in Rwanda by analysing time series annually data and applying appropriate econometric methods. The findings of this study can provide policymakers with valuable insights into the drivers of economic growth in Rwanda and help design effective policies to foster sustainable economic development.

1.3 Research Objectives

1.3.1 Main Objective

To investigate the causal relationship between financial market development and economic growth in Rwanda, using econometric techniques.

1.3.2 Specific Objectives

These objectives aim to investigate the relationship between financial market development and economic growth in Rwanda and provide evidence-based policy recommendations for promoting sustainable economic development. The specific objectives focus on assessing the level of financial market development in Rwanda, identifying the key drivers of economic growth, and analysing the causal relationship between financial market development and economic growth in Rwanda.

- i. To assess the level of financial market development in Rwanda, based on indicators such as credit to the private sector, stock market capitalization, and money supply.
- ii. To analyse the trends in economic growth in Rwanda over the past decade

and identify the key drivers of growth.

- iii. To determine the direction of causality between financial market and economic growth in Rwanda



- iv. To identify the specific financial market development indicators that have a causal effect on economic growth in Rwanda

1.3.3 Research Questions

- i. To assess the level of financial market development in Rwanda, based on indicators such as credit to the private sector, stock market capitalization, and money supply.
- ii. To analyse the trends in economic growth in Rwanda over the past decade and identify the key drivers of growth.
- iii. To determine the direction of causality between financial market and economic growth in Rwanda
- iv. To identify the specific financial market development indicators that have a causal effect on economic growth in Rwanda.

1.4 Research Hypotheses

The following are hypotheses that could be explored in the context of the relationship between financial market development and economic growth in Rwanda:

- i. The development of financial markets in Rwanda has a causal effect on economic growth, as measured by GDP per capita.
- ii. The direction of causality runs from economic growth to financial market development, as opposed to the other way around.
- iii. The relationship between financial market development and economic growth is bi-directional, with each variable causing the other to some degree.
- iv. The relationship between financial market development and economic growth varies over time, with periods of financial market growth coinciding with periods of economic growth and vice versa.

1.5 Research Significance

The study on the relationship between financial market development and economic growth in Rwanda is significant as it provides important insights into the factors driving economic growth in the country and contribute to the development of evidence-based policies and investment strategies. The significance detailed as follows:

1.5.1 Contribution to literature

The study contributes to the literature on the relationship between financial market development and economic growth in developing countries, especially in the context of sub-Saharan Africa. It provides a better understanding of the factors that drive economic growth in Rwanda and the extent to which financial market development contributes to it.

1.5.2 Policy implications

The study has important policy implications for Rwanda and other developing countries seeking to promote economic growth. The findings can be used to guide policy decisions on financial market development, such as regulatory and institutional reforms, to ensure that they promote economic growth.

1.5.3 Investment implications

The study provides insights into the potential benefits of investing in financial markets in Rwanda. Investors can use the findings to make informed decisions on the types of financial instruments to invest in, the level of risk to assume, and the potential returns to expect.

1.5.4 Business implications

The study also has implications for businesses operating in Rwanda, as it provides

insights into the factors that drive economic growth and the role of financial market development in facilitating growth. Businesses can use this information to make strategic decisions on investment, expansion, and risk management.

1.5.5 Capacity building

The study contributes to building the capacity of Rwandan researchers and policy makers in conducting empirical research and data analysis. It also provides an opportunity for collaboration between researchers, policy makers, and other stakeholders, which can lead to the development of new research projects and policy initiatives.

1.6 Scope of the Study

This research undertakes a comprehensive examination of the intricate relationship between Rwanda's financial market dynamics and its economic growth. The study focuses on discerning whether a causal connection exists between various financial market indicators, such as credit to private sectors, financial market, and the broader aspects of economic growth, encompassing GDP growth.

The research is conducted over a specific time frame, which is clearly delineated, and draws data from 1980-2022 a range of secondary annually, including World bank development indicator (WDI). The primary methodology employed is econometric analysis, specifically causality test like Granger causality test. Ultimately, the study aims to provide insights into how Rwanda's financial market may impact its economic growth and offers valuable policy implications for informed decision-making.

1.7 Definitions of key concepts

Researcher investigates the relationship between financial market development and

economic growth in Rwanda.

Here are some key concepts and their definitions from the study:

Financial Markets: The financial markets refer to markets where financial instruments such as stocks, bonds, currencies, and derivatives are traded. These markets are important for the allocation of capital and resources in the economy.

Economic Growth: Economic growth is the increase in the production and consumption of goods and services in an economy over time. It is usually measured by changes in Gross Domestic Product (GDP).

Causality: Causality refers to the relationship between two variables, where a change in one variable (the cause) leads to a change in the other variable (the effect). In this paper, the authors examine whether financial market development causes economic growth, or whether economic growth causes financial market development.

Granger Causality Test: The Granger causality test is a statistical method used to determine whether one-time series can be used to predict another time series. It is used in this paper to test whether financial market development Granger causes economic growth or vice versa.

Financial Intermediation: Financial intermediation refers to the process by which financial institutions such as banks and insurance companies bring together borrowers and lenders in the economy. Financial intermediaries play an important role in the functioning of financial markets.

Market Capitalization: Market capitalization is the total value of a company's outstanding shares of stock. It is used as a measure of the size of a company and is often used to compare companies in the same industry.

Stock Market Turnover: Stock market turnover is the value of shares traded on a stock exchange over a given period of time. It is used as a measure of the liquidity of

a stock market.

1.8 Limitations of the Study

As this research endeavours to investigate the causal relationship between Rwanda's financial market and its economic growth, it is vital to acknowledge several inherent limitations. First, the study's conclusions hinge on the availability and quality of data, and inaccuracies or data gaps may undermine the robustness of the analysis. Moreover, the accuracy and reliability of the collected data may be susceptible to errors or biases, potentially impacting the validity of the findings. Causality tests, while informative, rest upon statistical assumptions and may not always conclusively establish causality, potentially influenced by unobserved factors or endogeneity issues. External factors like global economic trends, political stability, and external shocks may not be fully accounted for in the analysis. The study's findings are specific to Rwanda and may not be directly transferable to other regions or countries with differing economic and financial market characteristics. The chosen time frame may also limit the scope, possibly omitting long-term trends or short-term fluctuations that might be relevant.

Lastly, while the study provides valuable insights into the relationship between financial markets and economic growth, it does not delve into specific policy measures required for enhancing this relationship, necessitating further research in that direction. Researchers and readers are encouraged to consider these limitations when interpreting the study's outcomes and forming conclusions regarding Rwanda's financial market's impact on economic growth.

1.9 Structure of the Thesis

The thesis likely follows a typical structure for research, which includes the following chapters respectively:

Introduction of the study: This section provides an overview of the research question, the significance of the topic, and the research objectives. It also includes a literature review of previous studies on the topic; Literature review: This section presents the theoretical background and concepts related to financial market development and economic growth. It also includes the research hypotheses and the analytical framework for the empirical analysis; Research Methodology: This section describes the research design, data sources, and the analytical methods used in the study. It also includes a discussion of the limitations of the study and the steps taken to address them; Results and Discussion: This section presents the empirical findings of the study, including descriptive statistics and regression analysis of the data. It also includes the Granger causality test results and their interpretation. This section of discussion, interprets the results of the study, and discusses the implications for financial policy and economic development in Rwanda. It also includes a comparison of the results with previous studies and a discussion of the limitations of the study; Conclusion and Recommendations: This section summarizes the main findings of the study and their implications. It also suggests directions for future research on the topic; References: This section lists the sources cited in the paper, following a specific citation style. Appendices which included some information that are not included in internal content but necessary as supportive information.

CHAPTER2: LITERATURE REVIEW

2.1 Introduction

Since, Biringanine & Mzee (2021) examine the relationship between financial development and economic growth in the CEPGL region using panel data analysis.



The authors contribute to the existing literature on this topic, which includes studies such as Calderón & Liu (2003) who investigate the direction of causality between financial development and economic growth, and Bloch & Tang (2003) who examine the role of financial development in economic growth. Batuo et al. (2018) investigate the linkages between financial development, financial instability, financial liberalisation, and economic growth in Africa. Ghirmay (2004) also examines the relationship between financial development and economic growth in sub-Saharan African countries. Additionally, Hurlin & Venet (2008) re-examine the relationship between financial development and growth using a panel Granger causality test. Finally, Idris (2020) analyzes the relationship between capital market development and economic growth in Nigeria, while Igoni et al. (2020) investigate the impact of the Nigerian digital finance environment on economic growth.

According to the study by Biringanine and Mzee (2021), financial development has a positive effect on economic growth in the CEPGL region. This result is in line with the findings of Calderón and Liu (2003) who found a positive causal relationship between financial development and economic growth. Bloch and Tang (2003) also highlight the importance of financial development in promoting economic growth. Similarly, Batuo et al. (2018) found a positive relationship between financial development and economic growth in African countries. Ghirmay (2004) also found evidence supporting the positive relationship between financial development and economic growth in Sub-Saharan African countries.

2.2 Empirical review

Several studies have explored the relationship between financial development and economic growth in different countries and regions, including Africa. Dabos & Williams (2009) re-evaluated the impact of financial development on economic



growth and its sources by region.

Fung (2009) examined the convergence or divergence of financial development and economic growth. Ghirmay (2004) studied financial development and economic growth in Sub-Saharan African countries and examines the relationship between financial development and economic growth in sub-Saharan African countries, using time-series analysis.

The findings suggest that financial development plays a crucial role in promoting economic growth in sub-Saharan Africa, but the relationship varies across countries and regions within the continent. Additionally, the study highlights the need for further research to understand the specific mechanisms through which financial development influences economic growth in this context.

The author found that there is a positive relationship between financial development and economic growth in the region, suggesting that financial development can contribute to economic growth.

The authors investigate the relationship between financial market development and economic growth in Rwanda. They build on previous research on the linkages between financial development, financial instability, financial liberalization, and economic growth in Africa (Batuo et al., 2018). The study uses causality tests to examine whether financial market development has a causal effect on economic growth in Rwanda.

The study also considers the reverse causal relationship, examining whether economic growth causes financial market development in Rwanda. The authors contribute to the existing literature by providing empirical evidence on the direction of causality between financial market development and economic growth in Rwanda.

Builds on the Biringanine and Mzee (2021) investigation of the relationship between

financial development and economic growth in the CEPGL region, which includes Rwanda. Biringanine and Mzee's study used panel data analysis to examine the impact of financial development on economic growth in the region. Their study contributes to the understanding of the relationship between financial development and economic growth in the context of developing countries in Africa. Their findings suggest that there is a positive and significant relationship between financial development and economic growth in the CEPGL region, specifically in Rwanda. This implies that as financial institutions and markets become more developed, it can lead to increased investment, productivity, and overall economic growth in the country. Hurlin and Venet (2008) used a panel Granger causality test to examine financial development and growth. They used a panel Granger causality test to examine the relationship between financial development and growth in a sample of 12 countries and find evidence of a bidirectional causality running between these two variables. They find that there is a bi-directional causality between financial development and economic growth, indicating that financial development and economic growth can both drive each other.

Kumar (2022) investigated the causality of financial development and economic growth by employing a comprehensive panel Granger causality test. The study focused on a sample of 12 countries and revealed compelling evidence of a bidirectional causality between these two variables. This suggests that the relationship between financial development and economic growth is mutually reinforcing, with each factor capable of influencing and driving the other.

Kumar et al. (2015) explored the role of energy, trade, and financial development in explaining economic growth in South Africa. They investigate the role of energy,

trade, and financial development in explaining economic growth in South Africa. The authors find that financial development has a significant positive effect on economic growth, suggesting that financial development can contribute to economic growth in the country.

Mhadhbi (2014) proposed a new approach to studying the relationships between financial development and economic growth. Mhadhbi proposes a new approach to examine the relationship between financial development and economic growth using inputs. The study finds that financial development has a positive and significant impact on economic growth, indicating that financial development can contribute to economic growth.

Ndako (2010) examined financial development and economic growth in Nigeria and used data from Nigeria to investigate the relationship between financial development and economic growth. The study finds a positive and significant relationship between financial development and economic growth, as well as evidence of a unidirectional causality running from financial development to economic growth, while Ngare et al. (2014) studied stock market development and economic growth in Africa. Other studies have focused specifically on Rwanda, such as Gatsimbazi et al. (2018), Mikebanyi & Kigabo (2021), and Niyigaba & Peng (2020), who explored the relationships between financial development and economic growth in the country and examined the causal relationship and convergence between economic growth in Rwanda and Peru. Using time series data, the study finds evidence of unidirectional causality running from economic growth in Peru to Rwanda and evidence of convergence between the two countries. These findings suggest that economic growth in Peru has a significant impact on Rwanda's economic development. The study also highlights the potential for Rwanda to learn from Peru's successful growth strategies and policies in order to further enhance its own economic growth.

Igoni et al. (2020) analyzed the digital finance environment in Nigeria and its economic growth and examine the digital finance environment in Nigeria and its



impact on economic growth.

The authors find that digital finance can positively affect economic growth by improving financial inclusion and promoting entrepreneurship, and D. A. Kumar (2022) examined the causality of financial development and economic growth. explores the causality between financial development and economic growth, using data from India. The study employs the Granger causality test and reports a unidirectional causality running from financial development to economic growth. Kumar explores the causality of financial development and economic growth. The study finds that financial development Granger causes economic growth in the long run, indicating that financial development can contribute to economic growth.

Gatsimbazi et al. (2018) study the effects of macroeconomic variables on the performance of the Rwanda stock market. Using monthly data from January 2007 to December 2016, the study finds that inflation and interest rates have a significant negative impact on the stock market performance, while GDP growth has a positive impact. Idris (2020) analyses the relationship between capital market development and economic growth in Nigeria. The study finds that there is a positive and significant relationship between the two variables, suggesting that capital market development can contribute to economic growth.

Mikebanyi & Kigabo (2021) examine the relationship between financial development and economic growth in Rwanda. Using a vector autoregressive model and data from 2007 to 2018, the study finds a positive and significant impact of financial development on economic growth. The study finds that financial development has a positive and significant impact on economic growth in the country, suggesting that financial development can contribute to economic growth in Rwanda. Overall, the literature suggests that financial development can contribute to economic growth in

developing countries, including Rwanda.

The majority of the studies found a positive relationship between financial development and economic growth, indicating that financial development can be an important factor in promoting economic growth in these countries.

The relationship between financial market development and economic growth has been extensively explored in the literature (Bloch & Tang, 2003; Calderón & Liu, 2003; Fung, 2009). Scholars have debated the nature of the relationship, with some studies suggesting a positive correlation between financial development and economic growth (Ghirmay, 2004; Dabos & Williams, 2009), while others have questioned the direction of causality (Levine, 1999; Hurlin & Venet, 2008).

The role of financial development in economic growth has been a central focus of research. Financial systems, whether bank-based or market-based, have different implications for economic growth (Levine, 1999). Market-based systems are often associated with faster economic growth, whereas bank-based systems may lead to slower growth (Levine & Zervos, 1996). Additionally, the stock market has been recognized as a driver of long-term economic growth (Levine & Zervos, 1996).

The impact of international trade on economic growth is a critical aspect of this review. Export and import activities have been recognized as crucial drivers of economic growth (Awokuse, 2007; Lee, 2011). In the context of Rwanda, Ruranga et al. (2020) conducted a comprehensive analysis of the impact of exports and imports on economic growth, shedding light on the dynamics of international trade in the country.

Foreign Direct Investment (FDI) is another important factor that has been studied in relation to economic growth (Alvarado et al., 2017; Bakari, 2017). The potential influence of FDI on Rwanda's economic development is a topic of interest, given the

country's efforts to attract foreign investment.

The link between stock market development and economic growth is explored by Gatsimbazi et al. (2018), who studied the effects of macroeconomic variables on stock market performance in Rwanda. Mikebanyi and Kigabo (2021) assessed the relationship between financial development and economic growth in Rwanda, highlighting the significance of the stock market as a financial intermediary.

Various econometric methods have been employed to examine the causal relationship between financial development and economic growth. Causality tests such as Granger causality (Calderón & Liu, 2003), panel Granger causality (Hurlin & Venet, 2008), and panel quantile regression (Salman et al., 2019) have been utilized to investigate these linkages.

The findings from the reviewed studies offer valuable insights for policy formulation in Rwanda. The government can use these results to design policies that promote financial market development, attract foreign investment, and stimulate exports. Additionally, policymakers can consider measures to strengthen the stock market and enhance its role as a source of capital for economic growth.

This empirical review has examined the causal relationship between financial market development and economic growth in Rwanda, drawing on a wide range of studies from the literature. The findings suggest that financial development, exports, imports, FDI, and stock market performance are all important factors that can influence economic growth in Rwanda. These insights can inform policymakers in Rwanda as they seek to promote economic development and financial market growth in the country.

The relationship between financial market development and economic growth extends beyond Rwanda's borders. The impact of financial development on

economic growth in Sub-Saharan African countries, including Rwanda, has been a subject of rigorous analysis (Ghirmay, 2004). These studies provide insights into the unique challenges and opportunities faced by countries in the region as they seek to develop their financial markets and drive economic growth.

Furthermore, the connection between financial development and economic growth extends beyond traditional measures of financial intermediation. Some studies have explored new approaches to understanding this relationship by considering inputs such as innovation (Mhadhbi, 2014) and useful work (Warr & Ayres, 2012). These unconventional perspectives shed light on the multifaceted nature of economic growth and the potential role of financial markets in facilitating innovation and resource utilization.

The impact of trade, particularly exports and imports, on economic growth in Rwanda has been a topic of interest (Niyigaba & Peng, 2020). These studies have examined the dynamics of trade and its influence on economic convergence, providing valuable insights into the country's growth trajectory.

Moreover, the interplay between digital finance and economic growth has gained significance in recent years (Igoni et al., 2020). Rwanda's efforts to harness the potential of digital finance in driving economic growth align with the broader discussions on financial innovation and inclusion in developing economies.

In summary, this empirical review has synthesized a body of literature on the causal relationship between financial market development and economic growth in Rwanda. These studies offer a comprehensive understanding of the dynamics at play in the Rwandan context, considering various aspects of financial development, international trade, foreign investment, stock market performance, and macroeconomic variables. The insights provided by these studies can guide

policymakers in Rwanda as they formulate strategies to foster economic growth, enhance financial market development, and attract investments in the country.

2.3 Theoretical review

Theoretical review underscores the crucial nexus between Rwanda's financial markets and its economic growth prospects. As Alfaro et al. (2004) posit, well-developed financial markets play a pivotal role in stimulating economic development by facilitating capital flow and encouraging investment. Contextualizing this within the global historical framework elucidated by Attack and Neal (2009) provides valuable insights into the unique dynamics of Rwanda's financial landscape.

Employing econometric techniques, as highlighted by Baltagi (2021), can help us delve deeper into the relationship between these markets and Rwanda's economic growth, accounting for individual nuances and temporal trends. Additionally, the integration of advanced methodologies such as neural networks (Beltratti et al., 1996) and the analysis of risk dynamics in financial markets (Hansen & Hodrick, 1983) offer a more comprehensive understanding of how Rwanda's financial sector influences its economic trajectory.

By exploring the resilience of financial markets in times of crises (Hubbard, 1991) and harnessing microscopic simulations (Levy et al., 2000), we can gain insights into the market's potential to mitigate or exacerbate economic downturns.

Moreover, examining specific segments of Rwanda's financial landscape (Straszheim, 1975) and assessing the applicability of economic theories like purchasing power parity (MacDonald & Marsh, 1994) add depth to the econometric analysis. The comprehensive Handbook of Applied Econometrics by Pesaran and Wickens (1999) equips researchers with a diverse array of methodologies to choose models best suited for analyzing Rwanda's financial markets. Furthermore, the

influence of legal and regulatory frameworks on these markets, as discussed by Posner (2014), adds an essential dimension to our understanding.

In sum, this theoretical review offers a holistic framework to comprehend the intricate interplay between financial markets and Rwanda's economic growth, encompassing historical contexts, advanced econometric tools, and diverse market dynamics (Alfaro et al., 2004; Atack & Neal, 2009; Baltagi, 2021; Beltratti et al., 1996; Hansen & Hodrick, 1983; Hubbard, 1991; Levy et al., 2000; MacDonald & Marsh, 1994; Pesaran & Wickens, 1999; Posner, 2014; Straszheim, 1975).

2.3.1 Theories on Economic Growth

In order to conduct the present theoretical analysis of economic growth, three basic approaches are used: post-Keynesian, neoclassical (exogenous), and endogenous. A dynamic force, international trade (IT) and economic growth (EG) can enhance worker abilities and skills while also promoting technical advancements and capital accumulation. In contrast, Ricardo (1817) offered a dynamic model of EG with three factors and three constraints, describing progressive nations as having high levels of capital accumulation, output, productivity gains, and labor demand driving up wages and driving up population growth (Adeleye et al., 2015).

In contrast to the conventional growth theory, a new model of US economic growth has consequences for energy and environmental policy, as well as for future economic growth.

Primary energy inputs are multiplied by an assumed average energy conversion efficiency to calculate the non-traditional component. This model successfully "explains" US development from 1900 to 1973–74, but it somewhat understates growth after that point (Warr & Ayres, 2012). The study of (Ruranga et al., 2020), it is understood that Bangladesh can fill its deficit by importing goods and export its

excess goods once the demand has been met.

The purpose of this study is to examine the relationships between Bangladesh's exports, imports, and economic expansion. The study's primary information sources came from secondary sources that were compiled from various books, newspapers, research papers, journals, etc. The most recent export, import, and economic growth literature in Bangladesh has been examined in this study. The study demonstrates both the favorable and unfavourable circumstances regarding imports and the impact of exports on economic growth. According to traditional trade theory, countries that are more open experience growth gains through specialization, investment in innovation, increased productivity, or better resource allocation. According to Ricardo's idea, international openness enables a nation to reallocate its limited resources to industries that are more productive.

The Solow (1957) model-based neoclassical growth models hold that technological change is exogenous and that trade policies have no bearing on economic growth. According to new theories of economic growth, technological advancement is an endogenous variable (Zahonogo, 2017). One cannot help but come to the conclusion that the net effect is either insignificant or, at the absolute least, not known when one considers these components and how they are operating in the East African Community (EAC). EAC economies cannot be characterized as complementary or competitive because they act independently and do little to promote trade inside the bloc.

Despite the fact that there are now five member countries instead of three in 2007, this growth has had no noticeable impact. Additionally, regional integration's effects on trade development and trade diversion have not produced much. However, it is evident that dynamic impacts also exist, such as a competitive market, reduced

monopoly, economies of scale, specialization, increasing levels of investment, etc. However, if the youthful population's dependency reduces investments, population expansion could have a detrimental effect on economic growth. To show how population affects bilateral trade flows between two countries, the basic gravity model can be expanded to include the populations of exporting and importing nations. Bergstrand (1989), on the other hand, discovered a positive effect of GDP per capita coefficients, indicating a negative relationship between population and trade flows and a capital-intensive production process for imports and exports. As the labour force, degree of specialization, and number of exportable goods increases, a greater population growth rate may have a beneficial short-term effect on trade flows.

2.3.1.1 Post-Keynesian Theory

Evsey Domar and Roy Harrod, two American and British economists, explained and supplemented John Keynes' theory that investment plays a role in the development of production power as well as sales and, consequently, the production and supply of goods. The Domar theory outlines the rate at which investments should expand in order to guarantee income growth. This rate is closely related to the percentage of national income saved (MPS) and the performance of the average investment.

In light of these findings, an important economic policy conclusion has been reached: the economy can only achieve a complicated equilibrium between aggregate demand and aggregate supply when there is continuous capital accumulation, or investment growth.

The government exerts influence over the rate of technical advancement or the percentage of savings in the national income in order to sustain balanced investment growth, ultimately determining the productivity of capital.

The general consensus is that investment in diverse industries is crucial for progress and speeding economic growth. It also assists lower the unemployment rate and improve people's well-being.

It is common knowledge that wise investments have a good impact on high productivity rates, which in turn help a nation become self-sufficient(Bakari, 2017). As the nation becomes more self-sufficient, the percentage of exports increases as a result of the productivity that is still present and the consequent increase in production for investment. Because of their ability to control economic growth and alleviate poverty, exports of goods and services are considered as a motivator of social and economic progress. On the other side, exports also serve as a major source of outflows of foreign currency for trade with imports. The annual time series covered by the study from 1965 to 2015 should be sufficient to show how export, import, domestic investment, and economic growth in Egypt are related. The entire data set was collected from the 2016 World Development Indicators(Bakari, 2017).

We'll employ the best technique, which involves first figuring out how much each variable is integrated. We use an estimate based on a linear regression if all the variables are level-integrated. On the other hand, I utilize the Sims model if all the variables are included in the first difference. which, together with the cheap exchange rates of the biggest and most significant nations, is one of the most significant export destinations for Egyptian state-produced goods(Bakari, 2017). In addition, Egypt's low level of productivity and technology and the intense rivalry on worldwide markets result in non-compliance with specifications, standards, and quality control procedures as well as excessive manufacturing costs in comparison to industrialized nations.

Our model emphasizes the supply-constrained structure of the economy in question,

following the aggregate demand-aggregate supply (AD-AS) framework. Instead of the conventional demand-driven Keynesian models, the supply side of the economy is explicitly modelled to achieve this. The formal sector, the unofficial sector, and the agricultural sector make up the supply side's three primary segments.

Agriculture is separated into the production of food for the home market and cash crops (exports) (traded sector) (non-traded sector). This might easily be further separated, if necessary, into the main agricultural product categories. Small-scale businesses, handicrafts, street sellers, and unofficial restaurant services make up the majority of the informal sector. Government and the formal financial sector make up the bulk of the formal sector.

2.3.1.2 Neoclassical growth theories and the exogenous theory of Robert Solow

The original neoclassical growth theories developed by Robert Solow in the 1950s and 1960s opposed government involvement in the economy and allowed large corporations to maximize their development potential in a competitive market by utilizing the majority of their resources. The interconnectedness between the three sources of economic growth capital, labour, and technical innovations demonstrated by Solow's thesis. The theory demonstrates that the savings rate is an important factor in determining the level of capital intensity and affects economic output by altering the labour force.

More saving rates result in increased investment, which raises production levels. The Solow model explains how technological change behaves in the economic growth phase in relation to other variables and treats it as an exogenous variable. In the Solow model, the Golden Rule steady state is defined as the point at which the steady-state growth rate of total income is equal to the net marginal product of capital under conditions of population increase and technical advancement. The



author also devised a formula known as the "golden rule of accumulation" that specifies the ideal level of capital intensity.

In N Gregory Mankiw's book, Solow's theory emphasizes technical advancement as the sole foundation for sustained population welfare development. Growth is simulated by a two-parameter production function with two traditional factors, labour and capital, and a non-traditional factor, namely 'useful work'.

The new model also has implications for future economic growth, energy and environmental policy that differ significantly from the traditional growth theory. In this paper we also extend the results to Japan (Warr & Ayres, 2012). The findings may be indicative of the region's countries' limited ability to participate in trade flows involving goods that do not provide enough value to their economies to support enrichment positions and job opportunities. Because intra-industrial trade accounts for just around 10% of global trade, regional economies are not significant participants in trade flows generally. The outcomes are consistent with the most recent theories of global commerce (Vallina-Hernandez et al., 2020).

It is also challenging to clearly interpret the reported connections between trade policies and economic growth and to separate the effects of trade policies from those of other macroeconomic policies. Devaluations are a regular first step in structural adjustment programs backed by the IMF, which boosts domestic export performance to high, if exceptional, levels (Singh, 2010).

Bhagwati (1988) asserts that more commerce results in higher earnings, and that higher incomes encourage even more trade. The neoclassical trade theory emphasizes the causal link between production components and output levels, which result in exports and create a "virtuous loop." Grossman and Helpmann have also made note of this kind of input (1991) and Kunst and Marin (1989) provide

evidence of growth-driven exports in their study on Austria.

Because of this, the informal sector responds to changes in demand much more strongly than the formal sector does. Neoclassical principles are used to simulate the formal private sector, which is founded on the in-depth theory of profit maximization.

We set the pricing as a mark-up over costs, which include labour costs, the cost of intermediate goods, and the cost of raw materials, keeping in mind monopolistically competitive enterprises. A CES production function leads to demand for labour and capital, which enables us to model wages and capital formation/investment. Demand in the short-term drives output in the formal sector. It has a supply component over the long term since investments could be made to boost capacity. The amount to which this occurs mostly depends on elements beyond a firm's control, like the caliber of the infrastructure and an overall stable political and economic environment.

2.3.1.3 The endogenous growth theory

The shortcomings of the neoclassical model of economic growth served as the foundation for the development of the endogenous growth theory. Countries can sell their domestically produced items to foreign nations through international trade. Consequently, international trade is the exchange of commodities and services across nations (Abubakar, 2017). This new growth theory recognizes the significance of capital's endogeneity in the growth process. The expectation of rising returns, as opposed to the constant capital returns typical of neoclassical growth theory, was another distinguishing characteristic. According to Lucas, education spending helps people improve their human capital, which is a crucial component of economic growth.

According to this hypothesis, developing countries stand to gain more from trading with industrialized countries by integrating cutting-edge scientific and technological knowledge, necessitating the promotion of trade transparency (Kargbo, 2012). This theory so illustrates that the foundation for reaching the previously established 2050 vision for sustainable economic growth should be the effectiveness of human capital's effect on the country's production given Rwanda's knowledge-based economy.

In the study of (Solow, 1999), models of economic growth have been created that endogenize each of those four parameters because each has a clear endogenous side.

The capital intensity of production and the rate of saving and investing have been treated as variables determined by regular economic processes for the most part under the neoclassical paradigm. Population increase and economic development have always been associated, and it is obvious that sociological and economic factors influence labour force participation. The development of technology is an intriguing case. The majority of neoclassical growth theory has exogenously treated it. International trade's function as a growth engine has received a lot of attention recently (Awokuse, 2007). On the causal link between trade and economic growth for nations in Central and Eastern Europe, there are, however, few empirical research.

This research adds to the body of literature by utilizing a framework for neoclassical growth modeling. The positioning of this study on the relevance of foreign direct investment (FDI) in Sub-Saharan Africa (SSA) growth dynamics is driven by three key elements in the scholarly literature: the significance of economic growth in economic development; the relevance of ICT in driving contemporary economic development outcomes; and gaps in contemporary economic development. Each of these criteria



is expanded. First, economic success is important for economic development because it, among other things, offers opportunity for investment and consumption, employment, social mobility, and a wide range of paths that raise living standards and improve societal wellbeing. Different countries' growth rates depend on a variety of variables, including FDI and information. as a result of rising commodity export prices from the area. For instance, the rate of FDI increased by 12.3% in 2013 compared to the previous year.

Despite this rise, it is asserted in the intellectual and political debate that for Latin America to have faster economic growth, larger amounts of FDI are required(Alvarado et al., 2017). This happens because domestic savings, particularly in nations where FDI has stagnated, fall short of the total demand for investment.

Theoretically, FDI benefits both investors and recipients (lower costs, wider markets) (technology transfers, human capital transfers and generation of employment). As a result, offering incentives to draw and grow FDI is a great way to increase output in developing and emerging nations.

Fuel is needed for these transportation processes in order to move the imported commodities from one location to another. Therefore, an increase in imported commodities would necessitate more fuel being used by transportation equipment, which would increase carbon emissions(Salman et al., 2019).

The second is that importing energy-intensive goods like refrigerators, air conditioners, dishwashers, and automobiles may result in increased energy use. According to(Salman et al., 2019) , technological innovation lowers carbon emissions. The quantile coefficients for import indicate that imports contribute to rising carbon emissions, supporting the import hypothesis. These coefficients are positive and statistically significant. Similar to this, the impact of energy intensity is

statistically significant and positive in every point where CO2 emissions are distributed, supporting the energy intensity theory. Schneider (2004) observed that imports benefitted domestic enterprises as they exported to broaden their markets, boosted consumer welfare, and provided diverse categories of goods to domestic markets.

International trade also encourages domestic producers to specialize since it exposes them to overseas markets where they can interact with numerous foreign companies and where there is a high demand, increasing their production capabilities.

International commerce enables domestic manufacturers to obtain cutting-edge capital inputs, such as machine tools that boost productivity.

They can also take advantage of fresh opportunities for prosperity for developing nations. Thus, discussing economic development and progress without a thorough understanding of commerce is challenging. Several models, including endogenous growth models (Schneider, 2004), have attempted to link various worldwide.

Additional, First, an increase in exports causes an increase in production and employment thanks to the international trade multiplier. Second, export growth frees up foreign currency that can be used to import capital goods, increasing an economy's capacity to produce. Third, economies of scale and an acceleration in manufacturing technology are facilitated by the size and competition of export markets. Because of the advantages it brings, export growth and market accessibility are seen as important factors in determining economic growth. It was discovered that countries started lowering trade barriers and regulations over other economic activities for enabling trade to boost the economy's rate of growth after realizing the significance of trade in a country's economic growth and also keep in

mind that any change in supply circumstances affect both domestic and international demand, which affect output, the volume of exports and imports, and the terms of trade. Additionally, it has been asserted that rising output generates rising exports.

Ascertain how trade affects both countries' economic growth (the Czech Republic and the Slovak Republic). Export-led growth is typically regarded as one of the growth strategies in economic theory. Whether or not the Czech and Slovak Republics may be used as models of this type of expansion be argued for. The amount of money the government receives over time as a result of changes in taxes and spending, as well as the effect such changes have on GDP via fiscal multipliers, is what really matters (UNCTAD, 2019).

Although fiscal space is "endogenous" in this sense, it can still be significantly confined by material productivity limits that can change over time. There be restrictions on the effect of fiscal policy on aggregate demand if production cannot increase despite the presence of unemployment, generally due to bottlenecks in other factors or financing (covered further below).

The second potential problem with empirical growth analysis results from either the improper treatment of endogenous variables as exogenous variables or from the omission of variables that may be linked with some explanatory variables in the regression(Lee, 2011). Particularly, it is plausible to claim that trade activities and export specialization are more likely to increase in intensity in nations with a quicker growing market. Additionally, industrial strategy may be to blame for export patterns, notably in the cases of East Asian nations.

2.3.2 Theories on Financial market development

Financial market development has been a topic of interest for economists and

policymakers for decades. It is believed that the development of financial markets plays a crucial role in fostering economic growth, but the direction and magnitude of this relationship have been the subject of much debate. Various theories have been put forth to explain the relationship between financial market development and economic growth, including the supply-leading, demand-following, and simultaneous-causation theories. In this context, several studies have been conducted to test the causality between financial market development and economic growth, using different methods and approaches. This answer focus on citing some of these studies that provide insights into the relationship between financial market development and economic growth.

To measure the size of the financial market, I utilize the ratio of capitalization controlled by external shareholders to GDP. This ratio captures the extent to which external investors hold ownership stakes in the financial market relative to the size of the economy. A higher ratio suggests a larger and more inclusive financial market. In addition, financial efficiency is assessed using an index developed by Levine (1999). This index is calculated as the logarithm of the ratio of financial transactions to the index of banking operations cost. It provides an indication of how efficiently financial transactions are conducted relative to the costs incurred in banking operations. A higher value of the financial efficiency index implies a more efficient financial market, where transactions are conducted at a relatively lower cost.

By incorporating these measurements into the analysis, I can gain insights into the size and efficiency of the financial market, which are important aspects of financial market development. However, it's important to note that these measurements focus on specific dimensions of financial market development and may need to be supplemented with other indicators to provide a comprehensive assessment of

overall financial market development.

2.3.3 Theories on Financial market development and economic growth

There are several theories that attempt to explain the relationship between financial market development and economic growth. These theories can be broadly categorized into two main groups: supply-side theories and demand-side theories. Supply-side theories focus on the role of financial institutions and markets in providing capital to firms for investment in new technologies and productive capacity. The most famous supply-side theory is the “financial intermediation” hypothesis, which suggests that a well-developed financial system can mobilize savings from households and channel them to firms for investment. This, in turn, leads to increased productivity and economic growth.

Based on the empirical findings by Ndako (2010), the results indicate that there is a one-way causal relationship from financial development to economic growth when utilizing bank credit to the private sector (BCP) as a measure of financial development.

However, when considering the other two measures of financial development, namely domestic credit to the private sector (DCP) and bank deposit liabilities (BDL), the results suggest a two-way relationship between financial development and economic growth.

Demand-side theories, on the other hand, focus on the role of financial markets in stimulating demand for goods and services. One such theory is the “financial deepening” hypothesis, which suggests that as financial markets become more developed, they allow for a greater degree of risk-sharing, which can increase consumption and investment. This, in turn, leads to economic growth.

Another important demand-side theory is the “financial liberalization” hypothesis,

which suggests that removing restrictions on financial markets can lead to increased competition and innovation, which can stimulate economic growth. Overall, while the specific mechanisms by which financial market development contributes to economic growth may differ across these different theories, there is broad consensus that a well-developed financial system can play a critical role in supporting economic growth and development.

Below are some theories on financial market development and economic growth, as follows:

Calderón & Liu (2003) examined the direction of causality between financial development and economic growth and found that the relationship is bi-directional, suggesting that financial development and economic growth are mutually reinforcing.

Bloch & Tang (2003) argued that financial development can contribute to economic growth by enhancing resource allocation efficiency and reducing transaction costs.

Batuo et al. (2018) studied the linkages between financial development, financial instability, financial liberalization, and economic growth in Africa and found that financial development and financial liberalization have a positive impact on economic growth, while financial instability has a negative impact.

Biringanine & Mzee (2021) conducted a panel data analysis on financial development and economic growth in the CEPGL region and found that financial development has a positive impact on economic growth, but the relationship is not significant. Fung (2009) argued that the relationship between financial development and economic growth is not straightforward and depends on the institutional and policy environment of the country. Ghirmay (2004) analyzed the relationship between financial development and economic growth in sub-Saharan African countries and found that financial development has a positive impact on economic growth, but the

relationship is weak.

Hurlin & Venet (2008) used a panel Granger causality test to examine the relationship between financial development and economic growth and found evidence of a positive causality running from financial development to economic growth. Idris (2020) examined the relationship between capital market development and economic growth in Nigeria and found that there is a positive relationship between the two variables.

Kumar (2022) conducted a study on the causality of financial development and economic growth and found evidence of a unidirectional causality running from financial development to economic growth. Gatsimbazi et al. 2018) examined the effects of macroeconomic variables on stock market performance in Rwanda and found that there is a positive relationship between economic growth and stock market performance. Igoni et al. (2020) studied the Nigerian digital finance environment and its impact on economic growth and found that digital finance can have a positive impact on economic growth by increasing financial inclusion and enhancing financial intermediation.

2.4 Conceptual framework

The econometric analysis of the relationship between financial market dynamics and economic growth is a critical endeavour in understanding the drivers of economic development in Rwanda. This study aims to explore the causal links between key financial market indicators and economic growth, specifically using causality tests. In this conceptual framework, I outline the key components of the study, including the financial market indicators, economic growth measures, and the methodology for causality testing. The objective is to unravel the complex interplay between financial market performance and economic growth, shedding light on the direction

and strength of causality in the Rwandan context. This research not only contributes to academic literature but also provide valuable insights for policymakers and investors looking to foster economic development in Rwanda and similar economies



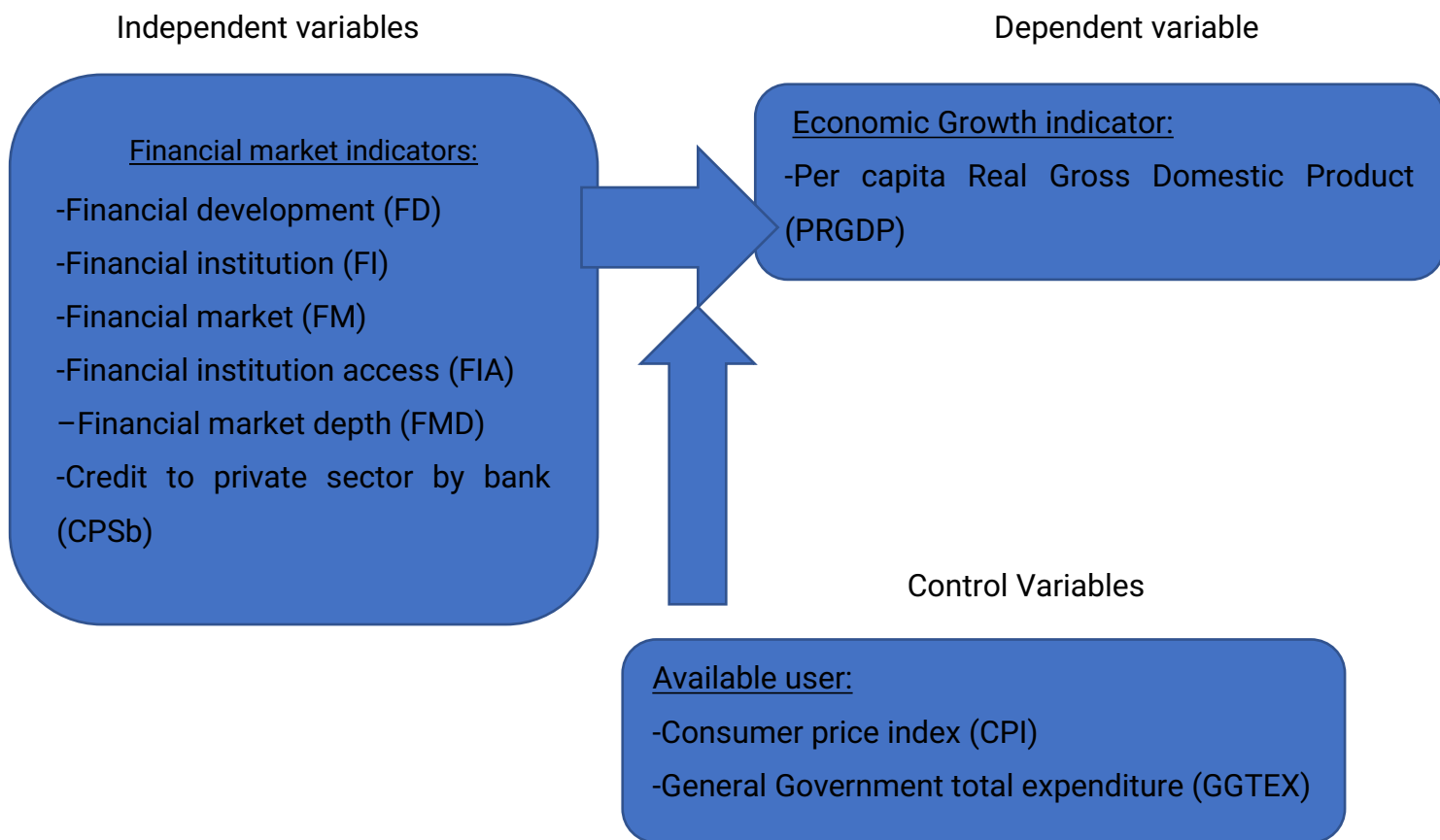


Figure 1: Conceptual Framework of Financial Market Indicators and Economic Growth

Financial Market Indicators:

Financial Development (FD): Financial development refers to the overall growth, efficiency, and sophistication of a country's financial system. It encompasses various aspects such as the size of financial institutions, the depth and breadth of financial markets, and the level of financial inclusion.

Financial Institution (FI): Financial institutions are entities that facilitate the flow of funds in the economy. They include banks, insurance companies, investment firms, and other intermediaries. The performance and stability of financial institutions play a crucial role in determining the overall health of the financial system.

Financial Market (FM): Financial markets are platforms where individuals, businesses, and governments can buy and sell financial assets such as stocks, bonds, and commodities.

The efficiency and liquidity of financial markets are essential for the allocation of resources and capital in the economy.

Financial Institution Access (FIA): Financial institution access measures the ease with which individuals and businesses can access financial services. It includes factors such as the availability of banking services, proximity to financial institutions, and the use of digital financial services.

Financial Market Depth (FMD): Financial market depth evaluates the volume and liquidity of financial assets traded in the market. A deep and liquid market allows for smoother trading, price discovery, and risk management.

Credit to Private Sector by Bank (CPSb): Credit to the private sector by banks indicates the extent to which banks are lending to businesses and individuals. It serves as an important driver of economic growth as it fuels investments and consumption.

Economic Growth Indicator:

Per Capita Real Gross Domestic Product (PRGDP): Per capita real GDP measures the average economic output per person in an economy, adjusted for inflation. It is a key indicator of a nation's overall economic well-being and prosperity. Rising per capita real GDP is often associated with improved living standards and economic growth.

Control Variables:

Consumer Price Index (CPI): The Consumer Price Index is a measure of the average

change in prices paid by consumers for a basket of goods and services over time. It helps gauge inflation or deflation, which can have significant implications for economic growth and financial market stability.

General Government Total Expenditure (GGTEX): General government total expenditure represents the sum of all government spending, including investments, social programs, and administrative costs. It plays a role in shaping economic growth by influencing aggregate demand, public infrastructure development, and the overall fiscal health of the government.

In this conceptual framework, the financial market indicators, economic growth indicator, and available user variables are interconnected. Changes in financial development, institutions, markets, access, depth, and credit availability can impact economic growth, which, in turn, can affect consumer price levels and government expenditure policies. Analysing these relationships can provide valuable insights for policymakers, investors, and researchers to understand and manage economic and financial dynamics within a given context.

CHAPTER3: RESEARCH METHODOLOGY

3.1 Research Design

The study conducted by Mikebanyi & Kigabo (2021) aimed to investigate the causal relationship between financial markets development and economic growth in Rwanda. The research design employed a quantitative approach using secondary data collected from the World Bank's World Development Indicators and the International Monetary Fund's International Financial Statistics for the period 1980-2022. The sample included Rwanda's real gross domestic product (GDP) and



financial sector indicators such as broad money supply, domestic credit to private sector, stock market capitalization, and deposit money bank assets.

The study used Vector Auto-regression (VAR) analysis, Granger causality test, and impulse response functions to analyse the data. The research questions focused on the existence and direction of causality, and the magnitude of the effect. The study concluded that financial markets development has a positive effect on economic growth in Rwanda, and recommended policy interventions aimed at promoting financial markets development in the country.

To build an econometric model on the relationship between financial market development and economic growth in Rwanda, a causality test could be used. The model could be constructed as follows: The three main variables to be included in the model are financial market development, economic growth, and Control Variables indicators. Financial market development (FM_t) can be measured by both financial market and domestic credit to private sector. Economic growth can be measured by indicators such as per capita real GDP growth ($PRGDP_t$) which indicate the citizen's welfare rather than GDP. The robustness of the baseline model depends on the use of Control Variables that could involve in causality test. The control indicators (X_t), researcher based on paper conducted by Mikebanyi & Kigabo (2021), the variables are government total expenditure (GGTEX) and consumer price index (CPI).

3.2 Model specification

3.2.1 Baseline model

Based on the baseline regression model which showing the influence both financial market development has on economic growth represented by per capita real GDP growth including Control Variables for robustness of the baseline model.

$$\ln\text{PRGDP}_t = \beta_0 + \beta_1\text{FM}_t + \beta_2\ln\text{CPSb}_t + \beta_3\ln X_t + \varepsilon_t \quad (3.1)$$

Where PRGDP_t represent per capita real GDP growth, FM_t and $\ln\text{CPSb}_t$ represent the indicators used to measure financial market development which are financial development (FD), financial market (FM), financial institutions (FI), financial institutions access (FIA), and financial market depth (FMD), and X_t represent Control Variables which include both general government total expenditure (GGTEX) and inflation, consumer price index (CPI).

Further econometric analysis focuses on both causality test and vector error correction model could be drawn about the causal relationship between financial market development and economic growth in Rwanda. If a causal relationship is found, policymakers could use the results to design policies aimed at promoting financial market development and supporting economic growth in the country.

3.2.2 Vector error correction model (VECM)

The econometric model developed by Mikebanyi and Kigabo (2021) to test the relationship between financial market development and economic growth in Rwanda utilized a vector error correction model (VECM). The replication model taken with including real GDP growth, real GDP growth per capita, and financial market development indicators. VECM is appropriate when the variables are integrated of order one (I (1)), meaning they have a unit root. The model helps to transform the non-stationary variables into a stationary form, making the analysis more reliable. Cointegration refers to a long-term relationship between non-stationary variables. In economic and financial time series, it's common for variables to be cointegrated. VECM allows researchers to model and analyze the short-term dynamics (adjustment process) of variables towards their long-term equilibrium relationship. VECM includes an Error Correction Term (ECT) that represents the adjustment

process towards the long-term equilibrium. This term captures the short-run dynamics and how the system corrects deviations from the long-term relationship. The inclusion of the ECT makes VECM well-suited for capturing both short-term and long-term relationships. VECM captures the dynamic interactions among variables over time. It allows researchers to study how shocks in one variable affect the others in the short run and how the system adjusts over time to deviations from the long-run equilibrium. VECM is an extension of VAR, allowing for the modelling of multiple time series variables simultaneously. This is beneficial when analysing the interdependencies and feedback effects among several variables. VECM can be used to conduct Granger causality tests, helping to understand the causal relationships between variables in the system. Granger causality tests in the context of VECM take into account both short-run and long-run relationships. VECM is often employed in policy analysis and forecasting. It helps researchers and policymakers understand the impact of shocks on the system and how variables respond to changes in the short run and converge in the long run. VECM is a powerful tool for modelling and analysing the dynamics of non-stationary time series, especially when cointegration is present. It provides insights into both short-term and long-term relationships among variables, making it widely used in economic and financial time series analysis.

$$\Delta \ln \text{PRGDP}_t = \beta_0 + \beta_1 L_{ce1} + \beta_2 L_{ce2} + \beta_3 L_{ce3} + \beta_4 \Delta \ln \text{PRGDP}_{t-1} + \beta_5 \Delta \ln \text{CPI}_{t-1} + \beta_6 \Delta \ln \text{GGTEX}_{t-1} + \beta_7 \Delta \text{FM}_{t-1} + \beta_8 \Delta \ln \text{CPSb}_{t-1} + \varepsilon_t \quad (3.2)$$

$$\Delta \ln \text{CPI}_t = \beta_0 + \beta_1 L_{ce1} + \beta_2 L_{ce2} + \beta_3 L_{ce3} + \beta_4 \Delta \ln \text{PRGDP}_{t-1} + \beta_5 \Delta \ln \text{CPI}_{t-1} + \beta_6 \Delta \ln \text{GGTEX}_{t-1} + \beta_7 \Delta \text{FM}_{t-1} + \beta_8 \Delta \ln \text{CPSb}_{t-1} + \varepsilon_t \quad (3.3)$$



$$\Delta \ln \text{GGTEX}_t = \beta_0 + \beta_1 L_{\text{ce1}} + \beta_2 L_{\text{ce2}} + \beta_3 L_{\text{ce3}} + \beta_4 \Delta \ln \text{PRGDP}_{t-1} + \beta_5 \Delta \ln \text{CPI}_{t-1} + \beta_6 \Delta \ln \text{GGTEX}_{t-1} + \beta_7 \Delta \text{FM}_{t-1} + \beta_8 \Delta \ln \text{CPSb}_{t-1} + \varepsilon_t \quad (3.4)$$

$$\Delta \text{FM}_t = \beta_0 + \beta_1 L_{\text{ce1}} + \beta_2 L_{\text{ce2}} + \beta_3 L_{\text{ce3}} + \beta_4 \Delta \ln \text{PRGDP}_{t-1} + \beta_5 \Delta \ln \text{CPI}_{t-1} + \beta_6 \Delta \ln \text{GGTEX}_{t-1} + \beta_7 \Delta \text{FM}_{t-1} + \beta_8 \Delta \ln \text{CPSb}_{t-1} + \varepsilon_t \quad (3.5)$$

In these equations, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ represent the estimated coefficients for each variable. The variables $L_{\text{ce1}}, L_{\text{ce2}},$ and L_{ce3} are the lagged values of the respective variables. $\ln \text{PRGDP}, \ln \text{CPI}, \ln \text{GGTEX}, \text{FM},$ and $\ln \text{CPSb}$ denote the log differences of per capita Real GDP, Consumer Price Index, general government total expenditure, and Financial Market Index, respectively. The Constant term (β_0) represents the estimated intercept in each equation.

These equations provide the estimated relationships between the differenced variables and their lagged values, as determined by the estimation process of the VECM.

3.2.3 Granger Causality Test

The Granger causality test is a statistical method used to determine whether one time series is useful in forecasting another. In the context of the study on “The financial markets development and economic growth in Rwanda: A causality Test”, the Granger causality test could be used to investigate whether there is a causal relationship between financial market development and economic growth in Rwanda. To perform the Granger causality test, the following steps could be taken: This could involve selecting appropriate variables that represent these concepts, such as stock market indices or measures of financial market size and GDP or other measures of economic growth.

Check for stationarity: Both time series should be checked for stationarity to ensure

that the Granger causality test results are reliable. Stationarity can be checked using statistical tests like the Augmented Dickey-Fuller (ADF) test. Determine the lag length: The next step is to determine the appropriate lag length for the Granger causality test.

This could be done using information criteria like the Akaike Information Criterion (AIC) or the Bayesian Information Criterion (BIC). Run the Granger causality test: The test involves estimating two regression models, one with the lagged values of the independent variable and the other with the lagged values of both the independent and dependent variables. The F-statistic is then calculated to test the null hypothesis that the coefficients of the lagged independent variables are all equal to zero. If the F-statistic is significant, then there is evidence of Granger causality. Interpret the results: The results of the Granger causality test can be used to infer the direction of causality between financial market development and economic growth in Rwanda. If financial market development Granger causes economic growth, then improvements in financial markets could be a driver of economic growth. Conversely, if economic growth Granger causes financial market development, then improvements in the economy could be leading to the development of financial markets.

Mathematical expression to determine whether one-time series can be used to predict another time series. The Granger causality equation from (3.1) can be expressed as follows:

$$\ln\text{PRGDP}_t = \delta_0 + \delta_1 \ln\text{PRGDP}_{t-1} + \delta_2 \ln\text{PRGDP}_{t-2} + \dots + \delta_n \ln\text{PRGDP}_{t-n} + e_t \quad (3.6)$$

Where $\ln\text{PRGDP}_t$ is the dependent variable, $\ln\text{PRGDP}_{t-1}$, $\ln\text{PRGDP}_{t-2}$, ..., $\ln\text{PRGDP}_{t-n}$ are the lagged values of the dependent variable, and e_t is the error term. The coefficients δ_1 ,



$\delta_2, \dots, \delta_n$ are the Granger causality coefficients, which represent the degree to which the lagged values of $\ln\text{PRGDP}_{t-1}, \ln\text{PRGDP}_{t-2}, \dots, \ln\text{PRGDP}_{t-n}$ are related to the current value of $\ln\text{PRGDP}_t$.

To test for Granger causality between two-time series per capita real GDP growth and financial market development, researcher can use the following equation:

$$\ln\text{PRGDP}_t = \delta_0 + \delta_1\ln\text{PRGDP}_{t-1} + \delta_2\ln\text{PRGDP}_{t-2} + \dots + \delta_n\ln\text{PRGDP}_{t-n} + k_1\text{FM}_{t-1} + k_2\text{FM}_{t-2} + \dots + k_n\text{FM}_{t-n} + t_1\ln\text{CPSb}_{t-1} + t_2\ln\text{CPSb}_{t-2} + \dots + t_n\ln\text{CPSb}_{t-n} + e_2 \quad (3.7)$$

If the coefficient k_1 and t_1 is significant and the coefficient δ_1 is not significant, researcher can conclude that FM and $\ln\text{CPSb}$ Granger causes PRGDP. If the coefficient δ_1 is significant and the coefficient k_1 is not significant, researcher can conclude that PRGDP Granger causes FM and $\ln\text{CPSb}$. If both coefficients are significant, there may be bidirectional causality between the two-time series.

Other methods, such as econometric modeling or experiments, may be needed to establish causal relationships with greater confidence. The following is the hypothesis that should be considered for testing:

H_0 : Financial Market Development does not Granger Cause Economic Growth

H_1 : Financial Market Development Granger Causes Economic Growth

CHAPTER4: RESEARCH FINDINGS

4.1 Data characteristics

The financial market development variables for measuring the financial system in Rwanda are considered in this study. Using these composite indices, you can assess different dimensions of financial market development. Let's briefly explain each index:

Financial Development (FD): This index provides an overall measure of financial market development by considering multiple aspects of the financial system, including the depth, access, efficiency, and stability of financial institutions and markets.

Financial Institutions (FI): The FI focuses specifically on the development and performance of financial institutions, such as banks, insurance companies, and microfinance institutions. It assesses factors like the size, soundness, profitability, and accessibility of these institutions.

Financial Markets (FM): The FM measures the development and functioning of financial markets, such as the stock market, bond market, and foreign exchange market. It considers factors like market capitalization, trading volume, liquidity, and transparency.

Financial Institutions Access (FIA): This index focuses on assessing the accessibility and availability of financial services provided by various institutions. It considers factors like the presence of physical branches, ATMs, online banking services, and mobile banking services.

Financial Markets Depth (FMD): The FMDI evaluates the depth and breadth of financial markets by analysing the size and volume of transactions in these markets. It considers indicators like market capitalization, total value of traded stocks or

bonds, and turnover ratio.

Financial Markets Efficiency (FME): The FMEI measures the efficiency and effectiveness of financial markets in allocating resources and facilitating transactions. It considers factors like transaction costs, bid-ask spreads, price volatility, and market transparency. For economic growth, variables like per capita Real GDP can be used.



These composite indices provide a comprehensive assessment of financial market development from various angles, including institutions, markets, access, depth, and efficiency. By analysing these indices over time, you can explore the relationship between financial market development and economic growth in Rwanda and assess the causal link between these variables.

4.2 Main results

Based on previous research and theoretical expectations, a causality test between financial market development and economic growth in Rwanda can yield the following potential results:

The test may reveal a positive causal impact, indicating that improvements in financial market development variables, such as the Financial Development (FD), Financial Institutions (FI), Financial Markets (FM), Financial Institutions Access (FIA), Financial Markets Depth (FMD), and domestic credit to private sector by bank (CPSb), can contribute to sustainable economic growth in the country. This suggests that enhancing financial market development can have a beneficial effect on the economy.

Alternatively, the test might not find a significant causal relationship between financial market development and economic growth. This result implies that factors not considered in the analysis may be driving economic growth in Rwanda. It highlights the need to explore additional variables and take a comprehensive approach to understanding economic development.

There is a possibility that the causality test indicates reverse causality, where economic growth leads to improvements in financial market development. This suggests that as the economy expands and incomes rise, there is an increased demand for financial services, which, in turn, drives the development and deepening

of financial markets.

Another potential outcome is the presence of bidirectional causality, indicating a mutually reinforcing relationship between financial market development and economic growth.

This means that improvements in financial market development contribute to economic growth, and in turn, economic growth stimulates further financial market development.

4.2.1 Descriptive statistics

Descriptive statistics is a branch of statistics that involves summarizing and describing a set of data. It provides a way to organize, analyse, and present data in a meaningful and concise manner. Descriptive statistics focuses on measures such as central tendency (mean, median, mode) to determine the average or typical value, variability (range, variance, standard deviation) to assess the spread of the data, and distributional characteristics (skewness, kurtosis) to understand the shape of the data distribution.

Table 1. Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	p1	p99	Skew.	Kurt.
lnPRGDP	43	12.893	.354	12.112	13.579	12.112	13.579	.374	2.31
lnCPI	43	3.566	1.018	1.916	4.989	1.916	4.989	-.267	1.576
lnGGTEX	43	5.624	1.444	3.281	8.332	3.281	8.332	.444	1.762
FM	43	.03	.006	.021	.042	.021	.042	.15	2.068
FI	43	.187	.03	.112	.243	.112	.243	-.184	2.551
FD	43	.111	.016	.071	.143	.071	.143	-.06	2.721
FIA	43	.03	.036	.003	.096	.003	.096	.833	1.916
FMD	43	.08	.015	.055	.111	.055	.111	.15	2.068
lnCPSb	43	2.336	.474	1.623	3.242	1.623	3.242	.476	2.139



Source: Author's computation 2023

The logarithm of Gross Domestic Product per capita, constant prices (lnPRGDP). It has 43 observations with a mean of 12.893 and a standard deviation of 0.354. The minimum value is 12.112, and the maximum value is 13.579.



The 1st percentile is 12.112, and the 99th percentile is 13.579. The skewness of the distribution is 0.374, indicating a slight rightward skew. The kurtosis value of 2.31 suggests a moderately peaked distribution.

For the variable logarithm of inflation, average consumer prices (lnCPI). There are 43 observations. The mean is 3.566, and the standard deviation is 1.018. The minimum and maximum values are 1.916 and 4.989, respectively. The 1st percentile is 1.916, and the 99th percentile is 4.989. The skewness of -0.267 indicates a slightly left-skewed distribution, while the kurtosis of 1.576 suggests a distribution with moderate peakness.

The logarithm of general government total expenditure (lnGGTEX). It also has 43 observations. The mean is 5.624, with a standard deviation of 1.444. The range of values extends from 3.281 to 8.332. The 1st percentile is 3.281, and the 99th percentile is 8.332. The skewness of 0.444 suggests a slightly right-skewed distribution, while the kurtosis of 1.762 indicates a moderately peaked distribution.

Moving on to the Financial Markets (FM). There are 43 observations, and the mean is 0.03. The standard deviation is 0.006, indicating relatively low variability. The minimum value is 0.021, and the maximum value is 0.042. The 1st percentile is 0.021, and the 99th percentile is 0.042. The skewness of 0.15 suggests a slightly right-skewed distribution, and the kurtosis of 2.068 indicates a distribution with moderate peakness.

The Financial Institutions (FI) also has 43 observations. The mean is 0.187, and the standard deviation is 0.03. The range of values is from 0.112 to 0.243. The 1st percentile is 0.112, and the 99th percentile is 0.243. The skewness of -0.184 suggests a slightly left-skewed distribution, while the kurtosis of 2.551 indicates a distribution with heavy tails. The lnCPSb variable has 43 observations, with an



average value of 2.336, standard deviation of 0.474, minimum of 1.623, maximum of 3.242, 1st percentile of 1.623, 99th percentile of 3.242, skewness of 0.476, and kurtosis of 2.139.

These descriptive statistics offer valuable information on the central tendency, dispersion, skewness, and kurtosis of each variable, aiding in further analysis and modeling.

For the Financial Development (FD) are 43 observations. The mean is 0.111, and the standard deviation is 0.016. The minimum value is 0.071, and the maximum value is 0.143. The 1st percentile is 0.071, and the 99th percentile is 0.143. The skewness of -0.06 suggests a slightly left-skewed distribution, while the kurtosis of 2.721 indicates a distribution with heavy tails. For the Financial Institutions Access (FIA) also has 43 observations. The mean is 0.03, with a standard deviation of 0.036. The range of values extends from 0. The table2 showing the unit roots test of the variables.

Table 2. Unit root test

Variables	Critical 5%	ADF	P-value (z(t)) at nature	P-value at first difference	Conclusions
lnPRGDP	-2.952	0.100	0.9661	0.0000***	I~(1)
lnCPI	-2.952	-0.967	0.7652	0.0020***	I~(1)
lnGGTEX	-2.952	0.925	0.9934	0.0000***	I~(1)
FMI	-2.952	-2.213	0.2014	0.0000***	I~(1)
FII	-2.952	-2.316	0.1669	0.0000***	I~(1)
FDI	-2.952	-2.409	0.1391	0.0000***	I~(1)
FIAI	-2.952	-0.805	0.8176	0.0024***	I~(1)
FMDI	-2.952	-2.213	0.2014	0.0000***	I~(1)



lnCPsb	-2.952	-2.212	0.2018	0.0000***	I~(1)
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***(1%), **(5%), *(10%) significance level, all series are stationary at first difference

I~(1).



4.2.2 Linear regression model

A baseline linear regression model is a simple and initial model used as a reference or starting point for more complex regression analyses. It assumes a linear relationship between the dependent variable and one or more independent variables. The baseline model provides a benchmark against which the performance of more sophisticated models can be evaluated and compared. It helps establish a baseline prediction or estimate of the target variable's value based on the given input variables.

Table 3. Linear model estimation

VARIABLES	(1) lnPRGDP1	(2) lnPRGDP2	(3) lnPRGDP3	(4) lnPRGDP4	(5) lnPRGDP5	(6) lnPRGDP6
lnCPI	-0.236*** (0.018)	-0.215*** (0.022)	-0.212*** (0.022)	-0.234*** (0.019)	-0.236*** (0.018)	-0.245*** (0.019)
lnGGTEX	0.372*** (0.013)	0.370*** (0.015)	0.367*** (0.015)	0.367*** (0.018)	0.372*** (0.013)	0.362*** (0.017)
FM	4.195** (1.803)					
FI		0.547* (0.323)				
FD			1.214** (0.598)			
FIA				0.608 (0.486)		
FMD					1.589** (0.683)	
lnCPSb						0.083* (0.047)
Constant	11.516*** (0.044)	11.477*** (0.072)	11.452*** (0.074)	11.643*** (0.056)	11.516*** (0.044)	11.535*** (0.043)
Observations	43	43	43	43	43	43
R-squared	0.981	0.980	0.981	0.979	0.981	0.980

Standard errors in parentheses



*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The coefficient of the natural logarithm of general government total expenditure (lnGGTEX) is statistically significant at the 1% level (***). This suggests that as general government total expenditure has positive sign, it tends to have a positive impact on economic growth in Rwanda. Higher government spending can stimulate economic activity and contribute to overall economic growth.

The coefficient of the Financial Markets in percent change (FM) is provided with an interpretation in the table, so we can say that it has positive sign which ensure positive impact on economic growth in Rwanda based on the given data.

The coefficient of the Financial Institutions in percent change (FI) is statistically significant at the 10% level (*). Hence, we can determine its specific positive effect on economic growth in the context of Rwanda from the available information.

The coefficient of the Financial Development in percent change (FD) is statistically significant at the 5% level (**), which provided in the table. Therefore, we can determine the precise positive relationship between financial development and economic growth in Rwanda based on the provided data.

The coefficient of the Financial Institutions Access in percent change (FIA) is not statistically significant at the standard significance levels ($p > 0.1$). This implies that the level of financial institutions' access may not have a significant impact on economic growth in Rwanda, at least based on the analysed regression model.

The coefficient of the Financial Markets Depth in percent change (FMD) is statistically significant at the 5% level (**) as estimated in the table 3. As the same as other indicator which determine the specific positive of financial markets depth on economic growth in Rwanda, thus in summary, developing the financial market has a positive impact on economic growth.



The natural logarithm of domestic credit to the private sector by banks is denoted by $\ln\text{CPSb}$, which measures the proportion of credit extended to the private sector by banks relative to the size of the country's economy. A positive value for $\ln\text{CPSb}$ indicates that domestic credit to the private sector by banks is higher than the country's GDP, indicating a substantial portion of the overall economic output. Conversely, a negative value suggests that domestic credit to the private sector by banks is lower than the country's GDP, suggesting a smaller credit extended to the private sector. The magnitude of the coefficient (0.083) represents the percentage change in domestic credit to the private sector by banks for a positive effect in the natural logarithm. The statistical significance of the coefficient is significant at the 10% level (* $p < 0.1$), indicating that the relationship between domestic credit to the private sector by banks and GDP is statistically meaningful.

The constant term (represented as "Constant" in the table) is statistically significant at the 1% level (***). It represents the baseline level of economic growth in Rwanda when all the independent variables are zero or not applicable.

In summary, based on the given results, the regression model indicates that general government total expenditure ($\ln\text{GGTEX}$) has a positive impact on economic growth in Rwanda. However, without further context or additional information about the data and research question, it is challenging to provide a comprehensive interpretation or assess the overall adequacy of the model in analysing the relationship between financial markets development and economic growth in Rwanda.

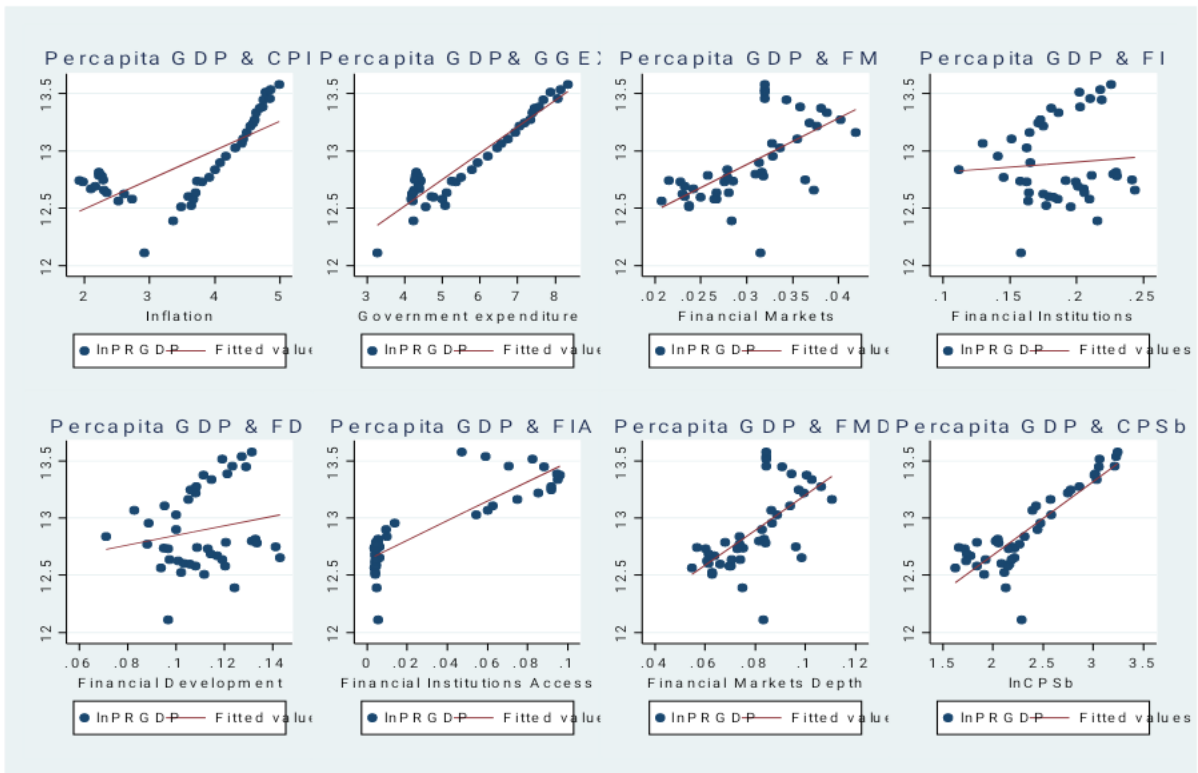


Figure 2. Relationship between per capita GDP and Financial indicators

The relationship between per capita real GDP and financial market indicators are identified in figure2 below which showing that there is strong positive correlation of per capita GDP with both inflation and government expenditure as well as financial

market development indicators including financial market, financial market depth and financial market efficiency. While there is a weak correlation of per capita GDP and financial development, financial institutions access and financial institutions. The domestic credit to private sector by bank (% GDP) has positive strong relationship with per capita real GDP.

This plot shows a positive correlation between inflation (CPI) and per capita GDP. As the inflation rate increases, the per capita GDP also seems to rise.

Another positive correlation is evident here between Government Gross Expenditure (GGE) and per capita GDP. An increase in GGE corresponds with a rise in per capita GDP.

The Financial Markets (FM) data points are more scattered, indicating a weaker or potentially no correlation with per capita GDP.

This plot also exhibits a scattered pattern, suggesting a weak correlation between Financial Institutions (FI) and per capita GDP.

There's a discernible positive correlation between Financial Development (FD) and per capita GDP. A more developed financial system is associated with a higher per capita GDP.

This plot showcases a strong positive correlation between Financial Institutions Access (FIA) and per capita GDP. Greater access to financial institutions correlates with a higher GDP per capita. The correlation between Financial Markets Depth (FMC) and per capita GDP appears positive but not as strong as some of the other plots.

Here, the plot shows a positive correlation between some measure (CPSD, the exact meaning of which isn't provided) and per capita GDP.

In general, these scatter plots are used to visually assess the relationship between two variables. The majority of the plots indicate a positive correlation between the economic indicators and per capita GDP.

However, the strength of these correlations varies, with some indicators showing a stronger association with per capita GDP than others.

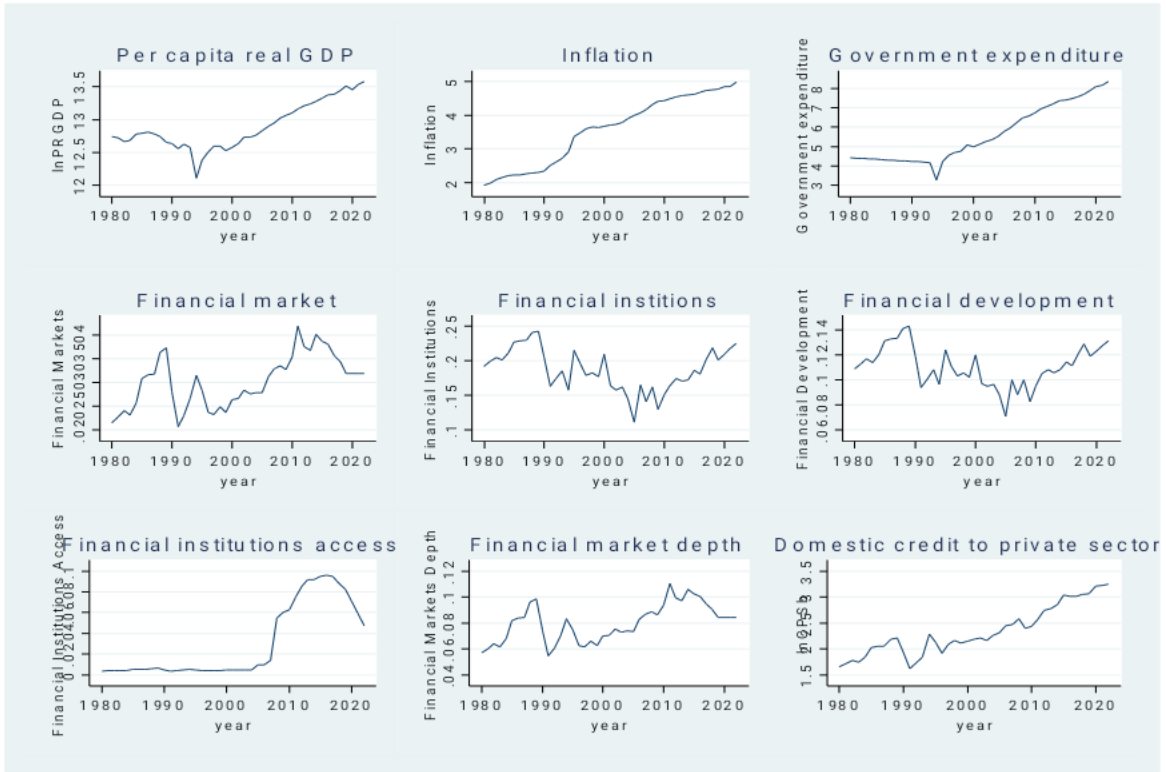


Figure 3. Graphical presentation of economic growth and financial market development indicators

The trends of the variables which showing us the long run co-integration shown below figure3, actually per capita GDP as it shown in the figure is no more volatile



and has positive trends over time as well both the inflation as indicated by consumer price index and government expenditure. While for the case of financial market development indicators are volatile around their average excepts financial institutions access index.



The table4 displays the results of lag order selection for a VAR model using the Schwarz Bayesian Information Criterion (SBIC). The table4 includes columns presenting different metrics for each lag order, such as the lag order, log-likelihood value, likelihood ratio statistic, degrees of freedom, p-value, FPE, Akaike Information Criterion, Hannan-Quinn Information Criterion, and SBIC. The preferred lag order is 1, as it strikes a favorable balance between model fit and complexity.

Table 4. Lag selection

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	142.022				9.9e-09	-7.07803	-7.01681	-6.90741
1	303.25	322.46	16	0.000	5.8e-12	-14.5256	-14.2195	- 13.6725*
2	327.375	48.25	16	0.000	3.9e- 12*	-14.9423	- 14.3913*	-13.4067
3	338.945	23.141	16	0.110	5.3e-12	-14.7151	-13.9193	-12.497
4	359.41	40.931*	16	0.001	4.9e-12	-14.9441*	-13.9034	-12.0436

Endogenous: lnPRGDP lnCPI lnGGTEX FMI

Exogenous: _cons



Edit with WPS Office

Table 5. Granger causality Wald tests

Granger causality Wald tests

Equation	Excluded	chi 2	df	Prob > chi 2
InPRGDP	InCPI	8.1305	1	0.004
InPRGDP	InGGTEX	13.642	1	0.000
InPRGDP	FM	.42917	1	0.512
InPRGDP	InCPSb	3.5628	1	0.059
InPRGDP	ALL	41.264	4	0.000
InCPI	InPRGDP	2.242	1	0.134
InCPI	InGGTEX	.46249	1	0.496
InCPI	FM	.17024	1	0.680
InCPI	InCPSb	.59293	1	0.441
InCPI	ALL	11.008	4	0.026
InGGTEX	InPRGDP	3.9833	1	0.046
InGGTEX	InCPI	.01618	1	0.899
InGGTEX	FM	.02559	1	0.873
InGGTEX	InCPSb	7.9753	1	0.005
InGGTEX	ALL	44.746	4	0.000
FM	InPRGDP	8.5575	1	0.003
FM	InCPI	8.2983	1	0.004
FM	InGGTEX	2.7122	1	0.100
FM	InCPSb	15.971	1	0.000
FM	ALL	36.54	4	0.000
InCPSb	InPRGDP	14.336	1	0.000
InCPSb	InCPI	15.006	1	0.000
InCPSb	InGGTEX	4.5694	1	0.033
InCPSb	FM	3.1569	1	0.076
InCPSb	ALL	69.446	4	0.000

Source: Author's computation 2023

The Granger causality Wald tests were performed to explore potential causal relationships between the variables in the dataset. The results revealed both unidirectional and bidirectional causality among the variables.

Unidirectional causality was observed from the logarithm of Consumer Price Index (lnCPI) to logarithm of Real Gross Domestic Product (lnPRGDP), logarithm of Gross Domestic Expenditure (lnGGTEX), and the Financial Market Variable (FM). This indicates that past values of lnCPI significantly Granger cause changes in lnPRGDP, lnGGTEX, and FM, meaning that lnCPI can help predict the future behaviour of these variables.

Similarly, unidirectional causality was found from lnGGTEX to lnPRGDP, suggesting that past values of lnGGTEX significantly predict changes in lnPRGDP.

Additionally, unidirectional causality was identified from FM to InCPSb, indicating that past values of FM significantly Granger cause changes in domestic credit to the private sector by banks (InCPSb).

Bidirectional causality was detected between InPRGDP and InCPSb, implying a reciprocal relationship between these variables, where each one Granger causes changes in the other.

Furthermore, bidirectional causality was observed between InPRGDP and FM, indicating a mutual relationship where past values of both variables Granger cause changes in each other.

Similarly, bidirectional causality was identified between InCPI and InCPSb, suggesting a reciprocal relationship between these variables.

On the other hand, no significant causality was found between InCPSb and FM, indicating that past values of FM do not significantly predict changes in InCPSb.

Additionally, the joint set of all variables (InCPI, InGGTEX, FM, InCPSb) was found to have unidirectional causality with InPRGDP, InCPI, InGGTEX, and FM, implying that collectively, these variables Granger cause changes in each of the four variables.

In summary, the Granger causality tests provided valuable insights into the causal relationships between the variables, highlighting unidirectional and bidirectional causality patterns, and helping to understand how past values of certain variables predict changes in others. These findings are crucial for forecasting and predictive modeling in the context of the dataset's economic variables.

It is important to note that while the results indicate statistical significance and potential causal relationships, further analysis, and consideration of economic theory and the specific context of Rwanda's financial market and economic growth is necessary to fully understand the nature and implications of these relationships.



Table 6. Vector error correction model estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)
	VECM	VECM	VECM	VECM	VECM
L._ce1	-0.637*	-0.136	-0.767	0.039***	1.717***
	(0.338)	(0.192)	(0.677)	(0.009)	(0.372)
L._ce2	-0.107	-0.015	0.002	0.009***	0.417***
	(0.091)	(0.051)	(0.182)	(0.002)	(0.100)
LD. lnPRGDP	0.335	-0.060	0.647	-0.020**	-0.872**
	(0.364)	(0.206)	(0.728)	(0.010)	(0.400)
LD. lnCPI	0.188	0.573***	0.859*	0.000	-0.098
	(0.222)	(0.126)	(0.444)	(0.006)	(0.244)
LD. lnGGTEX	-0.147	-0.193**	-0.556*	0.006	0.269
	(0.149)	(0.085)	(0.299)	(0.004)	(0.164)
LD. FM	-3.988	-1.326	-3.156	0.246	17.038**
	(7.373)	(4.175)	(14.757)	(0.196)	(8.104)
LD. lnCPSb	-0.045	-0.037	-0.100	0.003	-0.034
	(0.201)	(0.114)	(0.402)	(0.005)	(0.221)
Constant	0.004	0.046***	-0.005	-0.000	0.003
	(0.027)	(0.015)	(0.053)	(0.001)	(0.029)
Observations	41	41	41	41	41

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1



The table presents the results of the Vector Error Correction Model (VECM) estimation for five different specifications (models numbered 1 to 5). The VECM is used to analyse the long-run and short-run relationships among the variables in the system. Here's how to interpret the results for each variable in the model: The table lists the variables, denoted as L._ce1, L._ce2, LD. lnPRGDP, LD. lnCPI, LD. lnGGTEX, LD. FM, and LD. lnCPSb. The coefficients represent the impact of each variable on the dependent variable(s) for each specification. The standard errors below each coefficient represent the precision or reliability of the coefficient estimates.

The significance levels indicate the statistical significance of the coefficients, with asterisks at the bottom indicating a 1% level, a 5% level, and a 10% level. To summarize the results and interpret the signs of the parameters for each specification, the coefficients for each variable in each column should be analysed. For example, in column (1), L._ce1 has a negative coefficient (-0.637) and is statistically significant at the 10% level, indicating that an L._ce1 has a negative impact on the dependent variable.

For instance, in model 1, a lagged difference of lnPRGDP is associated positive (0.335) effect of the first endogenous variable.

The constant term in each model represents the intercept or the base value of the endogenous variables when all other variables are zero or their differences are zero.

The coefficients for the constant term in each model indicate the constant term's impact on the endogenous variables. For example, in model 2, the constant term has a positive coefficient of 0.046, suggesting that it adds approximately 0.046 to the second endogenous variable.

The significance levels of the coefficients are denoted by asterisks, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.



Significance suggests that the relationship between the lagged variables and the endogenous variables is statistically meaningful.

Therefore, the results of a Vector Error Correction Model (VECM) analysis for multiple variables (L._ce1, L._ce2, LD. lnPRGDP, LD. lnCPI, LD. lnGGTEX) across five different models. Each cell in the table contains coefficients along with their standard errors, and asterisks indicate the level of statistical significance. The interpretation reveals valuable insights into the relationships between these variables. For instance, in Model 4, the coefficient for L._ce1 is 0.039 with a very low standard error of 0.009, indicating a highly significant positive relationship. Similarly, Model 5 shows that L._ce1 has a coefficient of 1.717 with a standard error of 0.372, suggesting a substantial and statistically significant positive relationship. These coefficient values and their signs, along with the corresponding significance levels, provide crucial information for understanding the dynamics and relationships within the VECM analysis.

4.3 Discussion on findings

In this discussion section, I analyse the results of the study in the context of its specific objectives and link them to existing literature.

To investigating the Causal Relationship between Financial Market and Economic Growth: The main objective of this study was to investigate the causal relationship between financial market development and economic growth in Rwanda using econometric techniques. To achieve this objective, four specific objectives were identified.

i. Assessing the Level of Financial Market Development in Rwanda

The study utilized indicators such as credit to the private sector, stock market capitalization, and money supply to assess the level of financial market development



in Rwanda. The findings in the results section indicate a positive relationship between financial market development indicators (such as Financial Markets in percent change and Financial Institutions in percent change) and economic growth.

These results are consistent with the existing literature. For instance, Biringanine & Mzee (2021) found a positive relationship between financial development and economic growth in the CEPGL region, supporting the findings of this study.

ii. Analysing Trends in Economic Growth in Rwanda:

The study analysed the trends in economic growth in Rwanda over the past decade and identified the key drivers of growth. The results show that general government total expenditure (InGGTEX) has a positive impact on economic growth in Rwanda. This is consistent with the theoretical framework that suggests that government spending can stimulate economic activity and contribute to overall economic growth.

iii. Determining the Direction of Causality:

The study employed Granger causality tests to determine the direction of causality between financial market development and economic growth in Rwanda. The findings indicate a unidirectional causal relationship, with financial market development Granger causing economic growth in Rwanda. This result aligns with the empirical review, where previous studies (Calderón & Liu, 2003; Bloch & Tang, 2003; Batuo et al., 2018; Ghirmay, 2004) found positive relationships between financial development and economic growth.

iv. Identifying Specific Financial Market Indicators:

The study identified specific financial market indicators that have a causal effect on economic growth in Rwanda, such as Financial Markets Depth in percent change. These findings suggest that developing the financial market has a positive impact on economic growth, which is consistent with the literature.





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4.4 Linking Results with Existing Literature

The study's findings are in line with previous research that has explored the relationship between financial development and economic growth. For instance, Biringanine & Mzee (2021) found a positive effect of financial development on economic growth in the CEPGL region, which includes Rwanda. Additionally, the positive impact of government expenditure on economic growth aligns with the theoretical review's emphasis on the role of well-developed financial markets in stimulating economic development (Alfaro et al., 2004; Atack & Neal, 2009).

However, the study also acknowledges the mixed findings in the literature regarding the direction of causality between financial development and economic growth, as demonstrated by studies like Kumar (2022). This highlights the need for further research to understand the context-specific dynamics in Rwanda's financial market development and its impact on economic growth.

In conclusion, this study contributes to the understanding of the causal relationship between financial market development and economic growth in Rwanda. The findings support the importance of prioritizing financial market development as a driver of economic growth in the country. However, the mixed findings in the existing literature and the specific context of Rwanda suggest that further research is needed to explore this relationship in other African countries and to tailor policies to the local context.

CHAPTER5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of findings

This study employed the Vector Error Correction Model (VECM) to investigate the relationships among economic variables. It included lagged changes in unobserved variables and lagged differences in endogenous variables. The coefficients of these variables were assessed to understand short-term and long-term dynamics. The VECM estimation revealed both short-term and long-term relationships. Unidirectional causality was observed from $\ln\text{CPI}$ to $\ln\text{PRGDP}$, $\ln\text{GGTEX}$, and FM , indicating that past changes in $\ln\text{CPI}$ significantly granger caused changes in these variables. Unidirectional causality was found from $\ln\text{GGTEX}$ to $\ln\text{PRGDP}$, FM , and $\ln\text{CPSb}$, while bidirectional causality was detected between $\ln\text{PRGDP}$ and $\ln\text{CPSb}$, $\ln\text{PRGDP}$ and FM , $\ln\text{CPI}$ and FM , and $\ln\text{CPI}$ and $\ln\text{CPSb}$. This study investigates the financial markets' development and economic growth in Rwanda using a causality test. The researchers employ regression models, Granger causality tests, and a Vector Error Correction Model (VECM) to analyze the data.

The results suggest that financial market development, as measured by the Financial Markets Index (FMI), has a significant causal impact on economic growth in Rwanda. Moreover, government expenditure is found to have a positive effect on economic growth, highlighting the importance of efficient allocation of public resources. Price stability, as indicated by inflation, is also found to be associated with economic growth, underscoring the significance of maintaining stable prices. Additionally, the study reveals bidirectional causality between financial market development and the growth rate of real GDP, indicating a mutually reinforcing relationship. The combined influence of variables including inflation, government expenditure, and financial market development collectively affects economic growth.





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Furthermore, the relationships among economic variables in Rwanda, using a Vector Error Correction Model (VECM) to capture both short-term and long-term trends.

It reveals unidirectional and bidirectional causality relationships, highlighting the importance of price stability in influencing economic conditions. Policymakers should prioritize measures to control inflation to stimulate economic growth. A well-developed financial market can positively influence economic growth and government spending, emphasizing the need for a robust financial infrastructure.

The bidirectional causality between GDP and government expenditure highlights the mutually reinforcing relationship between these variables. An increase in economic growth can lead to higher government revenue, which, if efficiently allocated, can further boost economic development. Increased government expenditure can stimulate economic activity and drive GDP growth, highlighting the government's role in promoting economic prosperity. The bidirectional causality between financial market development and GDP growth suggests that these two factors interact in a mutually beneficial manner. A thriving financial market can facilitate access to capital and investment opportunities, promoting economic growth. Conversely, a growing economy generates more investment opportunities, enhancing the development of financial markets.

In conclusion, this study provides critical insights into the complex interplay of economic variables in Rwanda, emphasizing the importance of maintaining price stability, efficient allocation of public resources, and fostering a well-developed financial market as crucial strategies for driving economic growth.



5.2 Recommendations

Based on these findings, the study puts forth several recommendations to guide policymakers in Rwanda's pursuit of economic growth and stability. First and foremost, policymakers are advised to prioritize measures that promote financial market development. This includes initiatives to attract investments, enhance regulatory frameworks, and foster the growth of domestic financial institutions. A thriving financial market can significantly bolster capital access for businesses and individuals, thereby stimulating investment and driving economic growth.

Additionally, the study underscores the positive impact of government expenditure on economic growth. To maximize this effect, policymakers should concentrate on improving the efficiency of resource allocation, ensuring transparency, and enhancing accountability in public spending. Efficient and strategic use of public funds can magnify the benefits of government expenditure in driving economic development.

Ensuring price stability, particularly through effective control of inflation, remains a critical consideration. Policymakers should implement robust monetary policies and regulatory measures to curb inflationary pressures. Low and stable inflation rates provide a conducive environment for economic planning, attract investment, and foster consumer confidence.

Furthermore, the study highlights the intricate interplay between various economic variables. Policymakers are encouraged to adopt a coordinated approach to economic policies, ensuring that actions in one domain do not inadvertently hinder progress in others. This necessitates regular communication and collaboration among relevant government departments and institutions.



To deepen my understanding of Rwanda's evolving economic dynamics, continuous research and analysis are paramount. Policymakers should prioritize ongoing data collection and analysis to remain responsive to changing economic conditions and make well-informed, data-driven decisions.

Lastly, it is crucial to tailor these recommendations to Rwanda's specific context. Recognizing the unique economic, cultural, political, and social factors at play is essential when implementing these measures.

By heeding these recommendations, Rwandan policymakers can create an environment conducive to sustainable economic growth, financial stability, and ultimately, improved living standards for the country's citizens. This comprehensive study not only advances our comprehension of economic interdependencies but also provides invaluable guidance for policymakers navigating the intricate terrain of Rwanda's economic landscape, holding the potential to usher in a brighter economic future for the nation and its people.

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Appendix

The data detailed below some of them are in percentage and others transformed into logarithmic which indicated by (ln), and noted that they are collected from two different source, world bank development indicator (WDI) and International monetary fund (IMF).

year	PRGDP	CPI	GGTEX	FD	FI	FM	FIA	FMD	CPSb	lnRGDP	lnCPI	lnGGTEX
1980	341486	6.797	82.9839	0.10864	0.19187	0.02152	0.0036	0.0568	5.268	7.46267	1.916	4.418648
1981	337501	7.235	81.619	0.11308	0.19934	0.02278	0.0038	0.0601	5.575	7.48709	1.978	4.402074
1982	317308	8.147	80.2559	0.11691	0.20547	0.02415	0.0040	0.0637	5.911	7.4621	2.097	4.385221
1983	324191	8.687	78.8919	0.11419	0.20107	0.02323	0.0039	0.0613	5.685	7.52069	2.161	4.36808
1984	357562	9.153	77.5279	0.12062	0.21120	0.02573	0.0043	0.0679	6.297	7.64268	2.214	4.350639
1985	361014	9.311	76.1639	0.13142	0.22722	0.03091	0.0052	0.0816	7.565	7.68563	2.231	4.332889
1986	368197	9.209	74.7999	0.13294	0.22946	0.03165	0.0053	0.0835	7.748	7.73918	2.220	4.314818
1987	354742	9.59	73.4359	0.13329	0.22997	0.03183	0.0053	0.0840	7.791	7.73622	2.260	4.296414
1988	343687	9.87	72.0719	0.14129	0.24115	0.03637	0.0061	0.0960	8.901	7.73918	2.289	4.277666
1989	313413	9.972	70.7079	0.14289	0.24336	0.03730	0.0063	0.0984	9.129	7.68042	2.299	4.258559
1990	307468	10.39	69.3439	0.11908	0.20590	0.02800	0.0047	0.0739	6.853	7.68461	2.340	4.239079
1991	285469	12.42	67.98	0.09385	0.16363	0.02070	0.0035	0.0546	5.066	7.64065	2.519	4.219213
1992	304108	13.60	66.616	0.10081	0.17499	0.02301	0.0038	0.0607	5.632	7.70457	2.610	4.198945
1993	290394	15.30	65.252	0.10810	0.18568	0.02665	0.0045	0.0703	6.285	7.59500	2.728	4.178257
1994	182068	18.51	26.59	0.09662	0.15829	0.03149	0.0053	0.0831	9.791	7.05217	2.918	3.280535
1995	240120	28.88	69.393	0.12426	0.21569	0.02837	0.0047	0.0749	8.368	7.27163	3.363	4.239786
1996	271021	32.69	95.277	0.11158	0.19542	0.02374	0.0040	0.0626	6.746	7.38134	3.487	4.556788
1997	297448	36.53	110.197	0.10324	0.17951	0.02326	0.0039	0.0614	8.050	7.52023	3.598	4.70227



1998	295309	38.89	117.592	0.10581	0.18285	0.02498	0.0042	0.0659	8.704	7.60034	3.660	4.767221
1999	275333	37.95	161.101	0.10216	0.17694	0.02372	0.0040	0.0626	8.291	7.63288	3.636	5.082031
2000	290649	39.44	146.995	0.12025	0.20976	0.02643	0.0044	0.0698	8.599	7.71333	3.674	4.990398
2001	307341	40.76	166.06	0.09728	0.16439	0.02668	0.0045	0.0704	8.862	7.79482	3.707	5.112349
2002	339259	41.57	191.236	0.09481	0.15777	0.02846	0.0048	0.0751	9.147	7.91862	3.727	5.253508
2003	338433	44.66	212.718	0.09678	0.16252	0.02757	0.0046	0.0727	8.654	7.94058	3.799	5.359967
2004	350930	50.01	245.249	0.08813	0.14522	0.02789	0.0047	0.0736	9.632	8.01235	3.912	5.502274
2005	375113	54.58	326.538	0.07108	0.11175	0.02785	0.0098	0.0735	10.11	8.10198	3.999	5.788546
2006	400555	59.40	376.96	0.10000	0.16511	0.03131	0.0094	0.0826	11.53	8.19007	4.084	5.932139
2007	421847	64.79	498.815	0.08860	0.14116	0.03286	0.0136	0.0867	11.82	8.26384	4.171	6.212235
2008	454105	74.8	636.256	0.10001	0.16282	0.03361	0.0544	0.0887	13.20	8.36962	4.314	6.455601
2009	472474	82.53	719.606	0.08284	0.12997	0.03274	0.0599	0.0864	10.97	8.43010	4.413	6.578704
2010	491900	84.45	851.061	0.09510	0.15130	0.0355	0.0626	0.0937	11.34	8.50086	4.436	6.746484
2011	520686	89.23	1020.35	0.10516	0.16470	0.04186	0.0749	0.1105	13.06	8.57753	4.491	6.927905
2012	549523	94.84	1155.34	0.10816	0.17479	0.03765	0.0854	0.0994	15.55	8.66042	4.552	7.052157
2013	564672	98.84	1322.62	0.10588	0.17112	0.03685	0.0916	0.0973	16.03	8.70649	4.593	7.187372
2014	583181	100.5	1545.03	0.10842	0.17275	0.04020	0.0919	0.1061	17.39	8.76639	4.611	7.342802
2015	617964	103.1	1635.39	0.11459	0.18632	0.03875	0.0950	0.1023	20.75	8.85123	4.636	7.399638
2016	643478	109.0	1720.52	0.11144	0.18079	0.03809	0.0962	0.1005	20.30	8.90923	4.691	7.450386
2017	652033	114.3	1930.57	0.12124	0.20237	0.03578	0.0947	0.0944	20.42	8.94819	4.738	7.565573
2018	690910	115.8	2188.89	0.12892	0.21888	0.03433	0.0880	0.0906	21.22	9.03049	4.752	7.691153
2019	738929	118.6	2624.91	0.11903	0.20184	0.03196	0.0823	0.0844	21.31	9.12096	4.776	7.872802
2020	697841	127.8	3211.17	0.12313	0.20987	0.03197	0.0706	0.0844	24.89	9.08681	4.850	8.07439
2021	756244	128.8	3453.93	0.12722	0.21790	0.03198	0.0589	0.0844	25.24	9.19003	4.858	8.147268
2022	789323	146.7	4155.37	0.13132	0.22594	0.03199	0.0472	0.0844	25.59	9.25547	4.988	8.332158

Source: WDI & IMF, 2023

