ANALYSIS OF INFLATION DRIVERS ON ECONOMIC GROWTH IN THE EAST AFRICAN COMMUNITY COUNTRIES USING A FIXED EFFECTS PANEL MODEL

CASE STUDY: KENYA, RWANDA, TANZANIA AND UGANDA (2000-2022)

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DECLARATION

I, BERAHO Mira, hereby declare that this thesis entitled: "**ANALYSIS OF INFLATION DRIVERS ON ECONOMIC GROWTH IN THE EAST AFRICAN COMMUNITY COUNTRIES USING A FIXED EFFECTS PANEL MODEL''** is my own work and has not been presented for any award to any university.

Signature.....

Date...../...../ 2023

APPROVAL

This is to certify that the present research project entitled "**ANALYSIS OF INFLATION DRIVERS ON ECONOMIC GROWTH IN THE EAST AFRICAN COMMUNITY COUNTRIES USING A FIXED EFFECTS PANEL MODEL**" was conducted by **BERAHO Mira** under my guidance and supervision.

Supervisor: Dr Marcel NDENGO

Signature.....

Date...../...../2023

DEDICATION

To my spouse, loving mother, dear children, beloved sister, and friends, in gratitude for your unwavering support.

ACKNOWLEDGEMENT

I am immensely grateful for the invaluable contributions of numerous individuals that have led to the successful completion of this thesis. I want to extend my deepest appreciation to each and every one of them. Their exceptional efforts and support have played a pivotal role in finalizing this dissertation and enriching my academic journey.

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To all those mentioned above, as well as those whose contributions may not have been explicitly cited but were equally significant, my heartfelt gratitude is extended to you. Your steadfast support forms the foundation of my academic journey, and I deeply appreciate your involvement in this thesis.

I wish to convey my profound thanks and extend my heartfelt wishes for abundant blessings from the Almighty to each and every one of you. Lastly, I would like to acknowledge and thank God for the gift of wisdom and the precious gift of life.

BERAHO Mira

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LIST OF ABBREVIATIONS AND ACRONYMS

ADF: Augmented Dickey Fuller test

APR: Annual Percentage Rate

CD: Certificate of Deposit

EAC: East African Community

FDI: Foreign Direct Investment

FE: Fixed Effect

FY: Fiscal Year

GDP: Gross Domestic Product

GoT: Government of Tanzania

IMF: International Monetary Fund

INTR: Interest Rate

MB: Money Base

NBR: National Bank of Rwanda

NDP: National Development Plan

OLS: Ordinary Least Square

PGR: Population Growth Rate

SSA: Sub-Sahara Africa

UNDP: United National Development Program

WB: World Bank

ABSTRACT

High inflation in developing economies has a wide-ranging impact, eroding purchasing power, impeding economic stability, competitiveness, and investment, and ultimately leading to decreased demand for goods and services.

The primary goal of this study was to comprehensively evaluate the drivers of inflation and their impact on the economic growth of Kenya, Rwanda, Tanzania, and Uganda over a 22-year period spanning from 2000 to 2022. The study also sought to achieve specific objectives, including the exploration of the factors influencing inflation, an assessment of the extent of economic growth as influenced by these inflation drivers, and an analysis of the effects of these inflation determinants on the economic growth of the aforementioned East African nations.

To achieve these objectives, the study harnessed secondary panel data and conducted rigorous data analysis through panel regression analysis, utilizing data curated from the World Bank. An econometric model was constructed to gain a more profound comprehension of the intricate relationship between inflation drivers and economic growth, measured by Gross Domestic Product (GDP), in the Rwandan, Kenyan, Tanzanian, and Ugandan economies.

The results of this study underscore the significance of various variables, including Foreign Direct Investment, interest rates, the money base, population growth rate and exchange rate (all p-values < 0.05), in influencing inflation levels across the four countries. These variables also showed a nuanced relationship with GDP, with Foreign Direct Investment and exchange rate showing a negative impact and the money base, population growth rate and interest rate demonstrating a positive influence. The R-squared value of 0.927 suggests that 92.7% of the economic growth variations in the studied nations are explained by the independent variables. Furthermore, the F-statistics result with a p-value less than 0.05 confirms the strong fit of the regression model, offering convincing evidence of its reliability.

Keywords : *economic growth, inflation drivers, fixed effects, East African Countries*.

CHAPTER 1: GENERAL INTRODUCTION

1.0. Introduction

Inflation is a pivotal economic indicator with far-reaching implications for a nation's economic stability and growth. In the context of developing economies, East African countries represent a region of increasing economic significance and complexity. As these nations navigate the intricacies of globalization and regional integration, understanding the dynamics of inflation and its primary drivers becomes essential for formulating effective policy measures to foster sustainable development. This study embarks on an exploration of inflation and its key drivers—interest rates, money base, foreign direct investment, and population growth—while shedding light on their interconnectedness with economic growth in East African countries.

East Africa, encompassing countries such as Kenya, Rwanda, Tanzania, and Uganda, has witnessed substantial economic transformations over the past few decades. These nations exhibit unique economic structures, face distinct challenges, and possess varying degrees of exposure to external economic influences. The need for a comprehensive understanding of inflation dynamics becomes increasingly apparent as they aim to harness the opportunities and overcome the challenges presented by their evolving economic landscapes.

The drivers of inflation are multifaceted and deeply intertwined with the broader economic fabric. Interest rates, as determined by central banks, influence borrowing costs, consumer spending, and investment decision (Ben S., Jean, & Eliasz, 2005). The money base, which reflects the quantity of currency and reserves in circulation, has a direct impact on overall price levels (Friedman, 1970). Foreign direct investment, a catalyst for capital inflow and job creation, plays a pivotal role in economic development (Blomstrom & Kokko, 1998). Meanwhile, population growth directly affects supply and demand dynamics within these economies (Bloom, Canning, & Sevilla, 2003).

In an effort to unveil the nuanced relationship between these inflation drivers and economic growth in East African countries, this research will employ a robust methodological approach, encompassing data analysis, econometric modeling and statistical testing. The anticipated

outcomes of this study will provide valuable insights for policymakers, economists, and various stakeholders, empowering them to make informed decisions that contribute to the sustainable economic advancement of the region.

1.1.Background of the study

Inflation refers to the percentage increase in prices observed within a specific timeframe. It is generally measured as a comprehensive indicator, encompassing the overall price rise or the cost of living within a country. However, inflation can also be computed for specific categories of goods, such as food, or services, like a haircut. Irrespective of the context, inflation signifies the extent to which the designated range of goods and/or services has become more expensive over a specific period, typically a year (Yahaya, Mansor, & Okazaki, 2016).

After the significant increase in inflation around the world during the 1980s and 1990s, global inflation rates have remained relatively stable since the start of the 21st century, typically fluctuating between three to five percent annually. The global economic crisis, commonly referred to as the Great Recession, led to a significant spike in 2008, yet inflation remained stable throughout the 2010s until the recent inflation problem emerged in 2021. In the face of the economic repercussions caused by the coronavirus pandemic, the global inflation rate experienced a decline to 3.25% during the initial year of the pandemic. However, it rebounded and reached 4.7 percent in 2021. This upswing was primarily driven by the mounting impact of supply chain disruptions on consumer prices, which was subsequently aggravated by the Russia-Ukraine conflict. A series of problems including increasing energy and food costs, fiscal uncertainty resulting from the pandemic, and consumer insecurity have contributed to a fresh worldwide economic downturn, with global inflation in 2022 projected to have reached 8.75% (Matés-Barco & Vázquez-Fariñas, 2023).

Venezuela has the world's highest individual inflation rate which reached 235% in 2022. While this statistic is more than 100 times higher than the world average in most years, it represents a decline in Venezuela's inflation rate, which peaked at more than 65,000% in 2018. Venezuela faced hyperinflation between 2016 and 2021 because of the government's excessive spending and

printing of money in an attempt to curb the country's already-high inflation rate, and the invasion of migrants resulted in one of the world's worst refugee crises in recent years.

After the initial oil shock, African countries have struggled with significant inflation since the mid-1970s. Over the past 15 years, inflation rates of 20 percent or higher per year have become commonplace in many African nations. Shockingly, a few countries have even witnessed rates surpassing 50 or even 100% annually. This persistent inflation has had far-reaching consequences for African economies, affecting various aspects of economic performance. The financial sectors of these nations have particularly suffered from ongoing inflation, along with key macroeconomic indicators such as consumption, savings, investment, and foreign exchange markets in countries with exceptionally high inflation rates. Despite recognizing the inflation issue in Africa, there has been a notable dearth of analysis on this phenomenon to date (Arndt, Loewald, & Makrelov, 2020)

In October 2011, East Africa experienced a significant increase in inflation, with the average reaching 20%. This increase in prices was a matter of worry for both policymakers and the general population. Specifically, Ethiopia had an inflation rate of 34%, while Kenya aw its highest inflation rate for that month at 18.9%. Tanzania also faced a notable inflation surge, peaking at 17.9% in October 2011. (AFDB, 2011), Uganda recorded the second-highest inflation level in the region, reaching 30.5% during the same period in April 2011, for Rwanda the all-urban general index was established at 108.6 this stands for an increase of 1.40% over the previous month, which was 107.1. In annual change, it increased by 4.98% compared to 4.11% in the previous month. A rise in inflation carries adverse consequences for nations, especially impacting the poor communities (IMF report, 2011). With a significant portion of the population living in rural regions of these countries, the implications are significant. This phenomenon diminishes people's quality of life, potentially giving rise to political disorders on a scale similar to the ones witnessed in the Maghreb and the Middle East (Yousef, 2020).

The East African Community (EAC) Partner States are currently engaged in a joint effort to carry out an Integration program, which is based on the goal of strengthening economic, social, and political collaboration among them. The EAC Partner States are striving to attain equitable progress and advancement throughout the region. Notable progress has been achieved in the

integration process, including the establishment of the Customs Union in 2005, the Common Market in 2010, and the endorsement of the Monetary Union Protocol in November 2013.

Furthermore, it is important to note that the groundwork for establishing the Political Federation is currently in progress. It is crucial to emphasize that one of the primary and fundamental goals of the EAC is to promote trade, thereby fostering economic growth and development among its Partner States (Wama, 2014)

1.2. Problem Statement

Inflation poses a significant challenge within the economy, requiring an appropriate response from the monetary authority to mitigate its effects. High inflation detrimentally affects the economic activity of a country by eroding the purchasing power of the population. As a result, there is a decrease in demand for goods and services, leading to reduced levels of investment. In such circumstances, individuals may opt to refrain from saving in commercial banks and instead invest in tangible assets like bonds or real estate. However, it is important to note that investment accumulation occurs primarily through saving, and the decrease in savings leads to a decline in investment levels, ultimately hampering economic growth (Bodie, Kane, & Marcus, 2013)

(Osei & Ogunkola, 2022) conducted a research study on the factors influencing inflation and identified key determinants such as inflation expectations, federal spending, wages and salaries, and personal consumption. Similarly, Anthony Simpasa's investigation in 2020 revealed that a surge in money supply accounted for 40% and one-third of short-run inflation in Ethiopia and Uganda, respectively. Meanwhile, in Kenya and Tanzania, inflation appeared to be driven by oil prices, contributing to 20% and 26% respectively, although money growth also played a significant role in recent inflationary increases in these countries (Nguyen & Dridi, 2017). In Rwanda, lower domestic food supply linked to unfavorable weather conditions and higher prices of agriculture inputs such as fertilizers and seeds led to an increase in food prices and distribution across the country (Ndagijimana, (2023). However, the aforementioned studies did not delve into the effects of interest rates, population growth rates, import prices of goods and services, and the money base, despite their potential high influence on inflation.

This study aims to address the existing research gap by examining additional factors that influence inflation and hinder economic growth in East African Community (EAC) countries. Building upon the aforementioned research, this study will shed light on these unexplored variables to provide a more comprehensive understanding of the inflationary dynamics within the region. By doing so, it will contribute to a deeper analysis of the factors that impede economic growth in East Africa Community (EAC) countries.

1.3. Purpose of the Study

The purpose of the above study is to investigate and analyze some of the factors that influence inflation in EAC (East African Community) countries. The study aims to fill a research gap by examining additional variables that have not been previously considered. By identifying and understanding these factors, the study intends to provide a more comprehensive understanding of the inflationary dynamics within the region. Furthermore, the study seeks to evaluate the impact of inflation drivers on economic growth in EAC countries. Ultimately, the findings of this research will contribute to the existing body of knowledge and provide insights for policymakers, economists, and stakeholders in effectively managing inflation and fostering sustainable economic growth in the EAC region.

1.4. Objectives of the Study

1.4.1. General objective

The general objective of this study is to analyze drivers affecting inflation and its impact on economic growth in Kenya, Rwanda, Tanzania and Uganda over the period from 2000-2022.

1.4.2. Specific Objectives

i. To examine the drivers that influence inflation in Rwanda, Kenya, Uganda and Tanzania.

ii. To assess the extent of GDP in Rwanda, Kenya, Uganda and Tanzania through inflation drivers.

iii. To analyse the relationship between drivers of inflation on GDP in Rwanda, Kenya, Uganda and Tanzania

1.5. Research Questions

i. What are the main factors contributing to inflation in the East African Community countries, and how do they vary among the member states?

ii. What is the extent of GDP in Rwanda, Kenya, Uganda and Tanzania through inflation drivers?

iii. What is the relationship between inflation drivers and GDP in Rwanda, Kenya, Uganda and Tanzania?

1.6. Research Hypothesis

This study focuses on the following three hypotheses:

H0: interest rate, foreign direct investment, money base, population growth rate and exchange rate have no influence on GDP in Rwanda, Kenya, Uganda and Tanzania.

H0: There is no trend of GDP through inflation drivers in Rwanda, Kenya, Uganda and Tanzania.

H0: interest rate, foreign direct investment, money base population growth rate and exchange rate do not affect GDP in Rwanda, Kenya, Uganda and Tanzania.

1.7. Scope of the Study

This section highlights the study's limitations in terms of domain, time, and geography. The research study titled "Analysis of Inflation Drivers on economic growth in the East African Community Countries namely Rwanda, Tanzania, Kenya, and Uganda" is an investigation into the complex relationship between inflation and economic growth within a specific regional context. This study utilized Gross Domestic Product (GDP) as a primary indicator to measure economic growth, which is a commonly accepted metric for assessing the economic performance

of a country or region. The selection of GDP as a key indicator provides a standardized and widely recognized measure, allowing for meaningful comparisons and analysis.

The research is distinctly focused on the East African Community (EAC), which is a regional economic organization consisting of several East African countries. The specific countries examined in this study are Rwanda, Tanzania, Kenya, and Uganda. These countries were chosen as the primary case study, likely due to their membership in the EAC and their shared regional characteristics. This focus on a select group of countries within a regional context enables a deep and contextually relevant analysis of inflation and its drivers on economic growth.

The study spans a substantial 22-year period, from 2000 to 2022. This extended timeframe allows for a long-term perspective and the examination of trends and patterns in inflation and economic growth within the selected countries. The choice of this timeframe might is based on the availability of accurate and consistent data for the study variables over this period. However, it's important to note that the study's findings may be less representative of more recent developments and may not account for economic changes that occurred after 2022.

The domain of the research is centered around international economics and economic growth. The study investigates deeply into the intricate dynamics of international economic interactions and their impact on the economic growth of the East African Community countries under consideration. It likely involves the analysis of factors such as foreign investments, exchange rates, and regional economic integration, among others, to understand the relationship between inflation and economic growth within this specific regional context.

In Conclusion, this research study is a thorough exploration of the impact of inflation on economic growth within the East African Community, with a primary focus on Rwanda, Tanzania, Kenya, and Uganda. It utilizes GDP as a key measure of economic growth, spans over two decades to assess long-term trends, and operates within the domain of international economics and economic growth to provide valuable insights into the economic dynamics of this region.

1.8. Significance of the study

In all EAC Partner States, the primary objective of monetary policies is to ensure price stability. Therefore, conducting a thorough empirical investigation to quantify the impact of inflation on the economic growth of Rwanda, Kenya, Tanzania, and Uganda is of great significance.

The study investigated into the intricate relationship between inflation drivers and economic growth, offering clarity on whether specific factors facilitate or hinder economic progress in East African nations. This knowledge serves as a guiding light for governments and businesses, assisting them in formulating investment and policy decisions that foster sustainable growth, thereby ensuring the region's long-term prosperity.

Such research provides governments in these countries with evidence-based insights, enabling them to further enhance their policy-making processes. Additionally, this study expands the knowledge base of researchers, offering valuable information for academic courses in the field. Furthermore, this research serves as a key reference for future investigations on related development topics, helping researchers delve deeper into the subject matter. School administrators also benefit from this study by gaining insights into appropriate measures to orient both teachers and students. Completing this study successfully also contributes to the attainment of a master's degree with honors. Moreover, it provides valuable guidance to businesspersons and entrepreneurs on resource allocation strategies.

1.9. Limitation of the study

The study titled "Analysis of Inflation Drivers on Economic Growth in the East African Community (EAC) Using a Fixed Effect Panel (2000-2022)" presents valuable insights into the relationship between inflation and economic growth within the EAC region during the specified time frame. However, it is important to acknowledge the limitations of this research. One main limitation is the potential for omitted variable bias, as there may be unaccounted factors that influence both inflation and economic growth, which are not considered in the analysis. Additionally, the study's findings are constrained by the availability and quality of data for the chosen time period, and the generalizability of the results may be limited to the specific

characteristics of the EAC countries during this time frame. Nevertheless, this research lays a foundation for further exploration into the complex interplay between inflation and economic growth in the EAC region and offers valuable insights that can inform policy decisions and future academic investigations

1.10. Expected Outcomes

The study provided valuable quantitative data, shedding light on how these drivers have evolved over time in the region. This data will enhance our understanding of the East African economic landscape.

Moreover, the research delved into the correlations and causation between these inflation drivers and economic growth. It clarified whether changes in these drivers directly influence economic growth, offering practical insights for policy formulation.

The study identified the key drivers among the factors, helping policymakers allocate resources effectively. It will culminate in policy recommendations for governments and central banks, guiding them in managing inflation drivers to foster economic growth.

Additionally, the research may yield sector-specific insights, highlight regional differences, and explore the effectiveness of foreign direct investment and the influence of population growth on the economic landscape. Its academic contribution is expected to inspire further research in economics, particularly in the East African context. The findings could boost investor confidence and encourage foreign investment, ultimately contributing to economic growth and sustainable development in the region.

1.11. Structure of the thesis

The introductory chapter encompasses the study's introduction, problem statement, research objectives, research hypothesis, research questions, significance of the study, and the study's scope. Chapter 2 focuses on the literature review, offering theoretical insights into the drivers of inflation and its impact on economic growth. Additionally, empirical evidence regarding the relationship between inflation drivers and economic growth will be provided.

Chapter 3 offers a concise overview of the Research Methodology, encompassing details about the study area, research design and data collection methods, including sources, types, and collection techniques. Additionally, it provides insights into the specification of the econometrics model and the definition of variables.

Chapter 4 presents the findings and discussions related to Descriptive Statistics, the outcomes of the Econometrics model, and the analysis of the relationships among the variables being investigated in the contexts of the EAC countries.

The final chapter summarizes the main findings, draw conclusions, and provide potential recommendations based on the study's outcomes.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Inflation is a critical economic phenomenon that affects countries worldwide. Understanding the drivers of inflation and its impact on economic growth is of great importance, particularly in the context of East African countries. This literature review aims to explore and synthesize the existing research on the relationship between inflation drivers, including interest rates, population growth, foreign direct investment and the money base, and their influence on economic growth in the East African region.

2.2.Theoretical Framework

This section emphasizes different theories for similar authors about the topic based on the specific objectives.

2.2.1. Inflation and Economic Growth Theories

The relationship between inflation and economic growth has been of great concern to most countries and regions across the world. Several studies have attempted to explain the linear association, long run and causal relationship between inflation and economic growth however their findings have been somewhat inconsistent. For East African Community (EAC) countries, studies on the linear association, long run and causal relationship between inflation and economic growth have also been done although mainly dwelling on time series analysis. Coincidentally, their results have also shown inconsistent findings. The community being a trading block and in pursuit of regional integration, available studies have failed to explain the exact relationship that exist between inflation and economic growth in the region**.**

2.2.1.1. Quantity Theory of Money

The Quantity Theory of Money (QTM) originated in the 16th century when classical economists like Jean Boldin attempted to understand the reasons behind rising French prices. Boldin concluded that increases in the supply of gold and silver, which were used as currencies, led to

greater demand for French goods and subsequently higher prices. This concept linked changes in prices to alterations in the money supply. In the 1690s, John Locke further developed the quantity theory, exploring the impact of money on trade, interest rates, and the economy's demand for money. Notably, this period marked the emergence of the idea that money serves as a medium of exchange to facilitate trade transactions. Economists of that time inferred that the amount of money required for such transactions depended on the circulation speed of money and the balance between money supply and demand. When there was more demand than supply, interest rates would rise, and vice versa (Cantillon, 1755; (John, 1691), as cited in Ajuzie, et al., 2008).

The Quantity Theory of Money is based on the Irving Fisher equation of exchange, which states that the quantity of money in an economy to the price level. It is represented by the equation MV = PQ, where M is the quantity of money, V is the velocity of money, P is the price level, and Q is the quantity of goods and services produced. The theory assumes that in the short run, the velocity of money and the quantity of goods and services produced remain relatively stable. Consequently, changes in the money supply directly influence the price level. By understanding this relationship, economists can explain how changes in the money supply can lead to inflation when V and Q are relatively constant. Various versions of the Quantity Theory of Money exist, but the theory simplifies complex economic dynamics, assuming a constant velocity of money and constant goods and services production, which may not fully hold in reality. In the long run, additional factors such as real economic growth and changes in the money demand function become crucial in explaining price level changes.

2.2.1.2.Endogenous Growth Theory

This new growth theory termed endogenous growth theory describes economic growth which is generated by factors within the production process such as economies of scale, increasing return or induced technological changes, as opposed to exogenous factors such as increase in population. When endogenous growth models are set within a monetary exchange framework of (Lucas, 1988), the inflation rate (tax) lowers both the return on all capital and growth rate.

According to (Gokal & Hanif, 2004) a rise in inflation reduces the marginal values today, last want of consumption equals marginal product of cost of last unit of work. This theory assumes technological progress as endogenous, it assumes that the marginal product of capital is constant.

Endogenous growth theory, as described by (Gillman, Harris, & Mátyás, 2002) emphasizes that economic growth primarily relies on the rate of return on capital. In this framework, factors within the production process drive growth. However, this crucial factor, the return on capital, can be adversely affected by variables like inflation. When inflation occurs, it tends to erode this return, resulting in a decrease in capital accumulation and a subsequent slowdown in overall economic growth.

Within the realm of endogenous growth economics, the general consensus is that the impact of inflation on growth is relatively modest. Elevated inflation rates can, however, lead to lower employment rates, as demonstrated by (Gomme, 1993) .Inflation tends to erode the marginal value of today's consumption, discouraging individuals from engaging in work. Consequently, this diminishes the marginal product of capital and hinders the accumulation of capital.

Conventional wisdom regarding inflation suggests that it should be maintained at moderate and stable levels to facilitate optimal economic growth. (Lucas, 1988) argues that low inflation enhances economic growth by making wages and prices more adaptable. (Tobin, 1965) suggests that inflation can have a positive long-term effect on growth, viewing capital and money as potential substitutes. In contrast, (Sidrauski, 1967) maintains that inflation, due to the concept of money neutrality, exerts no influence on growth.

(Stockman, 1981) introduces the "cash in advance model," which postulates that capital and money are complementary. His research identifies a lasting relationship between economic growth and inflation rates. Additionally, (Dornbusch & Frenkel, 1973) propose that the real effects of money usage hinge on its specific application. The interplay between inflation and the tax system can impact lending decisions, investment, and the cost of capital, potentially leading to a reduction in economic growth, as articulated by (Feldstein, 1982).

2.2.2. Interest Rate and Economic Growth Theories

2.2.2.1. Financial Repression Hypothesis

Financial repression" refers to a wide array of policies that allow a government to place its debt with financial institutions at relatively low interest rates. Financial repression refers to the notion that a set of government regulations, laws, and other non-market restrictions prevent the financial intermediaries of an economy from functioning at their full capacity. The policies that cause financial repression include interest rate ceilings, liquidity ratio requirements, high bank reserve requirements, capital controls, restrictions on market entry into the financial sector, credit ceilings or restrictions on directions of credit allocation, and government ownership or domination of banks. Economists have commonly argued that financial repression prevents the efficient allocation of capital and thereby impairs economic growth (McKinnon & Shaw, 1973).

Ronald McKinnon (1973) and Edward Shaw (1973) were the first to explicate the notion of financial repression. While theoretically an economy with an efficient financial system can achieve growth and development through efficient capital allocation, McKinnon and Shaw argue that historically, many countries, including developed ones but especially developing ones, have restricted competition in the financial sector with government interventions and regulations. According to their argument, a repressed financial sector discourages both saving and investment because the rates of return are lower than what could be obtained in a competitive market. In such a system, financial intermediaries do not function at their full capacity and fail to channel saving into investment efficiently, thereby impeding the development of the overall economic system.

2.2.2.2. Liquidity Preference Theory

The Liquidity Preference Theory, first introduced by British economist John Maynard Keynes in his seminal work "The General Theory of Employment, Interest, and Money" (1936), lays the foundation for comprehending the intricate relationship between interest rates and economic growth. This theory delves into the dynamics of money demand and its repercussions on interest rates. It revolves around several pivotal concepts. Firstly, Keynes portrays interest rates as the "price" of holding money, highlighting the trade-off between holding cash or non-interest-bearing assets and the foregone interest income. Secondly, he identifies three motives for holding money:

the transaction motive, which entails using money for day-to-day exchanges; the precautionary motive, where money serves as a financial safety net for unexpected expenses; and the speculative motive, under which money is held as a means to exploit anticipated interest rate fluctuations. The Liquidity Preference Theory underscores the influence of these motives on interest rates and, consequently, their impact on economic growth. It underscores how fluctuations in money demand, associated with these motives, can drive changes in interest rates, subsequently affecting investment and overall economic activity. The theory also underscores the importance of differentiating between nominal and real interest rates, as real interest rates account for inflation and offer a more precise measure of the actual cost of holding money. Moreover, it implies that effective monetary policy can be a tool for influencing interest rates, which, in turn, can be harnessed to stimulate economic growth, aligning with the Keynesian perspective on government intervention during economic downturns (Keynes, The general theory of employment, interest and money, 1936). Understanding these intricacies is of paramount importance for policymakers and economists when formulating monetary policies and assessing their implications for the broader economic landscape

2.2.3. Theories on Population growth and Economic growth Model

In the Solow-Swan growth model, a short-term production function is employed, wherein labor and capital are utilized as inputs for production. When one of these production inputs is held constant, an increase in the other input leads to a decline in input productivity. For instance, if we assume that labor is a fixed input, then an increase in capital in the production process results in diminishing returns in terms of output (Solow, 1956).

Within the Neo-classical growth model, technological advancement plays a pivotal role in the economy. Technological progress that enhances the productivity of both capital and labor postpones the onset of diminishing returns and accelerates the pace of economic growth. It's worth noting that this growth process doesn't necessitate high capital accumulation, in contrast to the Harod-Domar model. Under a given capital stock, higher technology leads to higher output (Solow, 1956). Solow, however, has acknowledged that assuming a constant general price level is somewhat unnatural.

(Mundell, 1963) introduced a novel perspective within the Neo-classical framework to elucidate the link between economic growth and inflation. He highlighted that inflation or inflation expectations could erode wealth, distinct from the traditional notion of excessive commodity demand impacting growth. Mundell's insights revealed that rising inflation or inflation expectations could diminish wealth, leading individuals to increase their savings by investing in assets, which, in turn, reduces prevailing interest rates and fosters economic growth.

Expanding upon Mundell's ideas, (Tobin, 1965) introduced the concept of money serving as a store of value, functioning as a financial capital asset. This perspective encourages economic actors to invest their money in capital instead of hoarding cash reserves, thus increasing capital intensity and promoting economic expansion.

Stockman's 1981 neo-classical model predicts that when inflation rises, output stabilizes at a lower level, and people's welfare decreases. Money is considered complementary to capital in Stockman's model, explaining the conflict between the steady-state level of output and the inflation rate. In Stockman's depiction, a cash-in-advance restriction on both consumption and capital purchases results in reduced purchases of cash goods and capital when the inflation rate rises, thereby decreasing the steady-state level of output in response to inflation.

A review of neo-classical theory, as discussed by (Sidrauski, 1967), integrates monetary factors with the neoclassical growth model, assuming money neutrality. Sidrauski suggests that an increase in inflation may have varied effects on output: it could increase output (Tobin effect), decrease it (Stockman effect), or have no impact on the output growth rate (Mundell, 1963) and (Tobin, 1965), building on the neoclassical growth theory, explain the effect of inflation on economic growth. They argue that an increase in nominal interest rates due to inflation encourages investment over consumption, leading to capital accumulation and stimulating economic growth.

In summary, according to (Mundell, 1963) and (Tobin, 1965), there is a positive relationship between inflation and capital accumulation, which implies a positive impact on economic growth. The Mundell-Tobin effect suggests that, as money and capital can be used interchangeably, an increase in inflation reduces the purchasing power of money balances, leading to resource

substitution and an allocation shift from money to real assets in portfolios. Consequently, the rate of economic growth is accelerated (De Gregorio, 1992); (Boyd, Choi, & Smith, 1996).

Higher population growth (n) means that the labor force (L) is increasing at a faster rate. This can lead to an increase in output (Y) in the short run due to a larger labor force. However, in the long run, the impact of population growth on economic growth is not as straightforward. The model suggests that while population growth can contribute to an initial increase in output, it does not lead to sustained economic growth on its own.

This is because, in the long run, the economy tends to reach a steady state where the per-worker production function ($y = f(k)$) determines the growth rate of output per worker. Population growth does not affect this steady-state level of output per worker.

2.2.4. Balassa- Samuelson Hypothesis

The Balassa-Samuelson Hypothesis, inspired by the research of Balassa and Samuelson in 1964, provides a theoretical framework to explain the long-term patterns of real exchange rates (RER). According to (García Solanes & Torrejón-Flores, 2009), this hypothesis is founded on the idea of a positive connection between relative economic growth and the real exchange rate. Consequently, it suggests that rapidly advancing economies tend to experience real exchange rate appreciations, in contrast to slower-growing nations. The theory contradicts the widely held belief that currency depreciation is conducive to economic growth. The hypothesis has been extensively tested empirically and has been found applicable in certain countries, such as Japan and Korea.

The theory is based on several key assumptions, including the existence of two sectors within the economy producing tradable and non-tradable goods, an equivalence in production functions, world market determination of tradable goods prices and interest rates, adherence to Purchasing Power Parity in the tradable sector, and labor mobility within the country but limited mobility across borders. Additionally, wage developments initially occur in the tradable sector and then extend to the non-tradable sector, leading to wage equalization across sectors.

The primary determinant of real exchange rates is the productivity gap between the tradable and non-tradable sectors (MacDonald, 2000). Since improvements in tradable sector productivity are

typically associated with economic growth, the hypothesis posits a correlation between relative economic development and the real exchange rate (García Solanes & Torrejón-Flores, 2009). Consequently, it is expected that fast-growing countries will tend to witness real exchange rate appreciations compared to slower-growing economies, challenging the notion that rapid economic growth corresponds to depreciated currencies.

2.2.5. Theories of Inflation

Inflation is defined by the following theories:

2.2.5.1. The Demand-pull theory

Economists, central banks, and governments face a challenging task when attempting to formulate effective strategies for managing or lowering inflation rates. The concept of demand-pull inflation aligns with what can be referred to as the conventional explanation for inflation. Essentially, this theory suggests that inflation arises from an overabundance of demand, where people are spending more than what is readily available in terms of goods and services at their current prices. According to classical economists, the primary determinant is the money supply, as indicated by the quantity theory of money, which asserts that only an expansion in the money supply can elevate the overall price level.

As a result of this surplus in demand, prices will increase, leading to the emergence of excess demand inflation, commonly known as demand-pull inflation. Nevertheless, demand-pull inflation can also occur without a direct expansion of the money supply when factors such as an increase in Marginal Efficiency of Capital (MEC) or Marginal Propensity to Consume (MPC) drive up expenditures, subsequently causing price hikes. Given that inflation stems from an overabundance of demand, it is generally believed to be manageable through the implementation of demand-restricting monetary and fiscal policies (Selden, 1959).

2.2.5.2. Cost-push theory

Cost-push inflation occurs when disruptions in the supply of goods and services cause prices to increase. In situations where the supply is reduced, but the demand either stays the same or rises, companies respond by raising their prices, leading to inflation. Cost-push inflation can happen

even if demand remains steady or increases as prices climb. If, however, demand for these goods or services decreases in response to higher prices, inflation remains in check. Cost-push inflation is relatively uncommon, except for essential goods and services. To witness cost-push inflation, the demand for the affected product must remain constant while production costs are changing. To offset the increased production expenses, producers increase prices for consumers to maintain their profit margins while aligning with the expected demand (Homburg C. , 2017).

2.2.6. Drivers of Inflation

2.2.6.1. Interest Rate

Interest rates play a pivotal role in shaping economic conditions, particularly in relation to inflation and economic growth. The theoretical underpinning of the relationship between interest rates and inflation primarily draws upon the Quantity Theory of Money. According to this theory, the quantity of money in circulation exerts a direct influence on the general price level. When interest rates are on the rise, individuals and investors tend to allocate more of their wealth into interest-bearing assets, such as bonds and savings accounts. This shift in investment preferences results in a decrease in the money supply available in the broader economy, thereby exerting downward pressure on inflation.

The impact of interest rates on inflation is thus two-fold. First, the increased preference for interest-bearing assets reduces the money in circulation, curbing the overall demand for goods and services. This diminished demand subsequently exerts downward pressure on prices, which, in turn, contributes to lower inflation rates. Second, the potential dampening effect of interest rates on inflation aligns with their role as a tool for inflation control. Central banks often employ interest rate adjustments to maintain price stability by restraining inflationary pressures.

However, while higher interest rates have a potential to control inflation, they also possess the capacity to influence economic growth. Increased borrowing costs for businesses and consumers can lead to a reduction in investments and consumption, ultimately slowing down economic activity. Businesses may postpone investment projects due to the increased cost of borrowing, and consumers may reduce their spending, given the higher costs of financing loans. Consequently, the impact of interest rates on economic growth needs to be carefully managed. Striking the right

balance between using interest rates to control inflation and maintaining conducive conditions for economic growth is a complex and critical task for monetary policymakers (Taylor, 2000).

In summary, the interplay between interest rates, inflation, and economic growth is a multifaceted process rooted in economic theory. The Quantity Theory of Money provides a foundational understanding of how interest rates influence inflation by altering the quantity of money in circulation. Higher interest rates tend to reduce inflation through diminished demand for goods and services. However, this reduction in inflation may come at the cost of economic growth, as higher interest rates can deter investments and consumption. Finding the appropriate balance between these two objectives is a key challenge faced by policymakers when implementing monetary policy in East African countries and across the world.

2.2.6.2. Population growth Rate

Population growth is a significant driver of economic dynamics, with implications for both inflation and economic growth. The theoretical underpinning of the relationship between population growth and inflation is largely based on demand-side economics, which posits that more people can lead to higher consumer demand, potentially driving up prices. While the Quantity Theory of Money provides a framework for understanding the general relationship between the money supply and inflation, the transmission mechanism in this context differs. In the case of population growth, the increase in the number of people translates to more individuals demanding goods and services.

The impact of population growth on inflation is contingent on several factors, and it is not a straightforward linear relationship. Rapid population growth can exert upward pressure on inflation if it outpaces the economy's ability to produce an adequate supply of goods and services to meet the increased demand. However, this impact is moderated by the productive capacity of the economy. If the economy is flexible and can adjust to increased demand by expanding production, it is less likely to experience inflationary pressures.

The impact of population growth on economic growth is a subject of significant interest in economic theory and policy. According (Solow, 1956), a well-known neoclassical growth model,

an expanded labor force resulting from population growth can lead to higher economic output. However, the quality of this population growth is crucial. It is not merely the quantity of people but also their human capital, health, and job opportunities that matter. For population growth to be a positive driver of economic growth, it must be accompanied by productive investments, job creation, and human capital development. This notion is supported by the work of economists (Barro & Becker, 1989), who emphasized that the educational and health levels of a population play a critical role in economic development.

To illustrate, if population growth is associated with increased access to education and healthcare, it can lead to a more skilled and healthy workforce, which is better equipped to contribute to economic growth. In contrast, if population growth outstrips the capacity of the economy to create jobs and provide essential services, it can strain resources and potentially lead to lower economic growth. Hence, the quality of population growth, along with the capacity of the economy to absorb and utilize the increased labor force, is pivotal in determining the impact on economic growth.

Population growth has effects on both inflation and economic growth. The theoretical underpinning is rooted in demand-side economics, where an increase in population leads to higher consumer demand, potentially affecting inflation. The impact on inflation is contingent on factors such as the productive capacity of the economy. Furthermore, population growth can positively impact economic growth by expanding the labor force, but the quality of this growth, including factors like education, health, and job opportunities, is critical for determining the overall impact. Becker and Barro's work highlights the significance of these aspects in understanding the relationship between population growth, inflation, and economic growth (Barro & Becker, 1989).

2.2.6.3. Foreign Direct Investment

Foreign Direct Investment (FDI) is a critical driver of economic development, and its impact on inflation and economic growth is subject to various theoretical perspectives.

FDI's impact on inflation is theoretically grounded in demand and supply-side effects. Firstly, FDI can contribute to increased overall demand for goods and services in the recipient country, potentially leading to inflation if the domestic supply cannot keep pace with the heightened

demand. As more capital flows into the country, it boosts economic activity, stimulating consumer spending and investment. This demand-driven effect can exert upward pressure on prices.

On the other hand, FDI can lead to the introduction of new technologies, improved production processes, and increased productivity in the host country. This productivity-driven effect can have a deflationary impact on prices. As businesses become more efficient and cost-effective, they can lower the prices of their goods and services, thereby reducing inflationary pressures (Carkovic & Levine, 2015).

The impact of FDI on inflation is context-dependent and influenced by several factors. The extent to which FDI affects inflation depends on the absorptive capacity of the recipient economy. If the host country has the capacity to absorb increased demand by expanding production and improving resource allocation efficiently, it may mitigate inflationary pressures. Additionally, the sectors targeted by FDI play a significant role in determining the inflationary impact. Investments in sectors with inelastic supply, such as housing or specialized manufacturing, may have a more pronounced impact on inflation. Conversely, investments in competitive industries with sufficient capacity to respond to increased demand may have a lesser impact (Kurtishi-Kastrati, 2013).

The impact of FDI on inflation is also contingent on the extent to which FDI leads to increased production and competition. If FDI fosters competition and enhances the supply side of the economy, it is more likely to mitigate inflationary pressures. When FDI results in productivity improvements, it can increase the production of goods and services, preventing prices from rising excessively (Iwasaki & Tokunaga, 2019).

FDI is often perceived as a key driver of economic growth. This view is supported by the Endogenous Growth Theory, which highlights that FDI can contribute to technological progress and increased productivity, key factors for long-term economic growth. Technological advancements introduced by foreign investors can enhance a country's economic capabilities, making it more competitive on the global stage. This leads to increased production, job creation, and economic expansion (Kisswani & Kein, 2020).

Furthermore, FDI can create jobs, stimulate economic activity, and lead to increased exports. As foreign investors establish or expand operations in the host country, they often hire local workers and engage in trade. This, in turn, has a positive impact on income, employment, and export revenues, contributing to overall economic growth (Borensztein, Gregorio, & Lee, 1998).

FDI's impact on inflation and economic growth is shaped by the interplay of demand-side and supply-side effects. The context-specific nature of these effects necessitates a careful analysis of the recipient economy's absorptive capacity, the sectors targeted by FDI, and the potential for productivity gains. When managed effectively, FDI can serve as a powerful driver of economic growth by stimulating technological progress, productivity improvements, and job creation. It can also have a nuanced impact on inflation, which depends on various factors including the local supply capacity and the competitive landscape within the recipient country.

2.2.6.4. Money Base

The money base, or monetary base, represents the total amount of a country's currency in circulation along with the reserves held by its central bank. The relationship between the money base and inflation is anchored in fundamental monetary theory, primarily the Quantity Theory of Money. This theory posits that changes in the money base directly affect the price level in the economy. When the money base expands without a corresponding increase in the demand for money or in economic output, it can result in inflation.

An expansion of the money base can lead to inflation when it surpasses the economy's capacity to produce an adequate supply of goods and services to meet the increased demand. If there is more money circulating in the economy than it can effectively absorb, it can lead to a general increase in prices. The inflationary impact of an increased money base is, however, contingent on various factors.

The velocity of money, which represents the speed at which money circulates in the economy, plays a crucial role. If the velocity of money is low, an increase in the money base may not immediately lead to increased spending and demand, mitigating the inflationary pressure. Moreover, the overall health of the economy, including its productive capacity and the efficiency

of resource allocation, can influence the impact of changes in the money base on inflation. In a robust and efficient economy, an expansion of the money base may have a lesser impact on inflation compared to an economy with structural inefficiencies (Gedeon, 2009).

The impact of changes in the money base on economic growth is multifaceted and depends on various factors, including the overall economic conditions and the effectiveness of monetary policy. An excessive and uncontrolled expansion of the money base can lead to economic instability, uncertainty, and distortions. Misallocation of resources can occur as the value of money erodes due to high inflation, potentially discouraging productive investments and economic growth.

In the context of East African countries, where economic conditions and policy environments may vary, the relationship between changes in the money base, inflation, and economic growth is subject to unique dynamics. Careful analysis of these variables, the specific economic conditions, and the effectiveness of monetary policy is crucial to understand how changes in the money base can impact inflation and economic growth. The work of scholars like Arestis and Caner (2010) underscores the importance of considering these multifaceted relationships within the local context when formulating monetary policies and economic strategies (Arestis & Caner, 2010).

2.3.Empirical Literature Review

In his 1993 study titled "The Role of a Macroeconomic Factor in Growth," Fisher explored the connection between inflation and economic growth. He analyzed data from 93 countries, focusing on various macroeconomic indicators, including inflation. Fisher used a straightforward regression approach to investigate this relationship. His research revealed that inflation affects economic growth negatively. This impact occurs by reducing investment and diminishing the rate of productivity growth. Fisher also argued that inflation distorts price mechanisms, leading to inefficiencies in resource allocation, which, in turn, negatively affects economic growth.

The study (Sumon & Miyan, 2017) explored the 30-year period of Bangladesh's history to identify whether inflation was linked with economic growth in this country. Their findings based on the Johansen co-integration test and the two-step Engle-Granger test indicated a significant positive

relationship between these two variables. However, these correlations were primarily visible in the long-term perspective such as approximated figures based on five-year periods. It should also be noted that the analysed country had two-digit inflation rates multiple times throughout the analysed decades, which characterizes its economy as a relatively unstable one. Another piece of evidence about developing states was provided by (Ahmad, 2022) who investigated the relationship between inflation and economic growth in Pakistan. According to their findings, the first variable had an adverse long-term effect on the second one if its prominence reached two-digit values. However, moderate levels of stable inflation boosted trade and facilitated economic growth due to the positive effects on the agriculture sectors and other industries.

In Ethiopia, (Teamrat, (2017) the objective of his study was to examine the main factors of inflation using data for the period from 1975 to 2014. The study employed the ordinary least square method to test for the existence of a short-run and long-run relationship between inflation and its determinant variables. The co-integrating regression considers only the long-run property of the model and does not deal with the short-run dynamics explicitly. For this, the error correction from the long-run determinants of inflation is then used as a dynamic model to estimate the short-run determinants of inflation. The exceptional empirical result of this study is that the GDP significantly and positively affects the inflation rate in both the short and long run. The explanatory variables accounted for 98% of the variation of inflation during the study period. This study suggests that broad money supply is to be controlled and gross national saving is to be encouraged to reduce inflation in the country.

(Mallik & Chowdhury, 2001) conducted a study spanning various periods for countries such as India, Bangladesh, Sri Lanka, and Pakistan. Their findings revealed a significant and positive connection between economic growth and inflation across these nations. Interestingly, the sensitivity of growth to changes in inflation was found to be less pronounced than the sensitivity of inflation to changes in economic growth. These results highlight the potential for inflation to drive economic growth under certain conditions while acknowledging that the relationship is not linear.

In the Sri Lankan context, (Ahamed & Seeni, 2017) used the Auto Regressive Distributed Lag framework to estimate the impact of inflation on economic growth. According to their findings, these two variables were negatively correlated. At a practical level, a 1% increase in inflation decreased GDP figures by $3,427.94 million in the short-term perspective with the adverse long-term effect amounting to $107,263.8 million. These considerations further implied that national rates had to be closely monitored with appropriate micro- and macro-economic policies being promptly introduced to prevent these negative outcomes.

2.4. Review of related Literature in EAC

(Wilson & Muthoga, 2023) investigated the impact of interest rates on the economic growth of Kenya, focusing on lending interest rates and central bank rates over a longitudinal period from 2001 to 2020, with data obtained from central bank financial reports. The study revealed that commercial banks consistently had higher lending interest rates compared to central bank rates over the research period. Lending interest rates showed a positive but statistically insignificant relationship with GDP, while central bank rates had a positive and statistically significant correlation with GDP. In a combined model, the study confirmed that interest rates do significantly impact economic growth in Kenya, with central bank rates playing a more substantial role in this effect.

Secondary evidence from (George, (2022), examines the relationship between inflation and economic growth in Kenya from an analytical and empirical standpoint. The paper applies the autoregressive distributed lag (ARDL) bounds testing approach and the multivariate Granger-causality test using time series data covering 1970-2019. Structural breaks in the time series were also conducted using the Perron (1997) (PPURoot) and Zivot-Andrews (1992) (ZAU Root) techniques. Incorporating structural breaks into time series increases statistical inference's overall validity. Inflation and economic growth in Kenya were found to have structural breaks in 1995 and 1991. These years are marked by Kenya's economic, financial, public sector and institutional reforms. The other findings of the study revealed that inflation has a statistically significant negative influence on long-term economic growth. The multivariate Granger-causality results showed a distinct short-run unidirectional causality from economic growth to inflation in Kenya.

In order to ease the negative effects of inflation and the impact of the coronavirus on the economy and the well-being of the people, the research suggests that the Kenyan government should adopt wise and cautious measures in its monetary, financial, and fiscal policies.

A study conducted by (Nkikabahizi, Ndagijimana, & Musabanganji, 2017) investigated the connection between inflation and economic growth, focusing on the period from 2000 to 2015. Utilizing data on the Consumer Price Index and GDP, the research revealed a short-term negative relationship between inflation and economic growth. The findings indicated that inflation had an adverse impact on economic growth in Rwanda, particularly during the specified time frame. The research also determined an inelastic responsiveness of -0.7 in GDP to fluctuations in inflation.

(Sibanda, Ncwadi, & Mlambo, 2013), conducted a study examining the impact of real exchange rates on economic growth in South Africa. Using the Johansen cointegration and vector error correction model, the study considered various factors, including real exchange rates, real interest rates, money supply, trade openness, and gross fixed capital formation. The study's key findings revealed significant insights regarding the relationship between real exchange rates and economic growth in South Africa. It was observed that real exchange rates, gross fixed capital formation, and real interest rates had a positive and beneficial impact on the nation's long-term economic growth. Conversely, money supply and trade openness were found to exert a negative influence on long-term economic growth. Notably, the study also highlighted the dual nature of currency undervaluation: while it had a significantly positive effect on short-term economic growth, it acted as a hindrance to sustained long-term growth. Consequently, the strategy of deliberately depreciating exchange rates to stimulate economic growth was effective in the short term but proved unsustainable over extended periods. These findings provide valuable insights for policymakers and stakeholders in South Africa, emphasizing the importance of carefully managing exchange rates and considering the long-term implications of economic strategies

(Loiboo, Luvanda, & Osoro, 2021) explore the relationship between population growth and economic growth in Tanzania, a topic that has sparked debate globally. The research employed the Vector Auto-regression (VAR) estimation technique, utilizing annual time series data spanning from 1971 to 2017. The findings revealed a complex relationship, with both positive and negative

economic shocks attributed to population growth, potentially influenced by government spending on healthcare and child survival programs. The study ultimately concluded that in Tanzania, population growth tends to stimulate economic growth and development. As a recommendation, it suggests that the government should focus on ensuring that economic growth outpaces population growth to meet the rising demand for services and employment for a large, healthier, and better-educated workforce.

(Issa, 2017), investigated the connection between Foreign Direct Investment (FDI) and the economic growth of four member countries within the East African Community (Kenya, Rwanda, Uganda, and the United Republic of Tanzania) during the period from 1990 to 2015. They employed the Fully Modified Ordinary Least Square (FMOLS) technique and verifies the presence of panel cointegration to assess long-term coefficients. The results suggested that FDI has a favorable and statistically noteworthy influence on economic growth in the majority of East African nations, especially at a 10 % significance level. The study proposed that these countries should maintain open economic policies to attract more potential investors, especially in sectors that can promote economic growth and contribute to achieving their developmental objectives.

In another analysis found in the BNR Economic Review vol_13, it was revealed that the threshold level of inflation in Rwanda was 5.9%, which was lower than the EAC inflation ceiling of 8.0% and fell within the BNR inflation target. However, in the fiscal year of 2018/2019, inflation dropped significantly to 0.9%, which was far below the inflation target.

Considering these various studies conducted using different types of data and time periods, it becomes clear that there is a need for new research in EAC member states that takes into account how technology and innovation influence inflation and economic growth in East Africa. Investigate the impact of digitalization, technological advancements, and innovation on productivity, which can influence both inflation and growth., conducting sector-specific studies to understand how different sectors of the economy in East Africa respond to inflation drivers. Focusing on key sectors like agriculture, manufacturing, and services to identify potential variations in the impact of inflation on economic growth, investigate the relationship between financial inclusion, access to credit, and economic growth in the context of inflation. This updated

research can provide valuable insights into how changes in inflation affect economic growth and can help policymakers develop effective strategies to maintain stable prices and promote production. Additionally, this study can assist authorities in evaluating how the GDP growth rate responds to fluctuations in the general price level.

2.5. Conceptual framework

A conceptual framework is a useful analytical tool utilized in various contexts and formats. Its purpose is to differentiate between concepts and structure ideas. Effective conceptual frameworks encapsulate real elements in a straightforward and practical way. This section outlines the independent variables, dependent variables, and intervening factors in the study.

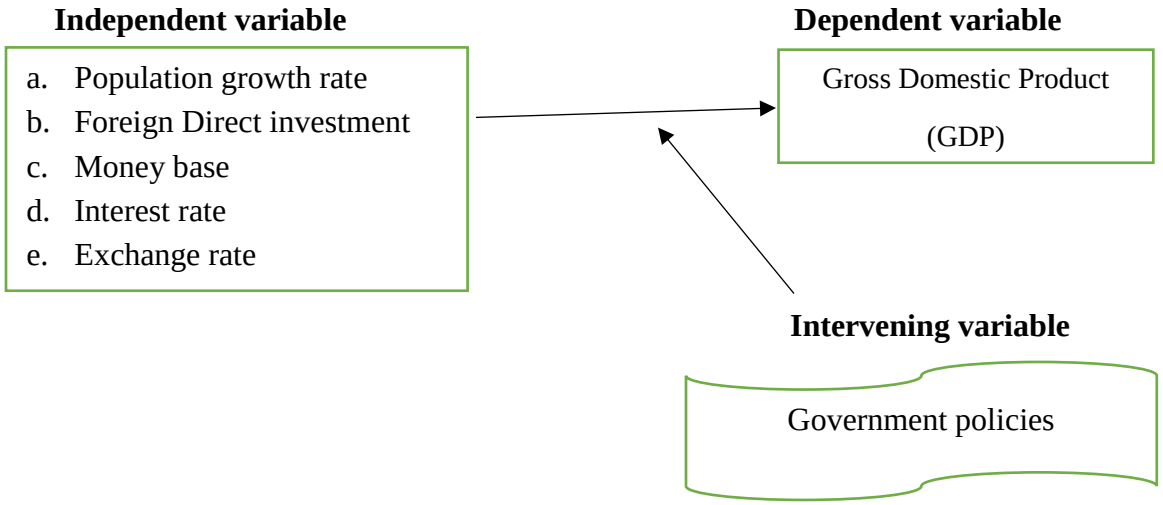

Figure 1: Conceptual Framework

Figure 1 above shows independent variables such as inflation and factors influencing that variable, which are interest rate, Foreign Direct Investment, money base and population growth rate. Dependent variable such as Gross Domestic Product. There are also intervened by Government policies, that ensure price stability and other monetary policy objectives like economic stability through conducting price-based monetary policy, which uses interest rate as an operating target to control the amount of money in the economy and influence other macroeconomic activity

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Research Design

(Leavy, (2022), defined Research design, often described as the backbone of a research endeavor, functions as the cohesive element that binds all components of a research project. In essence, it serves as a blueprint for the intended research work. Social scientists define research design in various ways; for instance, Jahoda, Deutch, and Cook offer different definitions of it "A research design is the arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy and procedure".

To satisfy the objectives of the study, the researcher used quantitative research design. Quantitative research entails the gathering and analyzing numerical data, enabling the identification of patterns, calculation of averages, testing of causal relationships, making predictions, and extending findings to broader populations. (Blau & Schwartz, 2018). Economic Growth was used as a dependent variable, and inflation, FDI, population growth rate and interest rate. Various statistical methods were employed to summarize and display the data, followed by the utilization of the OLS econometric approach to establish a clear cause-effect relationship between inflation and its drivers, thus enabling us to make more accurate forecasts of future trends.

3.2. Source of data

The research utilized secondary data collection. Secondary data refer to information that has been previously collected from primary sources and is readily accessible for researchers to employ in their studies. These secondary data cannot be traced back to the level of individual cases of statistical units. These secondary data included the information on Gross domestic product and those on each driver of inflation. These data were obtained from the websites of the World Bank. The dataset spans the period from 2000 to 2022. Past research studies, literature, libraries, and articles were used as valuable sources for gaining insights into the issues. The researcher thoroughly examined journals from online newspapers, archives, and other relevant media sources to gain a deeper understanding of the studied variables.

3.3. Methods of Data Analysis

This study used both descriptive and econometric analysis in the analysis. The descriptive statistics shows the current and variability of the variables in the four (4) countries. STATA software version 16 and EVIEWS 10 were used in the analysis of the panel data. An Ordinary Least Square (OLS) was used to determine the relationship between the variables.

3.3.1. Descriptive statistics

Descriptive statistics refer to concise summary measures used to depict a dataset, whether it represents the entire population or just a sample from it. This approach focuses on numerical data presented in tables or graphs and encompasses the techniques for analyzing such data. Descriptive statistics encompass measures of central tendency such as the mean, mode, and median, along with measures of variability like the standard deviation, minimum, maximum values, kurtosis, and skewness. Analyzing data descriptively is essential because it aids in assessing the distribution's normality (Adam, 2022).

3.3.2. Normality test

Normality test is often the first step in analyzing data. The normality test is employed to assess whether a dataset can be accurately represented by a normal distribution and to calculate the likelihood of the random variable behind the dataset conforming to a normal distribution (Vaclavik & Sikorova, 2019). One of the most famous tests for normality of regression residuals is the test of Jarque-Bera. (Samunderu & Murahwa , 2021) the Jarque-Bera test is described as an evaluation of how well sample data's skewness and kurtosis align with a normal distribution. The test statistic used in the Jarque-Bera test is consistently a positive value, and if it significantly differs from zero, it implies that the sample does not have a normal distribution. A hypothesis test formally tests if the population represented by the sample is normally distributed. The null hypothesis states that the population follows a normal distribution, while the alternative hypothesis suggests that it not normally distributed. Prism employs the conventional threshold of 0.05 to determine if the data has passed the normality test. When the P value exceeds 0.05, the response is affirmative, whereas when the P value is less than or equal to 0.05, the response is negative

3.3.3. Stationary test

Stationarity holds significant importance as it forms the foundation for various invaluable analytical tools, statistical tests, and models, upon which they rely. Stationarity implies that the statistical characteristics of a time series, or the process responsible for creating it, remain constant over time. A time series is considered stationary when its statistical attributes, such as mean, variance, and covariance, remain consistent over time, or when these properties are not time-dependent. Unit root tests assess whether a time series variable is non-stationary and possesses a unit root. The null hypothesis typically assumes the existence of a unit root, and the alternative hypothesis can encompass stationarity, trend stationarity, or explosive root, depending on the specific test applied. The Dickey-Fuller test is designed to evaluate whether a unit root exists in an autoregressive time series model, serving as the null hypothesis for this assessment (Perron, 1990). The Augmented Dickey-Fuller test (ADF Test) is a widely employed statistical examination to determine the stationarity of a specific time series. It assesses the null hypothesis, which states that the presence of a unit root in the time series sample. A more negative ADF test statistic implies a more robust rejection of the unit root hypothesis at a certain confidence level. Testing for stationarity is crucial because it can significantly influence the validity of regression result (Saleem & Sial, 2015).

3.3.4. Heteroskedasticity

Heteroskedasticity, also known as heteroscedasticity, means "differing dispersion." In the context of regression analysis, it signifies that the error variance (σ^2) is not constant for all values of the independent variable(s). In simpler terms, it indicates that the spread or dispersion of the error terms varies as the independent variable(s) change. When the error variance is not consistent, it can lead to challenges in the statistical analysis of the regression model. This is significant because it violates a fundamental assumption of classical linear regression, potentially affecting the reliability and validity of statistical inferences drawn from the model (Gujarati & Porter, 2009).

3.4. Description of Variables and Specification of Model

This part describes the variables used in this study and specifies the model built.

3.4.1. Description of Response variable

The Response variable is the expected effect, and it responds to other variables. In this study, the response variable normally known as dependent variable is Gross Domestic Product. In 1990, Pakistani economist Mahbub ul Haq created GDP which was further used to measure the country's growth by the United Nations Development Program (UNDP). As this study emphasizes on analysis of inflation drivers on economic growth in the East African Community countries using a fixed effects panel model, GDP was used to measure the economic growth.

3.4.2. Description of explanatory variables

The explanatory variables are the expected cause, and they explain the results.

Table 1: Expected Signs

Variable	**Description**	**Measurement Unit**	**Expected sign**
INTR	Interest rate	Ratio	**+/-**
EXR	Exchange rate	Ratio	**+/-**
POPGR	Population Growth Rate	Ratio	**+/-**
FDI	Foreign Direct Investment	Ratio	**+/-**
GDP	Gross Domestic Product	Ratio	**+/-**
M3	Money base	Ratio	**+/-**

3.4.3. Econometrics Model specification

This study builds an econometric model named multiple regression model, using panel data which will help in providing a better understanding of how each determinant affects economic growth measured by GDP (Gross Domestic Product) depending on their coefficients.

$Y_{it}=\beta_0+\beta_{it}x_{it}+\beta_{2it}x_{it}+...+\beta_{pit}x_{pit}+\mu_{it}$ (Flores-Sosa & *Et al,* 2022)

Where, for *i=n* observations**:**

yi=dependent variable

xi=explanatory variables

β0=y-intercept (constant term)

βp=slope coefficients for each explanatory variable

μ=the model's error term (also known as the residuals.

The specified multiple regression model is:

$$Y_{it} = \beta_0 + \beta_{1it}INTR_{it} + \beta_{2it}M3_{it} + \beta_{3it}PGR_{it} + \beta_{4it}\,FDI_{it} + \beta_{5it}\,EXR_{it} + \mu_{it}$$

Where

GDP= real GDP rate

INTR= interest rate

FDI= Foreign Direct Investment

EXR= Exchange rate

PGR= Population growth rate

M3= Money Base

Where INTR, FDI, PGR, EXR and M3 are the independent variables and are drivers of inflation.

Yt stands for GDP (Gross Domestic Product) which is the measure of economic growth.

Mt (μ) denotes the error term, which stands for other external drivers of inflation.

3.5. Definitions of Key Concepts

This section describes the key concepts of the study such as Gross Domestic Product, inflation, inflation rate, money base, population growth rate, Foreign direct investment and interest rate.

3.5.1. Inflation rate

Inflation is the increase in prices, resulting in a decrease in your ability to buy things over time. The pace at which your purchasing power diminishes can be observed in the average price hike of a collection of chosen products and services during a specific period (Mehmeti & Deda, 2022).

Inflation typically occurs from an increase in the money supply, although it can manifest through various channels within the economy. A nation's monetary authorities can boost the money supply through methods like printing and distributing additional currency to the public, legally decreasing the value of the official currency, or creating new money by providing reserve account credits through the banking system when they purchase government bonds from banks on the secondary market (a commonly used approach). In each of these scenarios, the currency ultimately loses its buying power. The ways in which this leads to inflation can be categorized into three main types: demand-pull inflation, cost-push inflation, and built-in inflation (Rockoff, 2020).

3.5.2. Interest Rate

The interest rate is a percentage of the loaned amount that a lender charges to a borrower. This rate is usually expressed annually and is commonly referred to as the annual percentage rate (APR) for loans. Furthermore, an interest rate can also pertain to the money earned in a savings account or a certificate of deposit (CD) at a bank or credit union. The annual percentage yield (APY) represents the interest earned on these deposit accounts (Khan & Sattar, 2016).

3.5.3. Money Base

The monetary base represents the total sum of a currency that is either in public circulation or kept in reserve. Money in circulation includes currency held and used by the general public, while

reserves encompass deposits held by commercial banks and any money kept in reserves at the central bank by these institutions (Ábel & Lehmann, 2016).

3.5.4. Population Growth Rate

Population growth rate is the percentage increase or decrease in a population over a specified period, usually expressed on an annual basis. To illustrate, annual population growth pertains to the increase in population within a single year, bi-annual measures growth occurring twice a year, and five-yearly takes into account growth happening every five years (Caswell, 2020).

3.5.5. Gross Domestic Product (GDP)

Gross domestic product (GDP) represents the total monetary worth of all the completed goods and services generated within a nation's boundaries during a specific period. As a broad measure of a country's overall production, it acts as a comprehensive assessment of that nation's economic well-being. While GDP is usually computed on an annual basis, it is also occasionally calculated every quarterly (Emehelu, 2021).

The GDP includes all private and public consumption, government expenditures, investments, additional private inventories, and foreign (balance of trade). There are different types of measurements: Nominal GDP, Real GDP, GDP Growth, and GDP per Capita. Real GDP is the measurement of the raw data, Real GDP takes into account the impact of inflation and allows comparison over some time, GDP growth rate is the increase in GDP from quarter to quarter, and GDP per capita measures the GDP per person in a country, it is a useful way to compare GDP data between various countries. It is composed of four components which are consumption, Government, Investment, and net Export (Smith, 2023).

3.5.5. Foreign Direct Investment

As per the definitions provided by the IMF and OECD, Foreign Direct Investment (FDI) is an investment made with the intention of acquiring a long-term stake in a business situated in a different economy. In this scenario, the investor, typically a resident of one economy, holds at least 10% ownership in the foreign enterprise, which is the entity in which the investment is made

(Masuku & Dlamini, 2009). Distinguishing Foreign Direct Investment (FDI) from foreign portfolio investment is the utilization of the invested capital within the host country. FDI entails foreign investors either putting their money into an existing company or creating a new company, such as a factory or branch, within the host country.

3.5.6. Exchange Rate

An exchange rate is a rate at which one currency will be exchanged for another currency and affects trade and the movement of money between countries (Bodnar & Gentry, 1993)

The exchange rate between two currencies is commonly determined by the economic activity, market interest rates, gross domestic product, and unemployment rate in each of the countries. Commonly called market exchange rates, they are set in the global financial marketplace, where banks and other financial institutions trade currencies around the clock based on these factors. Changes in rates can occur hourly or daily with small changes or in large incremental shifts**.**

3.6. Panel data modelling

3.6.1. Fixed effect model and Random effect model

During panel data analysis, the fixed-effect model is employed to account for the correlation between individual-specific effects and the independent variable, whereas the random-effect model is utilized to make population data inferences under the assumption of a normal distribution. In a fixed-effect model, the regression model's intercept can vary independently across individuals or groups, and it is frequently used in panel data analysis to control for individual-specific characteristics that remain constant over time. Random effect is a statistical model where the model parameters are random variables and are used in panel analysis of panel data when assuming no fixed effects (Bell & Fairbrother, 2019).

3.6.2. Hausman test

The Hausman test is a statistical tool in econometrics used to check the consistency of estimated coefficients in regression models, especially in panel data. It assesses whether coefficients from two different models, fixed effects and random effects, significantly differ. The null hypothesis is

that these coefficients are consistent. If the test rejects the null hypothesis, it indicates inconsistency between the models, guiding researchers to choose the more suitable one based on the data and research goals. The test calculates a statistic comparing coefficient differences to their standard errors, following a chi-squared distribution. A significant result suggests that the fixed effects model, which accounts for correlated individual-specific effects, is more appropriate (Hausman, 1978).

3.7. Correlation analysis

It is the analysis that is used to assess or identify the strength of the relationships between dependent and independent variables, it also helps to determine the existence and degree of statistical association as well as the potential for predicting one variable from another. This study helped to examine the strength of the relationship between variables and this was determined by establishing whether the correlation of any nature exists and examining the strength of the relationship if any. The high correlation points indicate a strong relationship between two variables while a low correlation means that the variables are weakly related (Gwelo, 2019).

3.8. Data analysis

Data from the World Bank website were organized in Microsoft Excel. Data were then analyzed using STATA and Eviews 10. They offer advanced data analysis, regression, and forecasting capabilities for Windows-based computers. With STATA, you can efficiently create statistical relationships from your data and utilize these relationships to predict future data values. The analysis involves panel regression analysis, finding correlation, normality test, and stationarity test.

During panel data analysis, the fixed effect model was used to assume that the country-specific effect is correlated to the independent variable. The fixed-effect model is a statistical regression approach that permits the regression model's intercept to vary independently among individuals or groups. This model is commonly used in panel data analysis to account for individual or country-specific characteristics that remain constant over time. (Bell & Fairbrother, 2019).

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1. Introduction

This chapter analysed data using STATA and Eviews 10 based on secondary data from the World Bank website. Different tests were considered to conclude the stated hypotheses. This Chapter also focused on the analysis of data using panel data analysis to achieve our objectives. Stationarity, Multicollinearity, Jarque-Bera and Normality tests were performed.

4.2. Data presentation

4.2.1. Trend of variables

To show the level of economic growth in Kenya, Rwanda, Tanzania and Uganda, line graphs were used to show the trend of the variable.

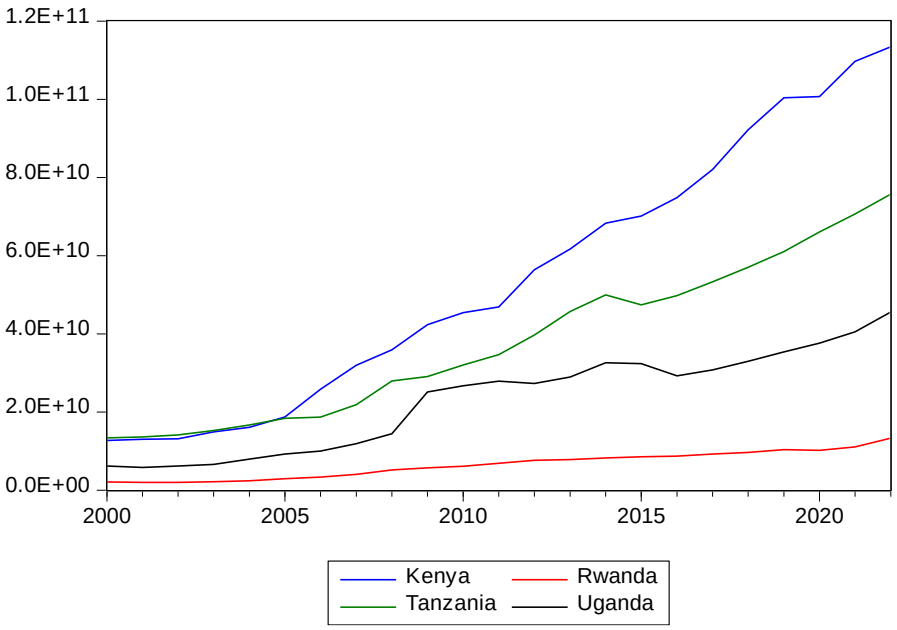

Figure 2: Level of economic growth in Kenya, Rwanda, Tanzania and Uganda

The above figure shows the overall growth of GDP from 2000 to 2022. GDP was very low from 2000 to 2015 due to poor infrastructure and low technology and from 2016 to 2022, it was vice versa due to the development of infrastructure and introduction of new technology, which boosted the economy and led to a very quick development compared with the previous years (Dickson &

Serge, 2012). In 2020, there was a fall in gross domestic production due to restrictions and lockdowns caused by the COVID-19 pandemic (Hemzawi & Umutoni, 2021). In Kenya, GDP gradually increased from 2002 to 2007 before significantly dropping in the subsequent years from 2008 to 2009 due to the negative effects of post-election violence. The economy resumed a recovery path which saw the real GDP rise in the years 2009 to 2011 before slightly declining again in 2012 due to uncertainties occasioned by the pending 2013 elections and transition into a new political regime.

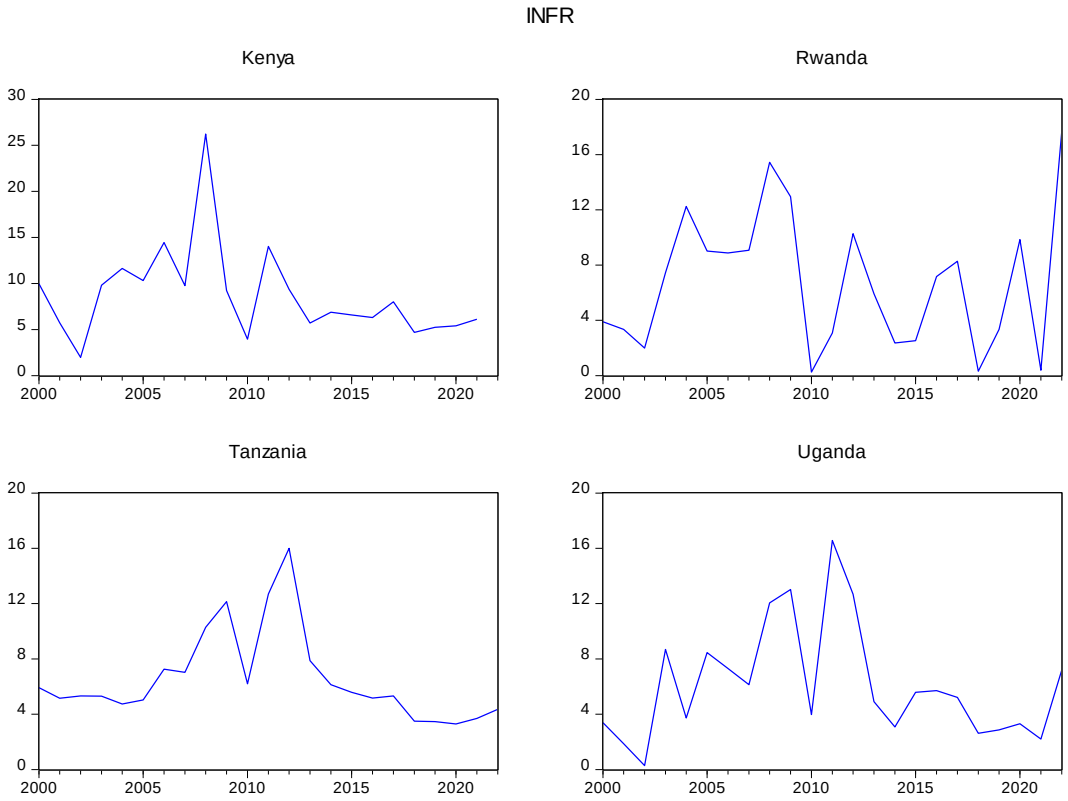

Figure 3: Level of Inflation in Kenya, Rwanda, Tanzania and Uganda

Figure 3 shows that there was a positive growth trend for Inflation from 2000 to 2020.

INFR graph illustrates that between 2000 and 2018, inflation displayed a dynamic pattern, marked by periodic fluctuations of both increase and decrease. As the same result of (Majumder, 2016) which states that, there is a positive relationship between inflation and economic growth in the long-run while (Kaller, 2015) states that, when inflation exceeds 4 percent, inflation will start to

significantly reduce the economic growth rate. The inflation rate for consumer prices in Rwanda moved over the past 55 years between -2.4% and 31.1%. In 2022, an inflation rate of 17.7% was calculated. The 12-month index change for non-food inflation increased to 16% in the year ended September 2011 from 10.2 percent registered in the year ended August 2011. It went up 23% between August and September 2011. The Rwanda's central bank, the Bank of Uganda, blames a combination of factors for the rise in prices.

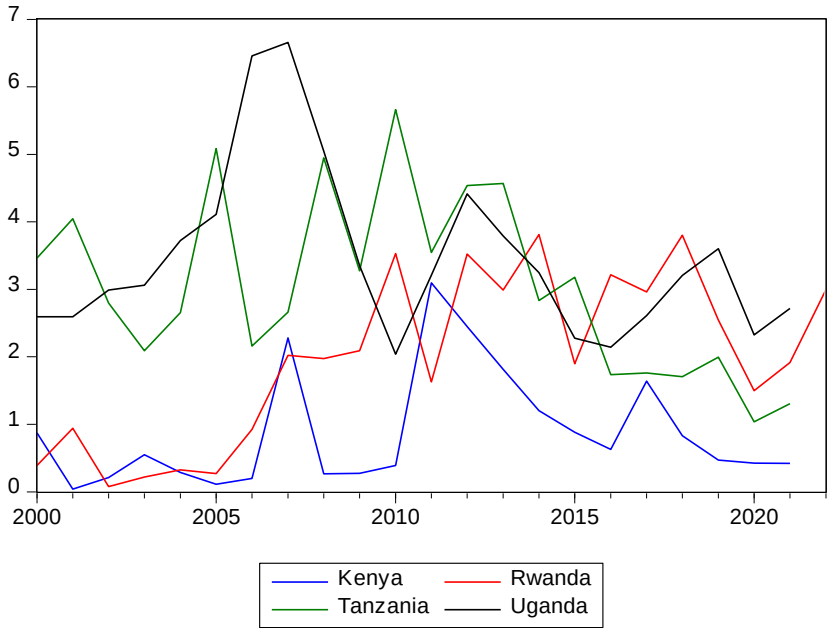

Figure 4: Trend of FDI in Rwanda, Kenya, Tanzania and Uganda's foreign direct investment from 2000 to 2022.

In 2020, the Rwanda Development Board (RDB) stated a total of $1.3 billion in new investment commitments. This represented a significant decrease of 48% compared to the previous year, 2019, and an even more substantial decline of 89% when compared to 2018. These dramatic reductions can be attributed to the stringent COVID-19 prevention measures in place during that year. The closure of Rwanda's borders, including the airport, and the strict restrictions on tourism activities played a pivotal role in deterring foreign investors. Due to effects of the COVID-19 pandemic, including the collapse of the tourism industry, Uganda's gross domestic product (GDP) grew by only 2.9% in fiscal year (FY) 2019/2020, the lowest growth rate since 2000. Foreign direct investment (FDI) declined by 18.6% from $1.42 billion in FY 2018/19 to $1.2 billion in FY

2019/2020. Nonetheless, the International Monetary Fund (IMF) forecasts a rebound to the pre-pandemic growth rate of 4.9% for the calendar year 2021. Uganda adheres to a policy of open trade and foreign exchange. With the economy showing signs of recovery, various sectors in Uganda, including power, agriculture, construction, infrastructure, technology, and healthcare, offer promising prospects for U.S. businesses and investors. The Government of Tanzania (GoT) welcomes foreign direct investment. In March 2021, President Samia Suluhu Hassan assumed the presidency following the death of President John Pombe Magufuli. uring the initial months of her presidency, President Hassan pledged to enact changes aimed at enhancing the business environment and emphasized the importance of attracting foreign investments.

This decline in investment activity predominantly affected sectors such as manufacturing, construction, and real estate. These sectors, which had previously seen substantial growth, were severely impacted by the limitations imposed due to the pandemic.

FDI accounted for 51% of registered projects. Therefore, as shown on the FDI figure above, there was a positive trend of FDI from 2000 to 2022. (Opoku & Adams, 2015) said that FDI positively affects manufacturing which will either increase or decrease the economy.

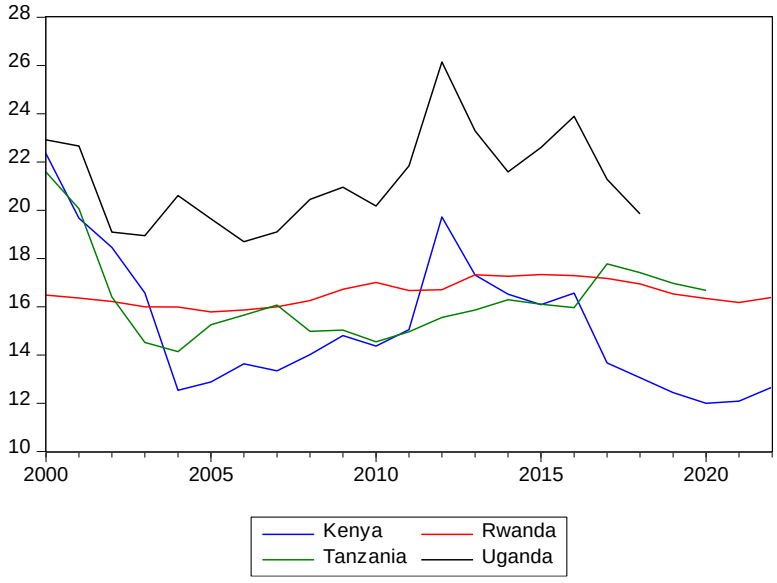

Figure 5: Trend of Rwanda, Kenya, Tanzania and Uganda's Interest rate from 2000 to 2022

Figure 5 above shows the level of interest rates in Kenya, Rwanda, Tanzania and Uganda. It illustrates how interest rates varied from 2000 to 2022. In Kenya, interest rate decreased by 0.239 % from 2000 to 2005, increased by 1.9% from 2005 to 2010, increased by 1.6% from 2010 to 2015, decreased by 4.1% from 2015 to 2020 and increased by 0.7% from 2020 to 2022. All this was due to the tightening of monetary policies by the central bank. Between the year 2005 and 2011 interest rate rose gradually and reached its peak in the year 2012.

In Tanzania, interest rates decreased by 0.151 % from 2000 to 2005, decreased by 0.7% from 2005 to 2010, increased by 1.6% from 2010 to 2015, and decreased by 0.6% from 2015 to 2020. Specifically, banks' lending rates rose initially to an average rate of 36 percent in 1995 before taking a downward trend to about 18 percent in 2017, whereas average deposits rates edged upward to 27 percent and declined to about 10 percent in the similar period. The developments notwithstanding, interest rate spreads remained much higher during reform period particularly from 1998 and were associated with high and rigid lending interest rates. Compared with other East African Community (EAC) member countries (Burundi, Kenya, Rwanda and Uganda), banks' lending rates in Tanzania over the past ten years (May 2009 to May 2019) was an average of 16.03 percent, being the second lowest after Kenya's 15.61 percent. However, lending rates in Tanzania exhibited an upward shift starting December 2016, while trending above those of other EAC member countries except Uganda.

In Rwanda, interest rate decreased by 0.018 % from 2000 to 2005, increased by 1.2% from 2005 to 2010, increased by 0.3% from 2010 to 2015, decreased by 1% from 2015 to 2020 and increased by 0.1% from 2020 to 2022. In 2017, Rwanda's recorded interest rate stood at 9.181% per annum, indicating a decrease from the previous year's figure of 11.183% in 2016. This interest rate data is annually updated and has an average of 10.025% per annum from December 1996 to 2017, spanning 22 observations. The data saw its highest point at 24.211% per annum in 1999 and its lowest at -4.762% per annum in 2003. The interest rate data continues to be actively maintained in CEIC and is reported by the World Bank. It is categorized within the Rwanda section of the Global Database.

In Uganda, interest rate decreased by 3.3 % from 2000 to 2005, increased by 0.6% from 2005 to 2010, increased by 2.4% from 2010 to 2015, decreased by 1% from 2015 to 2020 and increased 0.1% from 2020 to 2022. In 2018, Uganda's real interest rate stood at 14.75%. Over the period from 1999 to 2018, Uganda's real interest rate showed significant fluctuations, with a notable upward trend, culminating in a rate of 14.75% in 2018.

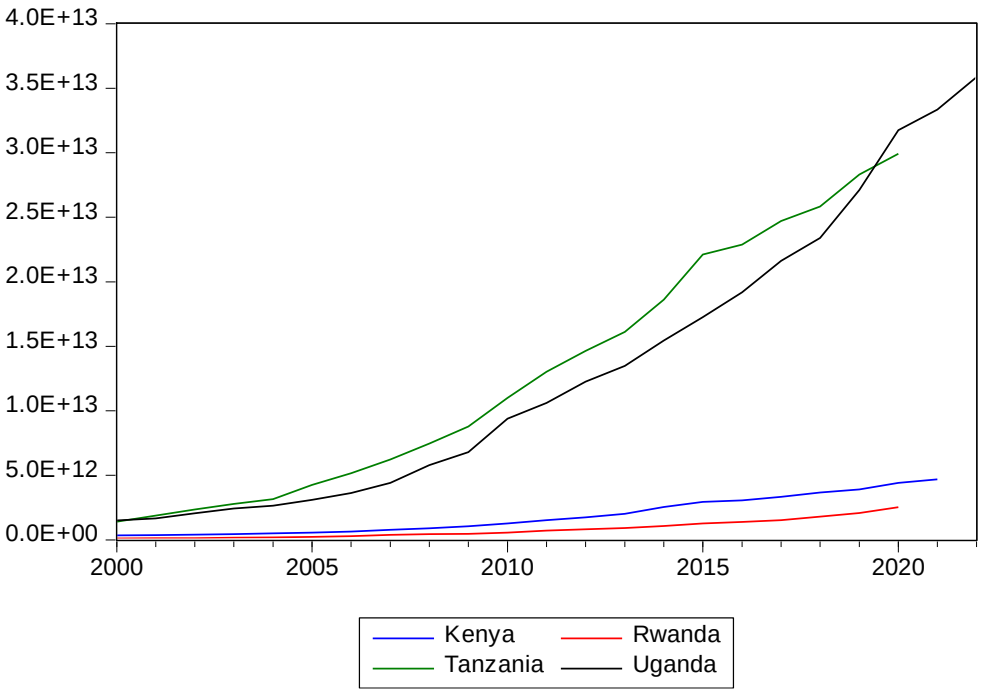

Figure 6: Trend of Rwanda, Kenya, Tanzania and Uganda's Money base from 2000 to 2022

Rwanda's economy has experienced swift industrialization, driven by effective government policies. From the early 2000s onwards, Rwanda has enjoyed a remarkable economic upturn, leading to an enhancement of the living standards for a significant portion of its population. The four countries had a positive trend of increase of MB as indicated by the figure above. In line with the above results, (Anna, 2018) stated that, increase in the money supply has a dual effect: it reduces interest rates, encouraging investments, and it also increases consumers' available funds, fostering a sense of wealth and consequently boosting their spending.

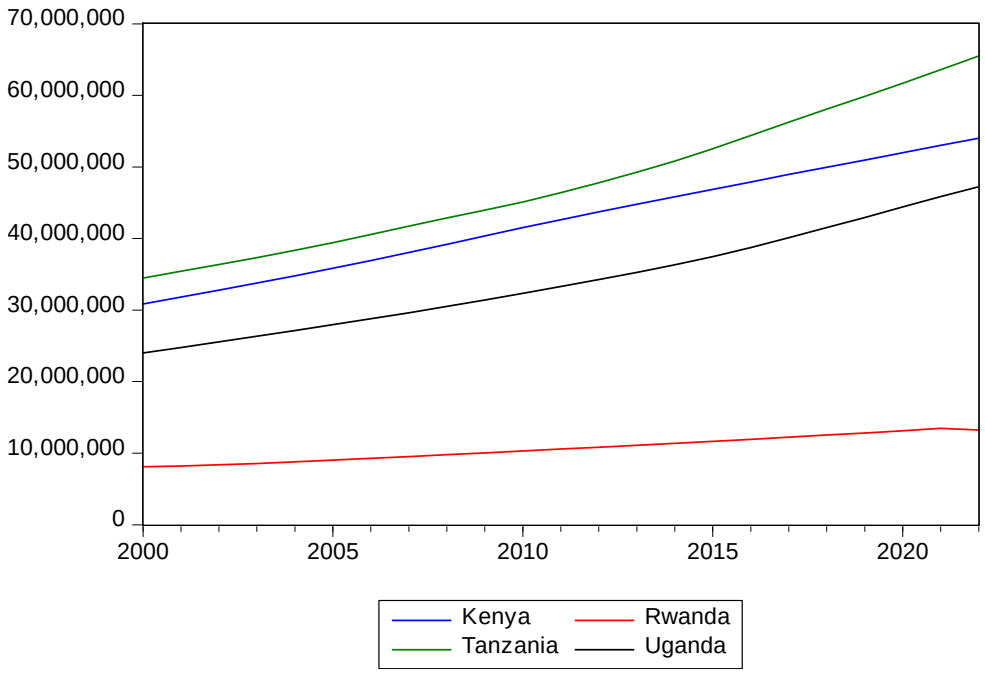

Figure 7: Trend of Rwanda, Kenya, Tanzania and Uganda's Population growth rate from 2000 to 2022.

Figure 7 shows that in all four countries population growth rate increased from 2000 to 2021. In Kenya, population growth rate increased by 9.40e06 from 2000 to 2021.

In Tanzania, population growth rate increased by 2.15e07 from 2000 to 2020.

In Uganda, population growth rate increased by 1.42e07 from 2000 to 2021.

In Rwanda, population growth rate increased by 2.7e06 from 2000 to 2021.

Comparing these four countries, Tanzania was on top with the highest population growth rate and Rwanda with the lowest. In line with these findings, (Mustapha , 2023) shows that the population of the EAC stood at 119.1 million in 1990, and in 2019 it had more than doubled to 276 million people (500.6 million) by 2043. This is reflective of the 2.8% population growth rate in 2019, which only declines to 2% by 2043.

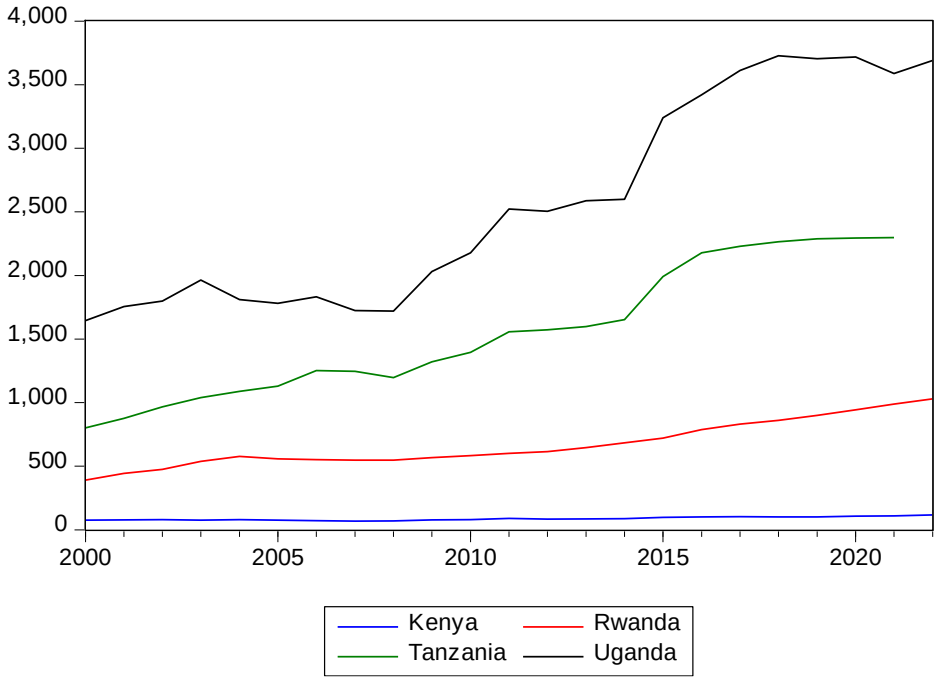

Figure 8: Trend of Rwanda, Kenya, Tanzania and Uganda's Exchange rate from 2000 to 2022.

Between 2000 and 2020, exchange rate trends in East African countries exhibited a mix of economic, political, and global influences. In Kenya, the Kenyan Shilling (KES) experienced fluctuations and periods of depreciation in the early 2000s due to economic and political challenges, followed by stability and growth in the mid-2000s and challenges stemming from the global financial crisis in the late 2000s. In Rwanda, recovery from the 1994 genocide led to early 2000s fluctuations and depreciation, while the mid-2000s brought stability and economic growth. Both countries saw appreciation in their respective currencies during the early 2010s, followed by relatively stable exchange rates with occasional fluctuations in the mid to late 2010s.

Uganda and Tanzania also witnessed exchange rate fluctuations in the early 2000s, primarily due to economic challenges. The mid-2000s brought stability and growth, resulting in stronger currencies, while the global financial crisis in the late 2000s influenced fluctuations. Both countries emphasized economic development and attracted investment in the early 2010s, potentially leading to currency appreciation. Exchange rates remained relatively stable with occasional fluctuations in the mid to late 2010s, influenced by factors like global commodity prices, government policies,

and geopolitical events. Inflation rates and trade balances with major partners were pivotal in shaping exchange rates during this period in Uganda and Tanzania.

4.2.2. Descriptive statistics

This part shows the descriptive statistics of data used in this research.

Table 2: Descriptive statistics

```
. sum logGDP logFDI PGR logINTR MB EXR
```

Variable	Obs	Mean	Std. dev.	Min	Max
logGDP	92	23.69174	1.034808	21.39923	25.45436
logFDI	89	.4787244	1.067437	-3.198256	1.895608
PGR	92	3.38e+07	1.59e+07	8109989	6.55e+07
logINTR	86	2.828623	.1681483	2.484555	3.263854
MB	87	7.28e+12	9.41e+12	1.14e+11	3.59e+13
EXR	91	1217.344	1064.196	67.31764	3727.069

Table 2 above explains the descriptive statistics of the raw data used in this research.

4.2.2.1. Measure of Location

Table 2 shows the mean of GDP, FDI, INTR, MB PGR, EXR which are 23.69174, 0.4787244, 2.88623, 7.28e+12 and 1217.344 respectively. This mean is the average value of each particular variable.

The minimum value in each variable, which is the lowest value in each particular as shown in the table.

The maximum value in each variable, which is the highest value in each particular variable is also expressed in the above table.

4.2.2.2. Measure of dispersion

This shows how data are spread out. The table shows the standard deviation of GDP, FDI, INTR, MB, PGR and EXR that are 1.034808, 1.067437, 1.59e+07, 0.1681483, 9.41e+12 and 1064.196

respectively. These standard deviations express how far observations are from the sample average in each variable.

4.2.3. Normality test

The normality test was used to test whether variables are normally distributed. The result shows that the residuals in the model are normally distributed because p-value of Jarque-Bera is greater than 5% level of significance.

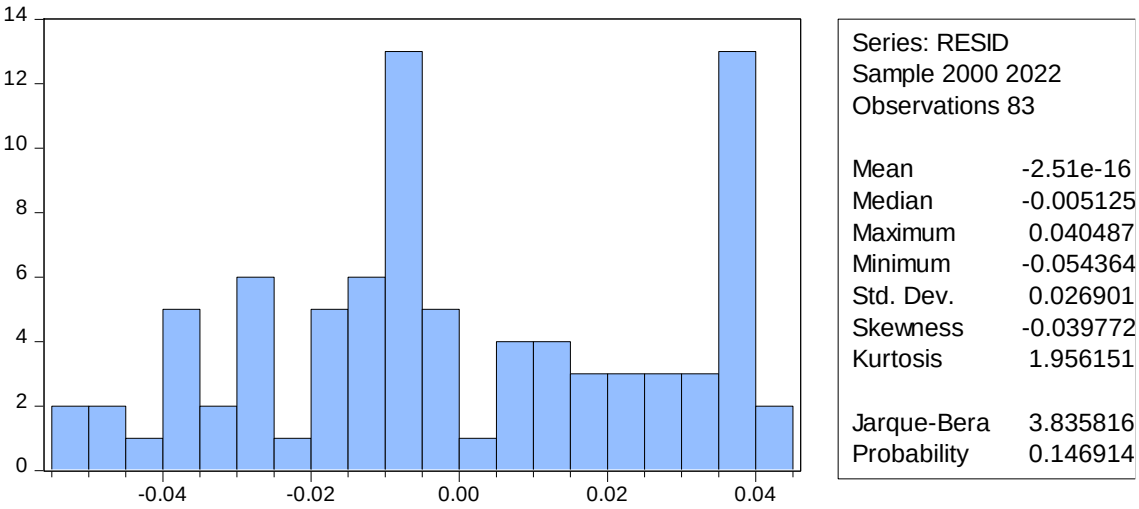

Figure 8: Normality Test

Hypothesis testing

Ho: null hypothesis, that variables are normally distributed.

H1: alternative hypothesis, that variables are not normally distributed.

Gleaned from the normality test for data variables, we accept the null hypothesis that the variables are normally distributed because the probability of Jarque-Bera is greater than the level of significance of 5% (0.146914>0.05), and conclude that variables are normally distributed.

4.2.4. Stationarity test

Stationarity tests whether variables are stationary.

	difference	Prob**Levin, Lin & Chu t*	Prob**of Im, Pesaran and Shin W-stat	Prob** of PP - Fisher Chi-square	Prob**of ADF - Fisher Chi-square
FDI	1st Difference	0.0000	0.0000	0.0000	0.0000
INTR	1st Difference	0.0000	0.0000	0.0000	0.0000
PGR	1st difference	0.0223	0.0028	0.0386	0.0005
EXR	1st Difference	0.0001	0.00000	0.0002	0.0003
MB	1st difference	0.0078	0.0213	0.0205	0.0002

Table 3: Stationarity test of variables

Through testing the unit roots at different levels, the table above shows the results that:

For the first variable FDI, the unit roots at first difference, the obtained Levin, Lin & Chu t probability, Prob**of Im, Pesaran and Shin W-stat, ADF- Fisher Chi-square probability and PP-Fisher Chi-square probability are 0.0000, 0.0000, 0.0000 and 0.0000 respectively, are all less than 5% and 10% significant level. Thus, this states that there is significant unit roots in FDI, there is stationarity among FDI.

For the second variable INTR, the unit roots at first difference, the obtained Levin, Lin & Chu t probability, Prob**of Im, Pesaran and Shin W-stat, ADF- Fisher Chi-square probability and PP-Fisher Chi-square probability are 0.000,0.000,0.00000 and 0.0000 respectively, are all less than 5% and 10% significant level. This means that there is significant unity roots in INTR, there is stationarity among INTR.

For the third variable interest PGR, the unit roots at first difference, the obtained Levin, Lin & Chu t probability, Prob**of Im, Pesaran and Shin W-stat, ADF- Fisher Chi-square probability and PP-Fisher Chi-square probability are 0.0223, 0.0028, 0.0386 and 0.0005 respectively, are all less than 5% and 10% significant. This means that there is significant unit roots in the population growth rate; there is stationarity among population growth rate.

For the fourth variable population growth rate, the unit roots at level, the obtained Levin, Lin & Chu t probability, Prob**of Im, Pesaran and Shin W-stat ADF- Fisher Chi-square probability and PP- Fisher Chi-square probability are 0.0078, 0.0213, 0.0705 and 0.0002 respectively, are all less than 5% and 10% significant level. This means that there is significant unit roots in interest rate; there is stationarity among interest rate.

As shown in the table, the fifth variable exchange rate, the unit roots at level, the obtained Levin, Lin & Chu t probability, Prob**of Im, Pesaran and Shin W-stat ADF- Fisher Chi-square probability and PP- Fisher Chi-square probability are 0.0001, 0.00000, 0.0002 and 0.0003 respectively, and are less than 5% and 10% significant level. This means that there is significant unit roots in exchange rate; there is stationarity among exchange rate.

In conformity with these results, (Simon , 2019) said that population growth allows for the expansion of labor and products, which then grows the economy. It is not just about more products being made; there must also be demand for those products! With a larger population, there will inevitably be more demand for products.

4.2.5. Correlation test

To know the strong relationship between variables, Correlation test was used.

```
. pwcorr logGDP logFDI INTR PGR logMB EXR,star(0.05)sig
```

	logGDP	logFDI	INTR	PGR	logMB	EXR
logGDP	1.0000					
logFDI	0.0888 0.4077	1.0000				
INTR	-0.1987 0.0666	0.3678* 0.0005	1.0000			
PGR	0.9092* 0.0000	0.0514 0.6324	-0.1604 0.1401	1.0000		
logMB	0.7062* 0.0000	0.5467* 0.0000	0.2279* 0.0383	0.7254* 0.0000	1.0000	
EXR	0.1717 0.1036	0.5144* 0.0000	0.6244* 0.0000	0.2698* 0.0097	0.7716* 0.0000	1.0000

Table 4: Correlation between GDP, Foreign direct investment, Interest rate, money base, population growth rate and exchange rate

From Table 4, it is observed that all the variables are correlated, where there is a positive weak correlation of 0.08 between GDP and FDI, a negative correlation of 0.19 between GDP and INTR, a positive strong correlation of 0.90 between GDP and PGR, a strong positive correlation of 0.70 between GDP and MB and a positive correlation of 0.17 between GDP and EXR. (Ndulu & Ndung'u, 1998) developed a growth model in which they used GDP as the dependent variable and trade-related variables and trade policy as explanatory factors. Their findings indicated that while trade had the most significant impact on GDP, macroeconomic factors such as the real exchange rate and inflation played a substantial role by influencing imports and exports indirectly (Nkikabahizi & Rizinde, 2018).

4.2.6. Heteroskedasticity

It tests whether the variance of the errors from a regression is dependent on the values of the independent variables**.**

Ho: residuals are distributed with equal variance

H1: residuals are not distributed with equal variance

```
.  reg logGDP logFDI INTR PGR logMB EXR
```

Source	SS	df	MS	Number of obs	=	83
				F(5, 77)	=	196.41
Model	81.4507566	5	16.2901513	Prob > F	=	0.0000
Residual	6.38625748	77	.082938409	R-squared	=	0.9273
				Adj R-squared	=	0.9226
Total	87.8370141	82	1.0711831	Root MSE	=	.28799

logGDP	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
logFDI	-.1562685	.0446371	-3.50	0.001	-.2451522	-.0673847
INTR	.0541989	.0154597	3.51	0.001	.0234147	.0849831
PGR	2.43e-08	4.90e-09	4.95	0.000	1.45e-08	3.40e-08
logMB	.721981	.0785038	9.20	0.000	.5656599	.8783021
EXR	-.0007946	.0000837	-9.49	0.000	-.0009614	-.0006279
_cons	2.238004	2.109154	1.06	0.292	-1.961858	6.437866

```
. hettest

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of logGDP

H0: Constant variance

    chi2(1) =   0.25
Prob > chi2 = 0.6153
```

Table 5: Heteroskedasticity test

As shown in tables 5, for the probability of chi- square is greater that the level of significance 5%, we accept the null hypothesis and conclude that residuals are distributed with equal variance.

4.2.7. Endogeneity Test

Endogeneity refers to situations in which an explanatory variable is correlated with the error term.

Ho: There is no endogeneity

Hi: There is endogeneity

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-6.42E-13	55	0.1000
F-statistic	4.12E-25	(1, 55)	0.3000
Chi-square	4.12E-25	1	0.0900

Null Hypothesis: C(2)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	4.083343	1.30E+11

Restrictions are linear in coefficients.
Estimation Command:
==========
LS(CX=F, PER=F) RES_FDI C MB INTR EXR PGR

Estimation Equation:
==========
RES_FDI = C(1) + C(2)*MB + C(3)*INTR + C(4)*EXR + C(5)*PGR + [CX=F, PER=F]

Substituted Coefficients:
==========
RES_FDI = -2.4648200154e-12 - 4.30982875922e-26*MB + 4.06847837438e-14*INTR + 3.05105490946e-16*EXR + 5.15659151512e-20*PGR + [CX=F, PER=F]

Table 6: Endogeneity test for FDI

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-8.168307	54	0.3000
F-statistic	66.72124	(1, 54)	0.5000
Chi-square	66.72124	1	0.0600

Null Hypothesis: C(1)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	-3.23E+13	3.95E+12

Restrictions are linear in coefficients.

Estimation Command :
==========
LS RES_MB C FDI INTR EXR PGR

Estimation Equation:
==========
RES_MB = C(1) + C(2)*FDI + C(3)*INTR + C(4)*EXR + C(5)*PGR

Substituted Coefficients:
==========
RES_MB = 0.35802629134 + 0.00334721110303*FDI - 0.0195337647999*INTR + 3.65849873232e-05*EXR - 2.11729685005e-09*PGR

Table 7: Endogeneity test for MB

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-2.01E-13	54	0.2000
F-statistic	4.05E-26	(1, 54)	0.0900
Chi-square	4.05E-26	1	0.1000

Null Hypothesis: C(1) =0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	-9.82E-13	4.877539

Restrictions are linear in coefficients.

Estimation Command:
==========
LS(CX=F, PER=F) RES_INT C FDI MB PGR EXR

Estimation Equation:
==========
RES_INT = C(1) + C(2)*FDI + C(3)*MB + C(4)*PGR + C(5)*EXR + [CX=F, PER=F]

Substituted Coefficients:
==========
RES_INT = -9.81873696192e-13 + 1.9553686088e-14*FDI - 9.98812501313e-27*MB + 2.89267688989e-20*PGR + 4.49069393642e-17*EXR + [CX=F, PER=F]

Table 8:Endogeneity test for Interest Rate

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-7.84E-14	54	0.2720
F-statistic	6.15E-27	(1, 54)	0.0601
Chi-square	6.15E-27	1	0.9000

Null Hypothesis: C(1)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	-1.80E-07	2295956.

Restrictions are linear in coefficients.

Estimation Command:
==========
LS(CX=F, PER=F) RES_PGR C FDI MB INTR EXR

Estimation Equation:
==========
RES_PGR = C(1) + C(2)*FDI + C(3)*MB + C(4)*INTR + C(5)*EXR + [CX=F, PER=F]

Substituted Coefficients:
==========
RES_PGR = -1.80033040911e-07 - 2.07649238843e-08*FDI + 2.03834979137e-20*MB + 2.76700037206e-08*INTR - 3.37718664488e-10*EXR + [CX=F, PER=F]

Table 9:Endogeneity test for PGR

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-771.4855	53	0.1000
F-statistic	595189.9	(1, 53)	0.4200
Chi-square	595189.9	1	0.3000

Null Hypothesis: C(1)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	-3.83E-10	4.96E-13

Restrictions are linear in coefficients.
Estimation Command:
==========
LS(CX=F, PER=F) RES_EXR C FDI MB INTR EXR PGR

Estimation Equation:
==========
RES_EXR = C(1) + C(2)*FDI + C(3)*MB + C(4)*INTR + C(5)*EXR + C(6)*PGR + [CX=F, PER=F]

Substituted Coefficients:
==========
RES_EXR = -3.82641586995e-10 + 4.35065423143e-12*FDI - 7.77430844392e-24*MB + 4.87882477894e-12*INTR + 7.43410271776e-14*EXR + 7.74388315905e-18*PGR + [CX=F, PER=F]

Table 10: Endogeneity test for EXR

In conclusion, E_ Views results shows that all variables has no correlation with error term, for all the probabilities of F statistics are greater than 0.05 level of significance, we accept the null hypothesis.

4.3. Panel Data Model selection

4.3.1. Fixed effect model

Fixed effects models in panel data analysis to account for unobserved, time-invariant individual-specific characteristics that may affect the dependent variable, thereby reducing omitted variable bias and improving the accuracy of parameter estimates.

```
 xtset CountryName1

Panel variable: CountryName1 (balanced)

. xtreg logGDP logFDI INTR PGR logMB EXR,fe

Fixed-effects (within) regression               Number of obs      =         83
Group variable: CountryName1                    Number of groups   =          4

R-squared:                                      Obs per group:
     Within  = 0.9581                                         min =         19
     Between = 0.6349                                         avg =       20.8
     Overall = 0.7434                                         max =         22

                                                F(5,74)           =     338.39
corr(u_i, Xb) = -0.3110                         Prob > F          =     0.0000

------------------------------------------------------------------------------
      logGDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      logFDI |   .0314974   .0251473     1.25   0.214    -.0186097    .0816045
        INTR |   .0145515   .0086705     1.68   0.098    -.0027249    .0318279
         PGR |   2.19e-08   6.22e-09     3.53   0.001     9.55e-09    3.43e-08
       logMB |   .6116123   .0449935    13.59   0.000      .5219607    .7012639
         EXR |  -.0002437   .0000654    -3.73   0.000    -.0003741   -.0001134
       _cons |   5.452902   1.128385     4.83   0.000     3.204545    7.701258
-------------+----------------------------------------------------------------
     sigma_u |  .60606767
     sigma_e |  .13827057
         rho |  .95052554   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(3, 74) = 86.68                     Prob > F = 0.0000
```

Table 11: Fixed effect model

As shown in table 6, the probability < 0.05 then the model is acceptable This is a test (F) to see whether all the coefficients in the model are different from zero.

4.3.2. Random effect model

```
estimate store fe

. xtreg logGDP logFDI INTR PGR logMB EXR,re

Random-effects GLS regression                   Number of obs     =         83
Group variable: CountryNamel                    Number of groups  =          4

R-squared:                                      Obs per group:
     Within  = 0.8864                                         min =         19
     Between = 0.9592                                         avg =       20.8
     Overall = 0.9273                                         max =         22

                                                Wald chi2(5)      =     982.06
corr(u_i, X) = 0 (assumed)                      Prob > chi2       =     0.0000

------------------------------------------------------------------------------
      logGDP | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
      logFDI |  -.1562685   .0446371    -3.50   0.000    -.2437555   -.0687814
        INTR |   .0541989   .0154597     3.51   0.000     .0238984    .0844993
         PGR |   2.43e-08   4.90e-09     4.95   0.000     1.47e-08    3.39e-08
       logMB |    .721981   .0785038     9.20   0.000     .5681163    .8758457
         EXR |  -.0007946   .0000837    -9.49   0.000    -.0009587   -.0006305
       _cons |   2.238004   2.109154     1.06   0.289    -1.895861    6.37187
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .13827057
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Table 12: Random effect model

In table 7, the probability is less than 0.05. we conclude than that the model is ok.

4.3.3. Hausman Test

Ho: random effect model is appropriate model

H1: fixed effect model is appropriate model

```
. hausman fe re

Note: the rank of the differenced variance matrix (4) does not equal the number of coefficients being tested (5);
      be sure this is what you expect, or there may be problems computing the test.  Examine the output of your
      estimators for anything unexpected and possibly consider scaling your variables so that the coefficients
      are on a similar scale.

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference       Std. err.
-------------+------------------------------------------------------------
      logFDI |    .0314974    -.1562685        .1877659               .
        INTR |    .0145515     .0541989       -.0396474               .
         PGR |    2.19e-08     2.43e-08       -2.31e-09        3.83e-09
       logMB |    .6116123      .721981       -.1103687               .
         EXR |   -.0002437    -.0007946        .0005509               .
------------------------------------------------------------------------------
                          b = Consistent under H0 and Ha; obtained from xtreg.
           B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

    chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =  76.38
Prob > chi2 = 0.0000
(V_b-V_B is not positive definite)
```

Table 13: Hausman Test

For the probability of chi2 is less than the level of significance 0.05, we reject the null hypothesis that states that random effect model is appropriate model and accept the alternative hypothesis and conclude that fixed effect model is appropriate model for the analysis.

4.4. Grange causality test

Granger causality testing in panel data is a statistical analysis technique used to investigate the causal relationship between two or more variables in a panel dataset.

Ho: Variable X does not granger- cause Variable Y

H1: Variable X does granger- cause

If p is greater than 0.05, we accept the null hypothesis and if p is less than 0.05, we reject the null hypothesis. If the test results reject the null hypothesis, it suggests that there is evidence of Granger causality, meaning that past values of X contain information that helps predict the current or future values of Y.

Pairwise Granger Causality Tests
Date: 11/01/23 Time: 07:25
Sample: 2000 2022
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
FDI does not Granger Cause GDP	81	0.10661	0.8990
GDP does not Granger Cause FDI		2.21249	0.1164
EXR does not Granger Cause GDP	83	4.05845	0.0210
GDP does not Granger Cause EXR		0.13661	0.8725
INTR does not Granger Cause GDP	78	1.45711	0.2396
GDP does not Granger Cause INTR		0.65253	0.5237
MB does not Granger Cause GDP	79	0.51124	0.6019
GDP does not Granger Cause MB		4.31471	0.0169
PGR does not Granger Cause GDP	84	2.33234	0.1037
GDP does not Granger Cause PGR		1.63328	0.2018
EXR does not Granger Cause FDI	81	0.79514	0.4552
FDI does not Granger Cause EXR		2.19814	0.1180
INTR does not Granger Cause FDI	77	0.38398	0.6825
FDI does not Granger Cause INTR		2.01392	0.1409
MB does not Granger Cause FDI	78	0.16619	0.8472
FDI does not Granger Cause MB		7.60842	0.0010
PGR does not Granger Cause FDI	81	0.74095	0.4801
FDI does not Granger Cause PGR		1.43269	0.2450
INTR does not Granger Cause EXR	78	0.53017	0.5908
EXR does not Granger Cause INTR		6.21359	0.0032
MB does not Granger Cause EXR	79	2.72779	0.0719
EXR does not Granger Cause MB		4.46816	0.0147
PGR does not Granger Cause EXR	83	0.08193	0.9214
EXR does not Granger Cause PGR		1.97198	0.1461
MB does not Granger Cause INTR	75	1.14887	0.3229
INTR does not Granger Cause MB		0.83416	0.4385
PGR does not Granger Cause INTR	78	1.60357	0.2082
INTR does not Granger Cause PGR		0.23821	0.7886
PGR does not Granger Cause MB	79	0.07809	0.9250
MB does not Granger Cause PGR		7.03031	0.0016

Table 14: Grange Causality test

4.5. Modelling

To authenticate the dependence of GPD on Foreign direct investment, money base, interest rate and population growth rate, a panel regression analysis is developed in which FDI, INTR, MB and PGR are regressed up on GPD of Kenya, Rwanda, Tanzania and Uganda during the period of 2000-2022.

```
xtset logGDP logFDI INTR PGR logMB EXR

      Source |       SS           df       MS      Number of obs   =        83
-------------+----------------------------------   F(5, 77)        =    196.41
       Model |  81.4507566         5  16.2901513   Prob > F        =    0.0000
    Residual |  6.38625748        77  .082938409   R-squared       =    0.9273
-------------+----------------------------------   Adj R-squared   =    0.9226
       Total |  87.8370141        82   1.0711831   Root MSE        =    .28799

------------------------------------------------------------------------------
      logGDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      logFDI |  -.1562685   .0446371    -3.50   0.001    -.2451522   -.0673847
        INTR |   .0541989   .0154597     3.51   0.001     .0234147    .0849831
         PGR |   2.43e-08   4.90e-09     4.95   0.000     1.45e-08    3.40e-08
       logMB |    .721981   .0785038     9.20   0.000     .5656599    .8783021
         EXR |  -.0007946   .0000837    -9.49   0.000    -.0009614   -.0006279
       _cons |   2.238004   2.109154     1.06   0.292    -1.961858    6.437866
------------------------------------------------------------------------------
```

Table 15: Panel Data Regression

Table 15 shows the relationship existing between dependent variable and independent variables.

From Table 15, the result of F statistics shows that there is evidence to conclude that the regression model fits the data more than the model without variables as its pro probability value is less than the level of significance (0.000000<0.05).

Using fixed effects, all variables become significant at 95% confidence interval because their probabilities are 0.001 and 0.001 respectively and they are all less than 0.05 level of significance.

The R-squared value of 0.9273 means that GDP will change by 92.7% when there is any change in independent variables (INTR, MB, FDI, PGR and EXR). Thus:

$$GDP_{it} = 2.238004 + 0.0541989INTR_{it} + .721981M3_{it} + 2.43\text{e} - 08PGR_{it}\text{-}$$
$$- 0.1562685FDI_{it} - 0.0007946EXR_{it}$$

Variables (FDI and EXR) have a negative effect on GDP as indicated by their coefficients and (MB, INTR and PGR) have a positive effect on GDP as indicated by its coefficient.

INTR has a positive influence on GDP, as evidenced by a statistically significant coefficient of -0.0541989 at a 5% significance level. This implies that a one-unit rise in INTR will lead to an increase in GDP by 0.0541989. When central banks lower interest rates, borrowing becomes more affordable for both individuals and businesses. This, in turn, serves as an incentive for businesses to embark on new projects, expand their existing operations, and potentially generate more job opportunities. The lowered borrowing costs stimulate increased investment, fostering economic growth and contributing to a rise in Gross Domestic Product (GDP) through heightened economic activity.

MB has a positive impact on GDP, as demonstrated by a statistically significant coefficient of 0.721981 at a 5% significance level. This suggests that a one-unit increment in MB will lead to a corresponding increase in GDP by 0.721981.

Expanding the money supply has a twofold effect: it contributes to the reduction of interest rates, thereby stimulating investment, and it also injects additional funds into the hands of consumers, enhancing their perception of wealth and subsequently boosting their spending. In response to heightened sales, businesses typically increase their orders for raw materials and ramp up production.

Population growth has wide-ranging effects on society, including its overall quality of life. A notable repercussion is the inflation of prices for essential goods and services, leading to financial challenges, particularly for the most vulnerable segments of the population. This issue is observable even in prosperous and highly developed nations such as Japan. The increase in prices for basic necessities can disproportionately affect those with limited financial resources, creating hardships and economic strain for individuals and communities.

PGR, as evidenced by a statistically significant coefficient of 2.43E-08 at a 5% significance level, exerts a positive influence on GDP. This suggests that a one-unit increase in PGR will lead to an increase in GDP by 2.43E-08.

A positive population growth rate can lead to labor force expansion, an expanded consumer base, increased innovation and entrepreneurship, economies of scale, higher tax revenue, and improved human capital. However, the benefits depend on the quality of population growth, investment in infrastructure and services, supportive economic policies, and sustainability. However, uncontrolled and rapid population growth can strain resources and hinder economic development. Therefore, managing population growth to align with development goals is crucial for maximizing its positive impact on GDP.

FDI is shown to have a negative effect on GDP, as evident from a statistically significant coefficient of -0.1562685 at a 5% significance level. This suggests that a one-unit increase in FDI results in a reduction of GDP by 0.1562685. Foreign investors monopolizing the market and displacing domestic producers can pose challenges to the local business landscape. Furthermore, FDI has the capacity to negatively influence the host country's balance of payments, either through substantial outflows of investors' profits or an increased reliance on imported inputs. The spill-over effects of FDI, such as the displacement of domestic investments, diminished market share, and reduced profitability, along with its contributions to wage inequality and environmental degradation, should be considered in the broader analysis of economic dynamics within the EAC. Balancing the benefits and drawbacks of FDI is essential for a comprehensive understanding of its role in the inflation and economic growth dynamics of the region.

Exchange rate has a negative impact on GDP as evident from a statistically significant coefficient of -0.0007946 at a 5% significance level. This means that a one unit increase in EXR results in a reduction of GDP by 0.0007946. Exchange rates wield a multifaceted influence on a country's economic landscape. A strong currency, indicative of appreciation, can diminish export competitiveness as foreign buyers find products more expensive, potentially leading to reduced export sales and negatively impacting GDP, especially in export-dependent economies. Conversely, a weak currency, reflecting depreciation, escalates import costs, contributing to inflation and diminishing purchasing power, thereby restraining consumer and business spending and impeding economic growth. Additionally, exchange rate volatility introduces uncertainty, dissuading foreign investors and potentially reducing foreign direct investment (FDI) and capital inflows, thereby posing challenges to economic development.

In conformity with these results, (Soubbotina & Sheram , 2020) observed that the standard of living encompasses multiple facets, such as access to clean drinking water, enhanced sanitation infrastructure, healthcare facilities, the expansion of primary education to boost literacy rates, poverty alleviation, well-developed transportation networks, and the growth of employment opportunities. Consequently, the quality of life serves as a principal measure of economic progress. Hence, an increase in economic development is a prerequisite for an economy to attain the classification of a Developed Nation.

4.6. Robustness Test

Robust test help in checking if the regression model is stable across different subsets of the data.

```
. xtreg log GDP log FDI INTR PGR log MB EXR, robust

Linear regression                               Number of obs     =         83
                                                F(5, 77)          =     332.29
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9273
                                                Root MSE          =     .28799

------------------------------------------------------------------------------
             |               Robust
      logGDP | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      logFDI |  -.1562685   .0559305    -2.79   0.007    -.2676403   -.0448966
        INTR |   .0541989   .0160807     3.37   0.001     .0221781    .0862196
         PGR |   2.43e-08   4.81e-09     5.05   0.000     1.47e-08    3.38e-08
       logMB |    .721981   .0803392     8.99   0.000     .5620052    .8819568
         EXR |  -.0007946   .0001074    -7.40   0.000    -.0010086   -.0005807
       _cons |   2.238004   2.219798     1.01   0.317    -2.182178    6.658186
------------------------------------------------------------------------------
```

p<0.05, our results in regression are trust worthy and can be used or prediction.

Table 16: Robust check

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

This chapter summarizes the findings of the study and presents conclusions and recommendations. It provides a detailed overview of the research's results and helps determine whether the study's objectives were achieved or not.

5.1. Conclusion

The objective of this study was to evaluate the degree to which inflation drivers influence Economic growth in the East African Community countries, namely Kenya, Rwanda, Tanzania and Uganda. The overall goal of this study was to analyze factors affecting inflation and how it affects the economic growth of these countries from 2000 to 2022.

The study utilized a well-balanced panel dataset consisting of four (4) East African Community (EAC) countries over the period spanning from 2000 to 2022. Secondary data from the World Bank website served as the primary data source for this research. The data were processed using STATA and Eviews 10 for Windows econometrics package. In order to investigate the correlation between inflation drivers and economic growth, a model was formulated. This model incorporated five key explanatory variables: Foreign Direct Investment (FDI), interest rates, the money supply (base), population growth rates and exchange rates. The estimation process utilized a Fixed Effects model to account for country-specific variations.

Over time, inflation drivers have significantly changed, and economic growth levels in these four nations have experienced irregular fluctuations. The findings from panel data analysis revealed that money base, population growth rate and interest rate have a positive effect on economic growth, as measured by Gross domestic Product (GDP), whereas foreign direct investment and exchange rate rate have negative impact on economic growth. In summary, when we compare these four countries, we find that our study has successfully achieved all of its objectives.

Currently, inflation is on the rise within the countries comprising the East African Community. Consequently, this study offers a significant contribution by elucidating the principal factors responsible for this inflationary trend and their effects on the economic growth of EAC nations.

5.2. Recommendations

Achieving the delicate balance of curbing inflation while simultaneously preserving or even augmenting economic growth demands a complex approach. Presented below are recommendations tailored for governments, future researchers, and central banks, designed to help attain this equilibrium:

East African nations must control interest rates effectively, Central Banks must handle them with care. Lowering interest rates can stimulate economic activity by making borrowing more affordable for businesses and consumers. Yet, if the reduction is too aggressive, it might lead to inflation. Striking the right balance is essential. Additionally, Central Banks can embrace inflation targeting frameworks to maintain stable prices while encouraging economic growth. This strategy entails establishing clear inflation targets and using interest rates as a tool to achieve those goals, ultimately creating a steady and flourishing economic environment.

Policymakers in EAC Countries need to assess whether regulatory or structural changes are necessary to enhance the positive impact of FDI. Engaging with policymakers is essential to understand their perspectives on FDI and explore potential policy interventions aimed at resolving the identified issues.

In order to foster both exchange rate stability and economic growth, it is advisable for EAC governments to embrace a flexible exchange rate system that predominantly hinges on market dynamics for the determination of exchange rates. Nonetheless, a preparedness to intervene becomes crucial in the face of drastic fluctuations, aiming to avert speculative attacks and undue currency depreciation. Striking a balance between market-driven mechanisms and strategic interventions is essential, as this approach not only diminishes uncertainty for businesses and investors but also permits the substantial influence of market forces in shaping exchange rates.

Future researchers should conduct studies to understand the specific drivers of inflation in their respective economies. Such endeavors will empower policymakers to make well-informed and data-driven decisions.

EAC Government should examine the favorable effects of the money base on Gross Domestic Product (GDP), exploring how monetary policy contributes to shaping the money base and its subsequent transmission mechanisms in the real economy. Furthermore, they should evaluate the efficacy of various monetary policy tools in facilitating economic growth, considering their impact on the broader economic landscape.

East African Countries need to invest in infrastructure which plays a pivotal role in fostering economic growth. The enhancement and upkeep of infrastructure are essential, not only for attracting Foreign Direct Investment (FDI) but also for decreasing production and transportation expenses, thereby increasing the competitiveness of businesses.

Strengthening regional economic coordination is paramount in our increasingly interconnected global landscape, emphasizing the essential nature of efficient collaboration between central banks and governments of the EAC Countries. In recognizing the interdependence of regional economic factors, particularly inflation and growth, joint endeavors become instrumental in mitigating their impact. For instance, East African nations could engage in collaborative initiatives to tackle shared economic challenges. Through regional economic integration, the promotion of harmonized policies, enhanced market access, and the reduction of trade barriers can be achieved, fostering a more resilient and collectively prosperous economic environment.

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APPENDICES

Appendix 1: Data used in the analysis

Country	year	GDP	FDI	INTR	PGR	MB	EXR
Kenya	2000	1.27E+10	0.872896	22.33917	30851606	3.4E+11	76.17554
Kenya	2001	1.3E+10	0.040833	19.66583	31800343	3.6E+11	78.5632
Kenya	2002	1.31E+10	0.210062	18.45333	32779823	3.95E+11	78.74914
Kenya	2003	1.49E+10	0.548413	16.57333	33767122	4.42E+11	75.93557
Kenya	2004	1.61E+10	0.286194	12.53167	34791836	5.01E+11	79.17388
Kenya	2005	1.87E+10	0.113202	12.8825	35843010	5.51E+11	75.55411
Kenya	2006	2.58E+10	0.19622	13.63553	36925253	6.44E+11	72.10084
Kenya	2007	3.2E+10	2.281243	13.34034	38036793	7.76E+11	67.31764
Kenya	2008	3.59E+10	0.266291	14.01694	39186895	8.97E+11	69.17532
Kenya	2009	4.23E+10	0.274534	14.80454	40364444	1.04E+12	77.35201
Kenya	2010	4.54E+10	0.392164	14.3715	41517895	1.28E+12	79.23315
Kenya	2011	4.69E+10	3.094711	15.04676	42635144	1.52E+12	88.81077
Kenya	2012	5.64E+10	2.447259	19.72341	43725806	1.74E+12	84.5296
Kenya	2013	6.17E+10	1.81417	17.31346	44792368	2.01E+12	86.12288
Kenya	2014	6.83E+10	1.202208	16.51393	45831863	2.54E+12	87.92216
Kenya	2015	7.01E+10	0.8838	16.08661	46851488	2.95E+12	98.17845
Kenya	2016	7.48E+10	0.627591	16.55963	47894670	3.06E+12	101.5044
Kenya	2017	8.2E+10	1.640837	13.66757	48948137	3.34E+12	103.41
Kenya	2018	9.22E+10	0.832686	13.06076	49953304	3.68E+12	101.3016
Kenya	2019	1E+11	0.468169	12.44113	50951450	3.9E+12	101.9913
Kenya	2020	1.01E+11	0.423521	11.99578	51985780	4.41E+12	106.4508
Kenya	2021	1.1E+11	0.422364	12.08	53005614	4.69E+12	109.6377
Kenya	2022	1.13E+11		12.67	54027487		117.866
Rwanda	2000	2.07E+09	0.391538	16.48417	8109989	1.14E+11	389.6962
Rwanda	2001	1.97E+09	0.940735	16.35417	8223941	1.19E+11	442.9919
Rwanda	2002	1.97E+09	0.0763	16.215	8372306	1.37E+11	475.3652
Rwanda	2003	2.14E+09	0.219813	15.9925	8567992	1.61E+11	537.655
Rwanda	2004	2.38E+09	0.324011	15.9875	8791853	1.89E+11	577.449
Rwanda	2005	2.93E+09	0.271324	15.77917	9026299	2.25E+11	557.8226
Rwanda	2006	3.32E+09	0.923091	15.86583	9270066	2.85E+11	551.7103
Rwanda	2007	4.07E+09	2.021505	15.99917	9523168	3.8E+11	546.955
Rwanda	2008	5.18E+09	1.974785	16.25167	9781996	4.45E+11	546.8487

Rwanda	2009	5.67E+09	2.091312	16.72333	10043737	4.62E+11	568.2813
Rwanda	2010	6.12E+09	3.529851	17.00083	10309031	5.56E+11	583.1309
Rwanda	2011	6.88E+09	1.628599	16.6675	10576932	7.16E+11	600.3065
Rwanda	2012	7.65E+09	3.522184	16.70167	10840334	8.11E+11	614.2951
Rwanda	2013	7.82E+09	2.989287	17.31917	11101350	9.09E+11	646.636
Rwanda	2014	8.24E+09	3.811088	17.25917	11368451	1.07E+12	682.4378
Rwanda	2015	8.54E+09	1.897077	17.33333	11642959	1.28E+12	719.8596
Rwanda	2016	8.7E+09	3.217218	17.29167	11930899	1.39E+12	787.2515
Rwanda	2017	9.25E+09	2.961536	17.17083	12230339	1.52E+12	831.5543
Rwanda	2018	9.64E+09	3.800051	16.94667	12531808	1.8E+12	861.0934
Rwanda	2019	1.03E+10	2.543545	16.5275	12835028	2.08E+12	899.3505
Rwanda	2020	1.02E+10	1.500199	16.345	13146362	2.52E+12	943.278
Rwanda	2021	1.11E+10	1.916696	16.17583	13461888		988.6248
Rwanda	2022	1.33E+10	2.994107	16.385	13246394		1030.308
Tanzania	2000	1.34E+10	3.464426	21.5775	34463704	1.4E+12	800.4085
Tanzania	2001	1.36E+10	4.044211	20.05726	35414469	1.88E+12	876.4117
Tanzania	2002	1.41E+10	2.797102	16.39824	36353531	2.36E+12	966.5828
Tanzania	2003	1.52E+10	2.091408	14.51696	37333918	2.78E+12	1038.419
Tanzania	2004	1.67E+10	2.653759	14.14032	38360879	3.15E+12	1089.335
Tanzania	2005	1.84E+10	5.084615	15.24895	39439505	4.25E+12	1128.934
Tanzania	2006	1.86E+10	2.161114	15.6521	40562052	5.16E+12	1251.9
Tanzania	2007	2.18E+10	2.66217	16.07037	41716497	6.22E+12	1245.035
Tanzania	2008	2.8E+10	4.947012	14.98213	42870884	7.46E+12	1196.311
Tanzania	2009	2.91E+10	3.275688	15.03048	43957933	8.78E+12	1320.312
Tanzania	2010	3.2E+10	5.663728	14.54417	45110527	1.1E+13	1395.625
Tanzania	2011	3.47E+10	3.547208	14.96333	46416031	1.3E+13	1557.433
Tanzania	2012	3.97E+10	4.53877	15.55667	47786137	1.46E+13	1571.698
Tanzania	2013	4.57E+10	4.569258	15.86083	49253643	1.61E+13	1597.556
Tanzania	2014	5E+10	2.83417	16.29083	50814552	1.86E+13	1653.231
Tanzania	2015	4.74E+10	3.178703	16.105	52542823	2.21E+13	1991.391
Tanzania	2016	4.98E+10	1.735926	15.95833	54401802	2.29E+13	2177.087
Tanzania	2017	5.33E+10	1.760081	17.77417	56267032	2.47E+13	2228.857
Tanzania	2018	5.7E+10	1.704411	17.41417	58090443	2.58E+13	2263.782
Tanzania	2019	6.1E+10	1.994592	16.97083	59872579	2.83E+13	2288.207
Tanzania	2020	6.61E+10	1.036629	16.67953	61704518	2.99E+13	2294.146
Tanzania	2021	7.07E+10	1.304675		63588334		2297.764
Tanzania	2022	7.57E+10			65497748		

Uganda	2000	6.19E+09	2.594762	22.91976	24020697	1.51E+12	1644.475
Uganda	2001	5.84E+09	2.593888	22.655	24763325	1.66E+12	1755.659
Uganda	2002	6.18E+09	2.988527	19.09718	25545090	2.06E+12	1797.551
Uganda	2003	6.61E+09	3.060332	18.94214	26354736	2.43E+12	1963.72
Uganda	2004	7.94E+09	3.720851	20.60318	27146084	2.65E+12	1810.305
Uganda	2005	9.24E+09	4.110826	19.64539	27946588	3.1E+12	1780.54
Uganda	2006	9.98E+09	6.457058	18.69733	28773227	3.63E+12	1831.452
Uganda	2007	1.19E+10	6.656597	19.10579	29629804	4.42E+12	1723.492
Uganda	2008	1.44E+10	5.047372	20.45007	30509862	5.79E+12	1720.444
Uganda	2009	2.51E+10	3.349162	20.95517	31412520	6.8E+12	2030.488
Uganda	2010	2.67E+10	2.039005	20.17463	32341728	9.39E+12	2177.558
Uganda	2011	2.79E+10	3.208606	21.83331	33295738	1.06E+13	2522.802
Uganda	2012	2.73E+10	4.414386	26.15013	34273295	1.23E+13	2504.563
Uganda	2013	2.89E+10	3.790317	23.28357	35273570	1.35E+13	2586.89
Uganda	2014	3.26E+10	3.245896	21.58423	36336539	1.54E+13	2599.788
Uganda	2015	3.24E+10	2.277605	22.60136	37477356	1.73E+13	3240.645
Uganda	2016	2.92E+10	2.14253	23.88613	38748299	1.92E+13	3420.098
Uganda	2017	3.07E+10	2.610889	21.27867	40127085	2.16E+13	3611.224
Uganda	2018	3.29E+10	3.205128	19.84656	41515395	2.34E+13	3727.069
Uganda	2019	3.53E+10	3.603043		42949080	2.71E+13	3704.049
Uganda	2020	3.76E+10	2.32352		44404611	3.18E+13	3718.249
Uganda	2021	4.05E+10	2.716495		45853778	3.34E+13	3587.052
Uganda	2022	4.56E+10				3.59E+13	3689.817

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Appendix 2: E_Views results

Panel unit root test: Summary

Series: D(LINTR)

Date: 09/16/23 Time: 12:51

Sample: 2000 2022

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.74367	0.0000	4	74
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.87728	0.0000	4	74
ADF - Fisher Chi-square	36.7339	0.0000	4	74
PP - Fisher Chi-square	33.5141	0.0000	4	78

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LMB)
Date: 09/16/23 Time: 12:52
Sample: 2000 2022
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.41983	0.0078	4	75
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.02738	0.0213	4	75
ADF - Fisher Chi-square	18.0984	0.0205	4	75
PP - Fisher Chi-square	29.8776	0.0002	4	79

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: D(PGR)

Date: 09/16/23 Time: 12:53

Sample: 2000 2022
Exogenous variables: Individual effects

User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.76436	0.0223	4	80
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.23467	0.0028	4	80
ADF - Fisher Chi-square	5.17650	0.0386	4	80
PP - Fisher Chi-square	4.07312	0.0005	4	84

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(FDI)
Date: 09/16/23 Time: 12:54
Sample: 2000 2022
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.69281	0.0000	4	77
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.38713	0.0000	4	77
ADF - Fisher Chi-square	41.6024	0.0000	4	77
PP - Fisher Chi-square	100.272	0.0000	4	81

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: D(EXR)
Date: 11/01/23 Time: 07:00
Sample: 2000 2022
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.69373	0.0001	4	83
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.94008	0.0000	4	83
ADF - Fisher Chi-square	29.6011	0.0002	4	83
PP - Fisher Chi-square	29.3943	0.0003	4	83

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 3: STATA results

```
* import data set*
import excel "G:\AAAAAAAAAAAAAAA\MIRA_dis\Book1_DATAAA.xlsx", sheet("Sheet1") firstrow clear
(8 vars, 92 obs)


* Generation of trend*
 gen trends=_n

 *Changing data set to timeseries*
 tsset trend
 Time variable: trends, 1 to 92
         Delta: 1 unit

* regression *
reg GDP FDI INTR PGR MB EXR
```

```
      Source |       SS           df       MS      Number of obs   =        83
-------------+----------------------------------   F(5, 77)        =     40.09
       Model |  3.9490e+22         5  7.8980e+21   Prob > F        =    0.0000
    Residual |  1.5169e+22        77  1.9700e+20   R-squared       =    0.7225
-------------+----------------------------------   Adj R-squared   =    0.7045
       Total |  5.4659e+22        82  6.6657e+20   Root MSE        =    1.4e+10

------------------------------------------------------------------------------
         GDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         FDI |  -1.88e+09   1.21e+09    -1.55   0.124    -4.29e+09    5.31e+08
        INTR |  -2.98e+08   7.69e+08    -0.39   0.699    -1.83e+09    1.23e+09
         PGR |   1237.224   149.7594     8.26   0.000     939.0153    1535.434
          MB |    .000678   .0004992     1.36   0.178    -.0003161     .001672
         EXR |   -8595049    4393852    -1.96   0.054    -1.73e+07    154228.9
       _cons |   2.73e+09   1.28e+10     0.21   0.832    -2.28e+10    2.82e+10
------------------------------------------------------------------------------
```

```
* Testing for heteroscedacitisity*

. estat hettest

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of GDP

H0: Constant variance

    chi2(1) =  30.46
Prob > chi2 = 0.0000
  * ###for the probability is significant, it means that there is heteroscedacity with in the variables.

  ** To remove Heteroscedacitisity
   hettest FDI INTR PGR MB EXR

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variables: FDI INTR PGR MB EXR

H0: Constant variance

    chi2(5) =  58.08
Prob > chi2 = 0.0000
```

```
**********************************************************************
ladder GDP

Transformation         Formula               chi2(2)  Prob > chi2
------------------------------------------------------------------
Cubic                  GDP^3                   62.70        0.000
Square                 GDP^2                   45.35        0.000
Identity               GDP                     16.65        0.000
Square root            sqrt(GDP)                5.64        0.060
Log                    log(GDP)                 4.44        0.109
1/(Square root)        1/sqrt(GDP)             21.82        0.000
Inverse                1/GDP                   44.37        0.000
1/Square               1/(GDP^2)               64.64        0.000
1/Cubic                1/(GDP^3)               71.83        0.000



. gen logGDP=log(GDP)
```

```
. reg logGDP FDI INTR PGR MB EXR

      Source |       SS           df       MS      Number of obs   =        83
-------------+----------------------------------   F(5, 77)        =     81.55
       Model |  73.8851637         5  14.7770327   Prob > F        =    0.0000
    Residual |  13.9518504        77  .181192862   R-squared       =    0.8412
-------------+----------------------------------   Adj R-squared   =    0.8308
       Total |  87.8370141        82   1.0711831   Root MSE        =    .42567

------------------------------------------------------------------------------
      logGDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         FDI |   .0329783   .0367257     0.90   0.372    -.0401518    .1061084
        INTR |   .0185255   .0233105     0.79   0.429    -.0278916    .0649426
         PGR |   6.13e-08   4.54e-09    13.50   0.000     5.23e-08    7.04e-08
          MB |   1.25e-14   1.51e-14     0.83   0.410    -1.76e-14    4.27e-14
         EXR |  -.0002307   .0001333    -1.73   0.087     -.000496    .0000346
       _cons |    21.3891   .3881348    55.11   0.000     20.61622    22.16197
------------------------------------------------------------------------------

. hettest

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of logGDP

H0: Constant variance

    chi2(1) =   3.20
Prob > chi2 = 0.0734

***** For probabilityof chi2 is  not significant(>0.05), heteroscedacitisity is no longer in our variable
```

```
. reg logGDP logFDI INTR PGR MB EXR

      Source |       SS           df       MS      Number of obs   =        83
-------------+----------------------------------   F(5, 77)        =     87.10
       Model |  74.6395265         5  14.9279053   Prob > F        =    0.0000
    Residual |  13.1974876        77  .171395943   R-squared       =    0.8498
-------------+----------------------------------   Adj R-squared   =    0.8400
       Total |  87.8370141        82   1.0711831   Root MSE        =      .414

------------------------------------------------------------------------------
      logGDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      logFDI |   .1169078   .0510047     2.29   0.025     .0153445    .2184712
        INTR |   .0195786   .0226318     0.87   0.390    -.0254871    .0646442
         PGR |   6.09e-08   4.39e-09    13.88   0.000     5.22e-08    6.96e-08
          MB |   1.55e-14   1.43e-14     1.09   0.279    -1.28e-14    4.39e-14
         EXR |  -.0002957   .0001259    -2.35   0.021    -.0005464   -.0000449
       _cons |   21.46281   .3738985    57.40   0.000     20.71828    22.20734
------------------------------------------------------------------------------

. ladder INTR

Transformation         Formula              chi2(2)  Prob > chi2
-----------------------------------------------------------------
Cubic                  INTR^3                 23.72        0.000
Square                 INTR^2                 14.09        0.001
Identity               INTR                    6.36        0.042
Square root            sqrt(INTR)              3.37        0.185
Log                    log(INTR)               1.03        0.598
1/(Square root)        1/sqrt(INTR)            0.06        0.969
Inverse                1/INTR                  0.60        0.742
1/Square               1/(INTR^2)              6.01        0.050
1/Cubic                1/(INTR^3)             13.54        0.001
```

```
. reg logGDP logFDI INTR PGR MB EXR

      Source |       SS           df       MS      Number of obs   =        83
-------------+----------------------------------   F(5, 77)        =     87.10
       Model |  74.6395265         5  14.9279053   Prob > F        =    0.0000
    Residual |  13.1974876        77  .171395943   R-squared       =    0.8498
-------------+----------------------------------   Adj R-squared   =    0.8400
       Total |  87.8370141        82   1.0711831   Root MSE        =      .414

------------------------------------------------------------------------------
      logGDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      logFDI |   .1169078   .0510047     2.29   0.025     .0153445    .2184712
        INTR |   .0195786   .0226318     0.87   0.390    -.0254871    .0646442
         PGR |   6.09e-08   4.39e-09    13.88   0.000     5.22e-08    6.96e-08
          MB |   1.55e-14   1.43e-14     1.09   0.279    -1.28e-14    4.39e-14
         EXR |  -.0002957   .0001259    -2.35   0.021    -.0005464   -.0000449
       _cons |   21.46281   .3738985    57.40   0.000     20.71828    22.20734
------------------------------------------------------------------------------

. ladder INTR

Transformation         Formula              chi2(2)  Prob > chi2
-----------------------------------------------------------------
Cubic                  INTR^3                 23.72        0.000
Square                 INTR^2                 14.09        0.001
Identity               INTR                    6.36        0.042
Square root            sqrt(INTR)              3.37        0.185
Log                    log(INTR)               1.03        0.598
1/(Square root)        1/sqrt(INTR)            0.06        0.969
Inverse                1/INTR                  0.60        0.742
1/Square               1/(INTR^2)              6.01        0.050
1/Cubic                1/(INTR^3)             13.54        0.001
```

```
. gen logMB= log(MB)
(5 missing values generated)

. reg logGDP logFDI INTR PGR logMB EXR

      Source |       SS           df       MS      Number of obs   =        83
-------------+----------------------------------   F(5, 77)        =    196.41
       Model |  81.4507566         5  16.2901513   Prob > F        =    0.0000
    Residual |  6.38625748        77  .082938409   R-squared       =    0.9273
-------------+----------------------------------   Adj R-squared   =    0.9226
       Total |  87.8370141        82  1.0711831   Root MSE        =    .28799

------------------------------------------------------------------------------
      logGDP | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      logFDI |  -.1562685   .0446371    -3.50   0.001    -.2451522   -.0673847
        INTR |   .0541989   .0154597     3.51   0.001     .0234147    .0849831
         PGR |   2.43e-08   4.90e-09     4.95   0.000     1.45e-08    3.40e-08
       logMB |    .721981   .0785038     9.20   0.000     .5656599    .8783021
         EXR |  -.0007946   .0000837    -9.49   0.000    -.0009614   -.0006279
       _cons |   2.238004   2.109154     1.06   0.292    -1.961858    6.437866
------------------------------------------------------------------------------
```

```
Transformation         Formula               chi2(2)  Prob > chi2
-----------------------------------------------------------------
Cubic                  FDI^3                   60.90        0.000
Square                 FDI^2                   35.88        0.000
Identity               FDI                      3.20        0.202
Square root            sqrt(FDI)                4.63        0.099
Log                    log(FDI)                17.77        0.000
1/(Square root)        1/sqrt(FDI)             56.61        0.000
Inverse                1/FDI                   93.40        0.000
1/Square               1/(FDI^2)              121.15        0.000
1/Cubic                1/(FDI^3)              127.49        0.000

. gen logFDI=  log(FDI)
(3 missing values generated)
```