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DETERMINANTS OF PRIVATE INVESTMENT

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Determinants of Private Investment

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Abstract

This study examines the determinants of private investment (PI) in the Ethiopian economy. Understanding these macroeconomic dynamics is crucial for policymakers in developing countries, as these variables play a pivotal role in shaping economic trajectories. The study employs a comprehensive analysis, including descriptive statistics, trend analysis, correlation analysis, and distributional analysis and implies ARDL mixed order integrated purpose model of the key variables. The correlation results indicate a moderate positive correlation between inflation and private investment, suggesting that inflationary periods may stimulate investment to some extent as a hedge against price fluctuations. However, the relationship between interest rates and private investment is found to be weaker, highlighting the multifaceted nature of investment decisions. The ARDL results indicate that inflation has a statistically significant positive impact on private investment, suggesting that businesses tend to increase investment as a hedge against rising prices. Also, the interest rate is found to have positive significant effect on private investment. The trend analysis further highlights the dynamic nature of these macroeconomic factors, with notable peaks and troughs in inflation, interest rates, and private investment over time. These insights underscore the need for policymakers to closely monitor and address the complex interplay between these variables. The study's findings call for a comprehensive policy approach that targets both inflation control and interest rate management to foster a conducive environment for private investment and sustainable economic growth in Ethiopia. Policymakers should prioritize measures that promote price stability, maintain competitive interest rates, and create an overall macroeconomic environment that is favorable for private investment and long-term economic development.

Key Words: Inflation, Interest Rate, Private Investment, ARDL, Ethiopia

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Acronyms

ADF: Augmented Dickey Fuller

AIC: Akaiki Information Criteria

ARDL: Auto RegressiveDistributedlag

AR: Auto regression

GDP: Gross Domestic Product

HQ: HannanQuinnInfo.Criteria

IGE: Imperial Government of Ethiopia

IMF: International Monetary Fund

INF: Inflation

IR: Interest Rate

JB: Jarque-Berra

LM: Lagrange Multiplier

NBE: National Bank of Ethiopia

PI: Private Investment

PP: Phillips-Perron

SIC: Schwarz(Bayesian) Information Criteria

TGE: Transitional Government of Ethiopia

VAR: Vector Auto regression

VECM: Vector Error Correction Model

WB: World Bank

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

An economy's core is investment. It is fundamental in the models of economic growth. According to (Sial et al., 2010), while evaluating a country's economic performance, one of the primary factors of economic growth is investment. A favorable investment climate offers opportunities and incentives for private investors to profitably invest, create jobs, and enhance national output, ultimately encouraging private investment and economic growth(World, n.d.). In other words, private investment is a key factor in economic growth. But it can be affected by both government policies and private sector decisions. In order to create an advantageous investment atmosphere, careful planning and effective policies are essential.

Private investment plays a central role in creating jobs, transforming economies, and reducing poverty and inequality. In the Ethiopian development experience, it is viewed as a key substance for its accelerated development as it stands at the core of economic activities.

Inflation and interest rates also play a significant role in the functioning of most economic activities and have a direct and indirect impact on private investment. The relationship between private investment and interest rates, as well as between private investment and inflation, has sparked considerable interest among scholars, policymakers, and development practitioners and still are hot topics.

The variety of theoretical considerations, econometric methodologies, along with the diversity of economic contexts examined. However, substandard and methodological biases, including the structural breaks in the series and model misspecification, have often led to weak conclusions and limit the consistent policy implications required by the past empirical evidence.

Despite all the consideration given, clear definitive conclusions and consensus regarding the direction and the strength of the nexus between private investment, interest rates, and inflation have not been achieved thus far. While the critical role of these key macroeconomic variables for the conduct of economic activities is well-evident, it is found to be more confusing that their

interactions and impact on private investment have become very challenging for many economies, including Ethiopia.

Investment Proclamation No. 1180/2020 issued that Private sector investment is essential for establishing an economic framework that enhances the global competitiveness of the national economy, boosts export performance, creates better job opportunities, and fosters long-term relationships between different economic sectors.

The cost of making an investment is money that will be used in the future. It is a real asset project; real assets are tangible items like buildings, land, capital goods, infrastructure, inventories, etc. (Agu, 2015). All economic activity that uses resources, including human, material, and financial ones, to create commodities and services is referred to as investment. Investment significantly contributes to a nation's total economic growth by raising the economy's productivity potential, generating employment opportunities, and advancing technology by introducing new manufacturing methods. Through the acquisition of new capital goods, it is also crucial for improving the economy's long-term capacity for production (Anyanwu, 2012). Investing is a powerful force for driving economic growth and is a crucial tool in combating poverty. By boosting production capacity and creating new jobs, investment plays a key role in expanding opportunities for individuals.

Consequently, the importance of private money in development is becoming more widely acknowledged. Enhancing innovation, speeding economic growth, and reducing poverty can all be achieved by encouraging private investment. Long-term socioeconomic growth is eventually ensured by increasing employment opportunities, raising revenue, and raising the income of the poor (Fiestas & Sinha, 2011).

Several African nations have started economic reforms aiming at boosting the contribution of the private sector, for instance by privatizing State-owned businesses in order to generate revenue and also enhance capital market. Additionally, they have taken action to restore and sustain macroeconomic stability by devaluing national currencies that had become overvalued as well as by lowering inflation rates and budget deficits (Nachum, 1999).

The supply and demand for currency both affect inflation, according to the Quantity Theory of Money. Inflation always follows a rise in the money supply or a fall in the money supply. Additionally, the IS-LM model indicates that monetary policy can be used to influence national output by increasing the money supply and decreasing interest rates, which in turn encourages investors to increase their investment with low-cost funds available for loan. According to the model, a rise in the money supply could result in lower local interest rates than those experienced globally. Therefore, businesses could boost their output using readily available loans with cheap interest rates (Mankiw, 2010).

The impact of inflation on prices of products and services is critical for consumers and businesses to keep prices steady and a thriving economy. Interest rates must be modified frequently to prevent inflation. When analyzing the market, inflation and interest rates are crucial because they enable investors to identify their investment needs and choose investments that will generate returns that are higher than inflation. Maintaining a thriving economy and ensuring customer happiness depend on regular changes in interest rates.

Interest rates are vital for connecting the money market, overall public savings, and investment, according to economists. The opportunity cost of an investment is what influences investment activities and indicates how much money should be invested in order to achieve the desired level of savings. A rise in interest rates, however, drives up investment costs and reduces investors' returns. Investors will certainly become uneasy as a result of this, which will cause them to become less interested in investing in that particular sector of the market.

According to Alfred Marshall, the interest rate is the cost associated with using capital, and it tends to a level known as equilibrium, when the total amount of capital stock and demand are equal. If the market is limited, the supply of capital from adjacent areas will rise in response to increase in demand. A major country's aggregate capital supply, however, won't grow quickly. The short-term rise in interest rates will then follow. (Marshall, 1920) noted that the whole stock of capital can only grow gradually. More capital will be used and thus more investments will be made when the rate of interest decreases (Marshall, 1920).

Additionally, Marshall made a distinction between net interest and gross interest. Accordingly, the latter contains other components like commercial security and the organization of credit,

whereas the former is "the earnings for capital or the reward for waiting" (Marshall, 1920). Marshall established a link between economic activity, real interest rates, and inflation. People borrow more money and purchase more items when prices are expected to rise, which contributes to the price increase. Since real interest rates are lower in an environment of high inflation, those who borrow will benefit personally at the expense of the community while also paying back less actual value. And “in case of credit crunch and falling prices, everyone will want to sell the commodities and keep more money (namely, real interest rate will rise); this will decrease the prices and shrink the credits further” (Marshall, 1920). In other hand “when money supply (and thus the inflation rate) increases, the rate of interest tends to rise rather than falling” (Fisher, 1930) This study aims to study the association among interest rate and inflation and also the impacts of inflation and interest rates on private investment.

1.2 Statement of the problem

One of the most important aspects of economic growth and development is a country's capacity to invest and use its resources in an efficient and productive manner. The private sector's contribution to the size of the GDP and its capacity for wise resource allocation and usage are crucial in this regard. Without significant, high-quality investment and efficient resource usage, growth is impossible.

The impact of money on the real economy has always piqued the interest of economists and policymakers. That’s why monetary policy is one of the most potent tools available to monetary authorities for influencing significant macroeconomic variables. The implementation of a broad variety of monetary tools and rules by central banks fosters competitiveness, efficiency, and transparency, while also broadening financial exchange within the banking industry. It also encourages commercial banks' managing their liquidity and progressively leads to the creation of well-functioning money and financial markets, which have the potential to spur development and economic growth. However, the use of these instruments has been extremely limited as a result of Ethiopia's underdeveloped money market and nearly nonexistent financial market. Thus, it is planned to use a variety of monetary policy instruments and laws to successfully carry out the NBE's monetary management duty (NBE, 2009).

Fiscal and monetary policies are the two most significant macroeconomic factors in economics, with monetary policy being one of the most significant macroeconomic factors that the monetary authority utilizes to achieve certain economic goals in the economy. These macroeconomic goals include a fairly constant general price level, employment, economic growth and development, and balance of payments equilibrium (Mengesha, 2016).

Ethiopia's monetary policy authority is empowered to set minimum interest rates on deposits or rediscount rates charged to commercial banks, as well as to change the amount of reserves held by commercial banks through open market purchases and sales of government securities, set minimum capital requirements through regulatory actions, and intervene in foreign exchange markets by buying and selling local currency for foreign exchange(NBE, 2009). Banks are required by statute to retain a certain proportion of their deposits with the National Bank of Ethiopia. These requirements are considered crucial instruments for prudential regulation and monetary policy. Even though the banking system's liquidity level is still quite high, commercial banks have a strong incentive to increase profitability by extending credit. In order to prevent the risk of excessive inflation and to guarantee a stable macroeconomic environment for sound economic growth, it has been determined that monetary growth must be controlled. (NBE, 2007).

There are multiple researches on the determinants of private investment has been conducted (Alebachew Legass et al., 2022), (Yemisrach, 2022), (Fujaw et al., 2018), (Frehiwot, 2020), (Kanasa Kore, 2017). They analyze the private sector investment with the opportunities and challenges together. Their study examined the economic variables impacting private investment, finding that savings, credit, and gross domestic product are key positive factors, while inflation and external debt stock are identified as negative determinants. In addition to this Studying private investment is crucial due to the short- and long-term impacts of variables on the private investment sectors. However, it's important to note that the influence of variables on private investment can change over time. So the purpose of this study is trying to answer the question how does private investment interplay with inflation and interest rate?

In his interest rate theory, Irving Fisher asserts that the interest rate is determined by the desire to spend income immediately and the potential to grow income through delayed spending. Fisher also differentiates between nominal and real interest rates by considering the "expected inflation

rate." He provided evidence that when the expected price level is on the rise, nominal interest rates also increase. Fisher highlights that as the money supply (and inflation rate) grows, interest rates typically rise rather than decrease. (Fisher, 1930).

On the other hand Alfred Marshall established a link between economic activity, real interest rates, and inflation. People borrow more money and purchase more items when prices are expected to rise, which contributes to the price increase. Since real interest rates are lower in an environment of high inflation, those who borrow will benefit personally at the expense of the community while also paying back less actual value(Marshall, 1920).

This confusion is caused by the variety of economic contexts examined, econometric methods, and theoretical concerns. However, methodological biases have often led to weak results and limited the consistent policy implications that have been necessary based on prior empirical evidence, such as model misspecification and structural breaks in the series. Regarding the nature and degree of the relationship between inflation, interest rates, and private investment, a consensus and conclusive results have not yet been reached despite thorough consideration. These significant macroeconomic variables undoubtedly play a critical role in the conduct of economic activities, but it is unclear how they interact and relate private investment, which has made them exceedingly challenging for many economies, including Ethiopia.

Achieving genuine and lasting development is extremely difficult for developing nations because of their limited and scarce economic resources. These nations aim to enhance both their existing resources and investment as a key driver of economic growth. Developing countries vary in their effectiveness in using interest rates to incentivize investment. As a result, this study aims to assess the extent to which interest rates interplay with private investment.

In general, macroeconomic variables which are related to monetary policy variables are vary time to time like inflation, interest rate. And also to the best of the researcher's knowledge, no empirical research has been done on how interest rates, inflation, and private investment are related in the context of Ethiopia. The researcher sent this study with the intention of examining the connection between them, based on this particular case.

1.3 Research objectives

1.3.1 General Objectives

The general objective of this study is to investigate the nexuses between private investment, interest rate and inflation in Ethiopia.

1.3.2 Specific objectives

1. To investigate the interplay of inflation and private investment
2. To investigate the interplay of interest rate and private investment
3. To investigate the relationship between interest rate and inflation

1.4 Hypothesis of the study

The study's goal is to investigate the following hypothesis, which is put forth below. The study's hypotheses start with theories about inflation, interest rates, and private investment that have been developed over time by various researchers and supported by earlier empirical research.

Based on the objective, the present study seeks to test the following hypothesis.

H1: Interest rate has negative relationship with private investment.

H2: Inflation has negative relationship with private investment.

H3: There is negative relationship between Interest rate and Inflation.

1.5 Significance of the study

The best choice of any efficient macroeconomics policy may help a nation achieve improved economic standing, while the central banks' monetary policy is crucial in determining the true

effects of the policy on some key variables. As a result, this research offers the following implications and should be utilized to direct Ethiopia's monetary policy makers. The National Bank of Ethiopia, the country's central bank, would use the research findings and suggestions as a foundation and input to enhance its policy and regulations after carefully assessing the output because this study's focus was on the impact of monetary policy on private investment in Ethiopia. It is well recognized that there hasn't been enough research done in Ethiopia to determine how interest rates and inflation linked to private investment. This study offers several contributions to other researchers as a point of departure and source of information in Ethiopia's connected fields for those who wish to conduct more research on this and related topics.

From both a policy and scholarly viewpoint, it is also interesting to analyze the relationship between private investment, inflation, and interest rates in Ethiopia. Therefore, from a policy perspective, it is crucial for the private sector investment to understand the relationship between these endogenous variables. The study adds significantly to the body of knowledge already available on the relationships between interest rates, inflation, and private investment.

1.6 Scope and Limitation of the study

This paper's focus is on the relationship between Ethiopia's inflation, interest rates, and private investment. Data sources used in the study range from 1974 to 2023. Due to a lack of information on how monetary policy affects private investment in Ethiopia, this was the main factor in the decision to choose monetary policy. Endogenous variables are incorporated into the model in this study and assess whether they have an impact on Ethiopia's private investment or not.

1.7 Organization of the study

There are five chapters in this paper. The study's theoretical and empirical research is reviewed in the second chapter. The model specification, data sources and types, and estimation methods are covered in the third chapter. The study's results and discussion covered in the fourth chapter and finally conclusion and recommendations are found in the fifth chapter.

CHAPTER TWO: REVIEW OF RELATED LITERATURE REVIEW

2.1 Overview of investment in Ethiopia

It is safe to claim that the acquisition of land during the reign of Emperor Minilik II marked the beginning of private sector investment in Ethiopia. A scramble of princes that were essentially at war with one another for control of the region and to protect Ethiopia from outside aggression characterized this time period. Private property acquisition in the form of land started throughout this era and was regarded as a mark of prestige. However, due to weak market connections, it was unknown whether the land had been developed by the owners for economic gain. The private sector began to grow under Emperor Haile Selassie. Even during this time, a large portion of the private sector was focused on land and related industries. Private landowners created commercial farms and, as a forward connection, small-scale agro-processing companies. The right of people to own and use private property is firmly supported by the constitution.

90% of Ethiopia's population confide in land for their livelihood, which was previously privately owned and capable of development until it was taken by the Socialist Military Regime in 1974. There were no significant private investments in other industries, such as transportation and services. There were hardly any businesses that were jointly owned by private and state entities. The socialist military regime prevents much discussion of private sector development.

The objective of the strategy was to consistently impede the private sector. The region's impact of the policy has been a complete failure from the outset. There were persistent food shortages in the nation. Condemnation of private property, primarily land, led to this. Even when the Regime fell, this condition persisted on a larger scale.

During the reign of Emperor Proc. The enactment of No. 60/1944 and 107/1949 aimed to encourage foreign investment in Ethiopia. To promote investment, the Minister of Finance issued an income tax exemption notice in 1950. Following that, in 1956, the Income Tax Decree was enacted, offering income tax exemptions in an effort to promote

investment. Nevertheless, the Income Tax Proclamation of 1963 superseded this Decree. The first official law in Ethiopia to govern investment transactions was this decree. Three years later, i. e. Investment Proclamation No. was issued in 1966. 242/1966 came into effect. The unique aspect of those laws was that the government was not given any investment areas. As a result, investors had unrestricted access to all sectors of the economy. Additionally, they offered income tax holidays and exemptions from import and export income taxes as investment incentives. Foreign investors could also possess the land needed to support their investments. Despite the positive state of the private sector, there were relatively few domestic investors because there was a dearth of entrepreneurship. Proclamation on Investment No. 769/2012.

During the National Democratic Revolution (NDR), the Dergue regime enforced a socialist economic plan that discouraged private investment. It was noted that nationalization was a common practice during this period. Nationalization officially started with Proclamation No. 26/1977, which clearly stated that all key resources for economic development had to be under government control.

As a result, all private investments were under the government's control, and the private sector was limited to modest industrial endeavors. Nevertheless, the government permitted joint venture investments, or investments made in cooperation with the Ethiopian government. The administration wanted to bring in technology and capital know-how for the nation. But because the government's part may increase from 51 to 99% while private investors' share could decrease from 49 to 1%, the measure was seen as discouraging private investors.

The transitional government took over from the Dergue regime. which was founded in 1991 and embraced an investment and economic strategy that was diametrically opposed to the Dergue regime. The policy placed a strong emphasis on the contribution of private investment to Ethiopia's economic growth. Ethiopia started implementing a liberal economic policy in 1992, which is thought to be conducive to investment.

The Transitional Government issued Investment Proclamation No. 15/1992 to put this policy into effect and welcome private investment. The proclamation also reserved to the government certain areas, including postal service and broad eclectic power. Additionally, it allowed for joint investment with the government of Ethiopia. The proclamation offered incentives to draw

in and encourage private capital. It also included a guarantee against expropriation and nationalization. Consequently, "unless in compliance with the due process of law, no assets of a domestic or foreign investor may be expropriated or nationalized wholly or partially."

The proclamation established the Investment Office to oversee and control investment activities. Proclamation No. 37/1996 was passed to address the issue of the proclamation's higher capital requirements for foreign investors. Thus, Proclamation No. 37/1996 and Regulations No. 7/1996 represent important developments. To establish a joint venture, the minimum capital needed from foreign investors has been lowered from 500,000 USD to 300,000 USD.

2.2 Theoretical Perspectives

2.2.1 Classical Theory of Investment

The long-term equilibrium solution to the model that emerges asymptotically when supply, demand, interest rates, and technology are constant over time is what the classical theory of investment relates to. An industry-specific investment theory that offers a strong microeconomic foundation for Keynes' investment theory is provided by the general case with any expected time paths for supply, demand, technology, and interest rates (Hansson, 1986). The idea that the economy self-regulates is the cornerstone of classical theory. The natural level of real GDP, or output, is the level at which the economy can always reach when all of its resources are being used(Eklund, 2013).This is the view held by classical economists.

2.2.2 Neoclassical Theory of Investment

Jorgenson created the neoclassical theory of investment behavior in 1963. Investment behavior explains the optimal capital stock accumulation. According to (Jorgenson, 1963), resource usage and the production plan can be used to solve problems involving the maximization of utility. Production plan might be chosen to take advantage of the current significance of productive enterprise, and secondly, resource utilization is allocated to maximize utility depending on the current price of a product. Fixed prices and the choice of production plan are independent of the subsequent allocation of resource utilization over time. The neoclassical model was derived from the flexible accelerator model that is stated as a standard neoclassical model.

The theory brought up a number of profit-maximizing presumptions. These are: there is perfect market competition, no uncertainty, a constant interest rate, and flexible labor and capital costs. According to (Jorgenson, 1963), depending on interest rates, the predictable inflation rate of purchasing new machinery, and the investment tax rate, capital stock has a positive relationship with the expected level of output and a negative relationship with the use of existing disposal machinery. This theory emphasizes that capital stock plays a significant role in determining net investment, which an industrialist can fully exploit by maximizing expected profit over current output costs.

Conventional neoclassical theory places a strong emphasis on the role that interest rates and prices in general play in influencing investment decisions. The neoclassical theory holds that an investment demand schedule is implied by the rate of interest, that changes in the interest rate lead to equality between savings and investments, and that full employment of output can be established provided there is sufficient price flexibility. Additionally, the investment demand schedule and the trade-off between investment and interest rate that goes along with it result in a capital measurement that is necessary for the hypothetical one-commodity world economy in order to comply with the requirements of the neoclassical theory of value (Alexiou et al., 2014). Neoclassical investment theory suggests that Real output growth rate is positively correlated with investment because it reflects shifts in the total output demand that investors are trying to satisfy. If we assume that the level of real output and the intended capital stock are fixedly correlated in the underlying production function, we can also easily derive this relationship from a flexible-accelerator model (Lesotlho, 2006). The main tenets of neoclassical theorists were explicitly assumes profit maximization (Eklund, 2013). Generally, three broad categories of variables can be extracted from the theory of classical, Keynesian and neoclassical variables. The neoclassical determinants of private investment include real interest rate, user cost of capital, and capital investment, while variables that may be included in the Keynesian tradition include GDP growth, internal funds, and capacity utilization. (Lesotlho, 2006). Nonetheless, as a result, these three categories of investment theories are complementary as opposed to antagonistic. While Keynes investment theory is applicable for determining the industry's investment given any expected paths for supply, demand, and technology, classical theory is relevant for a comparative statics analysis of long-run equilibrium.

Neoclassical investment theory is applicable when analyzing the impact of changes on an individual firm (Hansson, 1986).

2.2.3 Keynesian Theory of Investment

British economist John Maynard Keynes advanced the Keynes theory of investing in the 1930s. The idea of an independent investment decision function in the economy was first introduced by Keynes in 1936. One of Keynes's main contributions was that the real performance of the macro economy depended on the concept of money in general. This broad strategy is demonstrated by the theory of investment, which holds that a firm's capital expenditures are influenced by financial and monitoring conditions (Fazzari, 1989). Keynes contends that investments are made up until the opportunity cost of capital is equal to the present value of anticipated future revenues at the margin. In other words, investments are made up until the point at which the net present value is zero. Future cash flows from an investment are anticipated (Eklund, 2013). Keynes believed that a higher initial investment leads to a higher final aggregate income. Investment is viewed as a function of the capital's marginal efficiency with respect to a certain interest rate level, which represents the capital's opportunity cost. Investment success, in his opinion, is contingent upon the future marginal return on capital in relation to the investment fund(Keynes, 1936 as cited in Hilina, 2012).

According to Asante (2000), a fundamental aspect of Keynesian analysis is the requirement that ex-post decisions about investments and savings be the same for both. They contend that as investors grow, they invest all of their savings, making savings equal to investment. Savings and investment will therefore interact to create an equilibrium point. Keynesians use this realization to support their claim that modest inflation can encourage investment by bringing down the real interest rate and, consequently, the cost of borrowing. On the other hand, excessive inflation can result in decreased investment and uncertainty.

Shortly after his colleague British economist John Maynard Keynes published The General Theory of Employment, Interest, and Money in 1936, British economist John Hicks first

presented the IS-LM model in 1937. Hicks' model, which is primarily utilized as a heuristic tool nowadays, functioned as a formalized graphical representation of Keynes' theories. "Investment-saving" (IS) and "liquidity preference-money supply" (LM) are the acronyms for IS-LM. The trio of crucial exogenous, i.e. The IS-LM model incorporates three external variables: consumption, investment, and liquidity.

The theory states that the amount and velocity of the money supply determine liquidity. Individual actors' marginal decisions determine the levels of investment and consumption. The output, or gross domestic product (GDP), and interest rates are examined in the IS-LM graph. There are just two markets that make up the entire economy: money and output. The supply and demand of each market drives the economy toward equilibrium. The IS-LM model is criticized by a large number of economists, including many Keynesians, for making naive and unrealistic assumptions about the macroeconomy. It is unable to explain the economy's concurrently high rates of inflation and unemployment.

Additionally, it is undermined by central banks' shift from aiming to control the money supply to utilizing an interest-rate rule. It was probably best to use the model as "a classroom gadget, to be super," as even Hicks later acknowledged that its flaws were fatal.

2.2.4. Irving Fisher's Theory of Interest

The "Fisher Effect," an economic theory created by Irving Fisher, describes the relationship between inflation and real and nominal interest rates. The real interest rate is equal to the nominal interest rate less the expected rate of inflation, according to the Fisher Effect. It is now possible to analyze the money supply and foreign exchange trading using the Fisher Effect.

A positive real interest rate indicates that the lender or investor has outperformed inflation. A negative real interest rate indicates that the rate on a loan or savings account is not higher than inflation. Fisher's equation illustrates that the real interest rate can be calculated by deducting the nominal interest rate from the expected rate of inflation.

Every provided rate in this equation is compounded. The Fisher Effect is evident every time you go to the bank: the interest rate an investor receives on a savings account is actually the nominal interest rate. For example, if the nominal interest rate is 4% and the expected rate of inflation is

3%, the money in a savings account is actually growing at a rate of 1%. Savings deposits will take longer to grow when considering purchasing power than when considering a lower real interest rate. The nominal interest rate that an individual receives is determined by the amount of their deposit. Unlike the nominal interest rate, the real interest rate accounts for purchasing power in its computation.

(M)(V)=(P)(T)

where:

M=Money Supply

V=Velocity of circulation (the number of times money changes hands)

P=Average Price Level

T=Volume of transactions of goods and services

Certain versions of the quantity theory predict that variations in the money supply will lead to proportionate increases and decreases in inflation and deflation. This claim is rejected by the majority of economists, and the available data does not support it. Two disclaimers are added by a more sophisticated version of the quantity theory: inflation cannot occur unless new money truly circulates in the economy. Inflation is not absolute; it is relative.

In other words, prices usually end up higher than they would have otherwise been when more dollar bills are used in economic transactions. Monetarists argue that a sharp increase in the money supply could lead to a sharp increase in inflation as well. This is because, when money growth exceeds the growth of economic output, too much money is supporting too little production of goods and services. To avoid an uncontrollably high level of inflation, the money supply must expand more slowly than the economy is growing.

Some monetarists may suggest raising the money supply as a temporary boost when they are brainstorming ways to improve the production level of an economy that is in dire need of it. Since monetary policy's long-term effects are less predictable, many

monetarists contend that maintaining the money supply within a reasonable range will help control inflation.

Rather than continuously modifying economic policies through taxing and spending, monetarists advise allowing non-inflationary measures, such as a slow reduction in the money supply, to drive an economy toward full employment. The basic assumptions of monetarism and the quantity theory of money continue to be contested by many Keynesian economists, who also contest the claim that the most effective approach to addressing economic growth is through economic policies that aim to manipulate the money supply.

A theory of economics known as Keynesian economics mainly refers to the idea that in order to affect aggregate demand and produce the best possible economic performance, the government should implement economic intervention and activist stabilization measures. British economist John Maynard Keynes created this theory in the 1930s as a part of his investigation into what causes the Great Depression in the first place.

Keynes promoted a government response to the global depression at the time that included cutting taxes and raising spending in order to boost demand and drag the economy out of the downturn. Along these lines, Keynes contested the quantity theory of money in the 1930s, arguing that real income—that is, the flow of money to the factors of production—rose while the money supply actually decreased. Money could therefore react differently to variations in the money supply.

Other economists have since demonstrated that Keynes' claim regarding the accuracy of the quantity theory of money is consistent with his original argument. Throughout the 1980s, several of monetarism's principles gained significant traction in both the U.S. s. also the U. KK. In an attempt to meet goals for money growth in their respective economies, leaders in both of these nations—Margarita Thatcher and Ronald Reagan, for example—tried to implement the philosophy. It was very real, though.

2.2.5. Tobin's Q Investment Theory

Nicholas Kaldor created the Q ratio in 1966, and Nobel laureate James Tobin popularized it. The Q ratio, sometimes referred to as Tobin's Q, assesses the relative overvaluation or undervaluation of a company or the market as a whole. It is predicated on the ideas of replacement value and market value. This theory's most basic form is the market value of a company's assets divided by their replacement cost. If q is higher than 1, it means that the market places a high value on the company's current assets, which attracts new investment. By raising the cost of capital, higher interest rates can lower Tobin's q and deter investment.

2.3. Review of the Empirical Literature

2.3.1. Relationship between Private Investment Inflation and Interest Rate

Interest rate changes can be interpreted as a reflection of the fundamental conditions under which the macroeconomic system operates. They also have an impact on all other macroeconomic variables that are relevant to the economy, including GDP, price level, employment, international balance of payments, and economic growth rate. One important economic variable is the interest rate, which affects both macro and microeconomic activities. Modern macroeconomic textbooks often describe an inverse relationship between interest rates and business investment. Understanding this relationship is crucial for understanding how monetary policy changes impact the economy.

In economics, interest is the cost of persuading individuals with money to save it rather than spend it, and to invest in long-term assets rather than hold onto cash (Alemayehu, 2021). The impact of the real interest rate on private investment is unclear, as it can have both negative and positive effects. Lower interest rates may encourage private economic agents to invest due to lower borrowing costs, aligning with the neoclassical investment model that views the real interest rate as a key factor in the cost of capital. However, the McKinnon-Shaw hypothesis suggests a positive relationship between the real interest rate and private investment, indicating that higher interest rates offered by financial institutions could lead to more funds available for investment through savings, ultimately increasing levels of private investment.

As long as the real interest rate's impact on saving exceeds that of unit cost, interest and investment have a positive relationship, according to McKinnon (1973) and Shaw (1973). The real interest rate implies that future increases in the real interest rate will raise the user cost of capital, resulting in a negative net profit for investors, according to empirical data from Lesotho (Molapo & Damane, 2015). Investment in real sector activity is determined by interest rates; as interest rates rise, investment will decrease. On the other hand, a decline in interest rates would result in a rise in demand for investments. As such, a real interest rate that is capable of transferring funds from savers to investors is essential for a successful private investment.

In contrast to the conventional theory, some researchers came to the conclusion that interest rates and investment positively correlated. An analysis of real financial assets based on data from 21 developing nations between 1971 and 1980 revealed a positive correlation between investment and the rise in real interest rates (Lisuyuan, 2015). The relationship between investment and interest rate in an uncertain environment was found to be positively correlated if the discount factor was chosen to represent the investment variable and the GMM estimation method was applied. Additionally, the correlation would be more positive the higher the interest rate's volatility (Lisuyuan, 2015). Additionally, some academics think that the rates might not affect the investment. When the causal relationship between interest rates and investment was tested using the VAR model, it was discovered that investment was more dependent on macroeconomic demand than interest rates (Dore Mohammed et al. 2013). An examination of three rate increases in West Germany between 1960 and 1978 revealed that the impact of interest rates on investment differed in the two periods because of the different policies (R. T. Baillie and P. C. McMahon (1981).

(Hambur & Cava, 2018) have investigated how Interest Rate affects business Investment in a company level data. Investing is a diverse endeavor. Certain businesses always invest more than others, depending on the situation. Because of this, empirical research that takes advantage of this heterogeneity at the corporate level usually succeeds better in simulating business investment. (e.g. La Cava 2005; (Gilchrist & Zakrajsek, 2007). Using data at the company level can also assist in reducing the issue of endogeneity in time-series analysis. For example, central banks typically increase interest rates during times of robust economic growth when investments are high, and lower them during slowdowns. This

causality creates challenges in identifying a clear negative relationship between interest rates and investments when using aggregate data.

They come to the conclusion that different companies have very different costs associated with debt and investment; at any given time, some companies may be investing while others may not. Additionally, different interest rates apply to individuals who are investing. This study emphasizes how crucial it is to take this heterogeneity into consideration when examining the connection between investment and financing costs. They provide evidence that some businesses have continued to pay comparatively high interest rates in recent years. Furthermore, they demonstrate a strong negative correlation—which is challenging to demonstrate with aggregate time series data between company-specific interest rates and investment.

(Lisuyuan, 2015) has also looked into how interest rates affect investments in Jiangsu Province, China. To test the relationship between interest rates and investments, they established a vector equivalent curve model (VECM) using investment and rate data from 2003 to 2012. They came to the conclusion that the variables have a long-term equilibrium relationship. Investment and interest rate have a negative relationship over the long term; if the rate drops, the investment will rise. On the other hand, there is a positive short-term correlation between rate and investment. The investment will rise in tandem with an increase in interest rates.

(Iorember, 2015) used interest rate quarterly data for space modeling and the Kalman Filtering Technique for the years 1999–2013. According to out-of-sample interest rate forecasts, Nigeria's interest rate will likely be close to the national average of 18%. From the first quarter of 2014 to the fourth quarter of 2020, this trend would be seen. According to the study's conclusion, an effective policy measure needs to be implemented because the current level of interest rates is detrimental to the state of investment in the economy. The authors also emphasized how the economy's Small and Medium-Sized Enterprises (SMEs) would suffer from a sustained increase in interest rates.

According to (Fujiawa et al. 2018), (Yirtaw Gizachew G. , 2017), they attempt to look into and analyze the variables that affect private investment in Ethiopia between 1996 and 2016. The results of the regression demonstrate that while foreign direct investment and lending

interest rates have a significant but negative impact on the performance of private investment, real GDP, bank credit availability, external debt servicing, and public investment have a significant positive impact on private investment. They recommended fortifying financial institutions capable of providing sufficient financial resources to private investors.

The classical theory posited that a higher interest rate would incentivize people to save more, resulting in an increase in domestic credit and ultimately leading to a boost in investment activity. Similarly, a Long-Run ARDL Model conducted by (Alebachew Legass et al., 2022) found a positive and significant correlation between interest rates and gross private investment at a 5% level of significance. This study indicated that the current interest rate plays a significant role in influencing private investment in the short term.

Wasihun Demeke (2018) on their MSc thesis they try to analyze factors that determine the private sector investment and they reveal inflation has a negative role in promoting private investment.

(Fischer et al., 2016) on their paper entitled "Investment Choice and Inflation Uncertainty" Small businesses cut back on their overall investment during times of high inflation uncertainty. A shift in the mix of investments away from fixed assets, the less flexible factor, and toward working capital is also linked to periods of high inflation uncertainty. The principal cause of this decline in fixed asset investment is a decrease in the probability of making any fixed asset investment. When considered collectively, the findings provide credence to a real option model of investment's connection between inflation uncertainty and actual economic activity. The outcomes hold up well when inflation, exchange rates, overall economic activity, and potentially endogenous borrowing decision timing are taken into account.

(Iqbal & Nawaz, 2010) has analyzed the nexus between investment and inflation with economic growth in Pakistan. And their study result indicates that inflation has significant and negative impact on investment/GDP ratio.

According to (Mohammed, 2002), (Molapo and Damane, 2015), and (Kaputo, 2011), private investment is negatively impacted by inflation in Sierra Leone, Zambia, and Lesotho. The expectation of low return on capital among domestic investors has resulted in a decrease in private investment due to inflation.

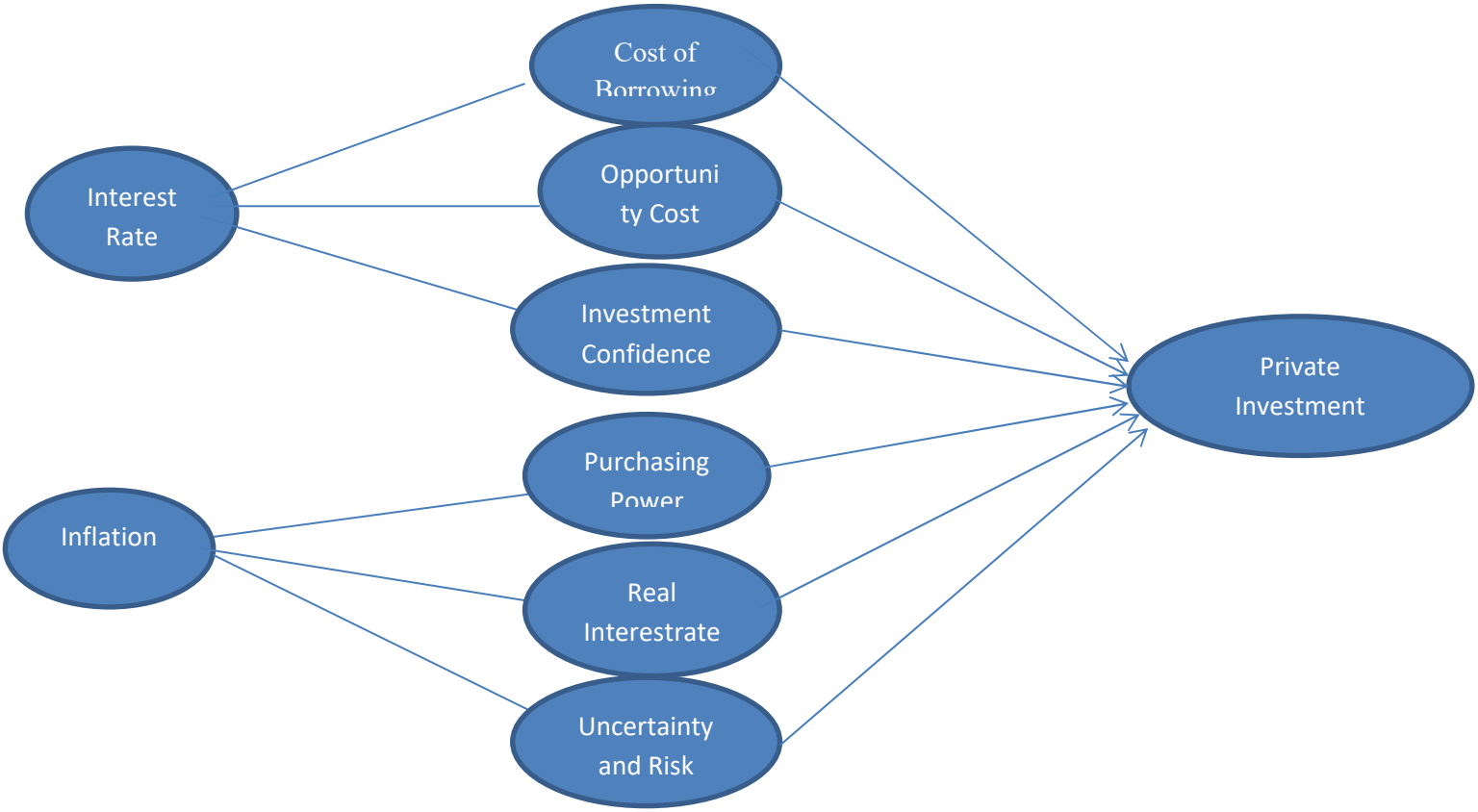
Alfred Marshall defined interest rate as the cost of using capital, and he said that it tends to an equilibrium level where total capital stock and total demand for capital are equal. If the market is small, an increase in the demand from neighboring districts will be met by an increase in the supply of capital. But the aggregate capital supply won't rise quickly for the entire globe or a sizable nation. Next, the short-term increase will be in the interest rate. Only very gradually can the total stock of capital rise (Marshall, 1920). More capital will be used and consequently more investments will be made when the rate of interest declines (Marshall, 1920). Additionally, Marshall made a distinction between "gross interest" and "net interest.". As a result, the former is defined as "the earnings for capital or the reward for waiting," while the latter also comprises other components like credit organization and commercial security (Marshall, 1920). Not to mention, Marshall showed a link between economic activity, real interest rates, and inflation. People borrow more money and purchase more goods when prices are likely to rise, which contributes to further price increases. When inflation is high, borrowing individuals will repay less real value and enrich themselves at the expense of the community because real interest rates will be lower. Additionally, everyone will want to sell the commodities and keep more money in the event of a credit crunch and declining prices.

Irving Fisher maintained that the two "opportunity principles," the two "impatience principles," and the two "market principles" are the three pairs of factors that determine the rate of interest. The other two pairs show the objective and subjective forces that underlie supply and demand, while market principles are related to supply and demand. The subjective factor illustrates the influence of "human impatience" or "time preference" in two ways: first, the rate of "time preference" is determined by people's attitudes and future income; second, the market rate is a crystallization of "human impatience" with regard to spending money. The investment opportunity rate, also known as the rate of return, is the objective factor. Two things go into this: first, each person has the power to alter the nature of their prospective income; and second, the market rate also takes into account the possibility of future income growth coming at the expense of current income. To summarize, interest rates are determined by two factors: the desire to spend money right away and the chance to save money by delaying spending (Fisher, 1930). Fisher also used the "expected inflation rate" to distinguish between the nominal and real rates of interest. He provided some evidence that the

nominal interest rate tends to rise along with the expected price level. Furthermore, he emphasized that the rate of interest tends to rise rather than fall when the money supply (and consequently, the rate of inflation) increases (Fisher, 1930).

(Bagci & Erguven, 2016) has studied the Relations between Interest Rate, Inflation, Growth and Investment in Turkey, from 2002-2015. They came to the conclusion that the weak relationships between interest rates and investments are demonstrated by Pearson and Kendall's Tau correlation tests. However, there is a moderately positive relationship between interest rates and inflation. Although their initial positive correlation may seem odd, we can argue that these two indicators are dependent variables for the period under consideration because the same factors made it possible for their decrease. The study's findings ran counter to the widely held belief that interest rates influence economic growth and investment patterns. Furthermore, the study discovered no evidence of the relationship between these variables that the economic theory predicted, and there was only a weak correlation between interest rate and growth.

2.4 Conceptual framework



The diagram demonstrates the pathways through which interest rates and inflation influence private investment. Each factor affects various aspects of the investment environment, such as borrowing costs, opportunity costs, purchasing power, and risk, which in turn shape private investment decisions. The framework captures these interconnections, showing how each factor indirectly or directly impacts private investment.

CHAPTER THREE: METHDOLOGY

3.1. Definition of Variables

Private Investment:- The entire amount added to the stocks of assets (purchases and own-account capital formation) in the private sector, less any sales of used and scrapped assets, is known as gross domestic investment.

Interest Rate:-Interest rates impact the economy broadly and private investment specifically in a variety of ways. It has an impact on bank credit volume, saving rates, and the private sector's capacity to borrow money for investments. The interest rate an investor expects to receive after making an investment is known as the real interest rate. The bank rate or prime rate is closest to it. According to the Fisher equation, the real interest rate is equal to the nominal interest rate less the rate of inflation. Divergent opinions exist regarding how real interest rates affect private investment. The real cost of capital increases with high real interest rates, which in turn reduces private investment and vice versa. Economists claim that interest is the price of investing. Research has demonstrated an inverse relationship between the performance of the private sectors in Zambia and Sierra Leone and the interest rate. According to (Mohammed, 2002), A rise in the real interest rate will increase the user cost of capital and reduce the profitability of investments. (Kaputo, 2011) discovered that the high cost of investment capital deters local firms from making investments, which has a major negative long-term impact on the real lending interest rate. An acceptable interest rate promotes investment and, consequently, saving. According to this, higher interest rates on loans have a greater tendency to discourage investment while they increase the likelihood of investment in bank deposits. It is crucial to take t into account as a result.

Inflation :- Inflation has been defined and conceptualized in a number of ways until recently. Keynesians define inflation as occurring when the money supply grows faster than the level of full employment, while neoclassical economists initially described inflation as a raging increase in prices brought on by an excess of money. It is generally acknowledged that inflation refers to a persistent rise in the general price level, despite the fact that various theoretical mainstreams have offered several alternative interpretations and concepts. Alternatively, inflation may be understood to signify a decline in the purchasing power of money or a

depreciation of the monetary unit. Private investment is significantly influenced by the rate of inflation. High and increasing rates of inflation are a sign of macroeconomic instability, and while moderate inflation is necessary for businesses to succeed in the nation, it has a detrimental effect on private investment. According to (Oshikoya, 1994), investment in developing nations is suffering as a result of high inflation. Diminishing the value of money leads to a decrease in the economy's saving rate, which in turn accumulates investible funds for future use. A decline in the buying power of one unit of money is reflected in inflation. People have to spend more money in order to purchase fewer goods when there is high inflation. Elevated inflation rates have an adverse effect on the private sector. investing activities by making long-term investments more risky.

3.2. Source of Data

This study's data came from a variety of sources. Time-series information on interest rates, inflation, and private investment. The research has incorporated secondary data from reputable sources such as websites, other official resources, and direct official data from the NBE, CSA, EIC, and IMF. The researcher also made use of official publications, research documents, statistical reports, and annual reports. As previously mentioned, the information is entirely secondary and consistent with earlier research on private investment.

3.3 Descriptive Analysis

Descriptive analysis in time series involves summarizing and understanding the main features of the data collected over time. It includes a variety of techniques and statistics to provide insights into the temporal characteristics and patterns. Here's key components and methods used in this time series data: Summary Statistics, and distributional analysis.

3.4. Estimation Technique

3.4.1. Stationarity Test

Empirical research based on time-series data presumes that the underlying time series is stationary, according to Davidson and MacKinnon (2021). It is vital to determine the time-series characteristics of the data before estimating a macroeconomic time-series model of the kind taken into consideration in this study. In order to prevent improper model specification and deceptive outcomes, it is necessary to assess whether the variables in the model are stationary as well as their orders of integration. A process is said to be stationary if its distribution does not change when its time interval is arbitrarily changed. According to Endders (1995) and Gujarati (2003), a stochastic process is considered weakly stationary if its variance and mean remain constant over time and the covariance value between two time periods solely depends on the distance or gap between them, rather than the time at which the covariance is computed. Additionally, a time series is deemed strictly stationary by (Gujarati, 2003) if every moment of its probability distribution remains constant over time. On the other hand, the variance and the mean, which are the two moments of the normal stochastic process, fully describe it.

The stationarity of each series is confirmed with both the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. A time series is considered to be integrated of order d, denoted as I(d), if it becomes stationary after being differenced at least d times (Dickey & Fuller, 1979). The results of the stationarity tests may vary depending on whether a constant and/or a time trend is included in the regression. The decision to include a constant and/or trend is determined by formally testing their statistical significance in the respective stationarity test regression equations.

3.4.2. Testing for Unit Roots

One method that is now frequently used to check for stationarity is the unit root test. The Dickey-Fuller (DF) test, the Augmented Dickey-Fuller (ADF) test, and the Phillips-Peron test are three methods for determining whether a unit root exists. The ADF test is used in this study to ascertain whether a unit root exists. The Dickey-Fuller (DF) test and its straightforward extension, the Augmented Dickey Fuller (ADF) tests, are widely used

formal tests for the presence of a unit root in data (Harris, 1985). The process of augmenting a dependent variable involves adding lag values (p) of its first differences as extra regressors to account for the potential for autocorrelation.

Augmented Dickey-Fuller (ADF) Test

A method for determining whether a time series variable is stationary by directly testing the null of the unit root (non-stationary) was developed by (Dickey and Fuller, 1979). A straightforward autoregressive of order one, or AR (1) process with a white-noise disturbance serves as the foundation for the original Dickey-Fuller (DF) test. Nevertheless, the error terms may be serially correlated since the DF test regression does not include values of variables with more than one lag; as a result, results derived from such tests may be skewed and invalid (Davidson and Mackinnon, 1999; Gujarati, 2004; and Kirchgassner and Wolters, 2007). By adding lag-difference terms to account for serial correlation, the ADF test circumvents this issue (Greene, 2003).

The following is the general form of the ADF equation without the intercept term and time trend:

$$Yt = \delta Yt\text{-}1 + \sum_{i=2}^{p} \Psi i \Delta Y_{t-i+1} + \varepsilon t$$

The situation where the auto regression contains just the intercept is expressed as.

$$Yt = a0 \quad + \delta Yt\text{-}1 + \sum_{i=2}^{p} \Psi i \Delta Y_{t-i+1} + \varepsilon t$$

When the autoregression includes both the intercept and a trend, the equation takes the following form:

$$Yt = a0 + \delta Yt\text{-}1 + \sum_{i=2}^{p} \Psi i \Delta Y_{t-i+1} + a1t + \varepsilon t$$

Assuming that t is an error term and Δ is the first-difference operator, let Yt be any variable in the model that needs to be tested for stationarity. In the aforementioned three equations, the alternative that $\delta < 0$ is the null hypothesis of ADF, and a rejection of this hypothesis signifies that the time series is stationary and devoid of a unit root (Enders 1995). The Dickey-Fuller test, in which the critical values differ for three regressions, provides the appropriate critical values to be used after the equations have been estimated in order to test for the presence of a unit root. The resulting "t" statistics are compared with

the corresponding critical values provided in the Dickey-Fuller tables following the estimation of the equations using OLS. However, compared to Dickey and Fuller's tabulated simulations, MacKinnon (1991) implemented a much larger set of simulations. Furthermore, MacKinnon uses the simulation results to estimate the response surface, allowing Dickey-Fuller critical values to be calculated for any sample size and any number of right-hand variables. Thus, the unit root test in this study employs MacKinnon critical values. The presence of the unit root is not ruled out as the null hypothesis if the t-calculated value is less than the MacKinnon critical value.

Phillips-Perron Test

Nandwa and Mohan (2007) state that the Phillips-Perron (PP) test is an alternative stationarity test that has the same null as the ADF test. It is argued that the PP test is superior to the ADF test in terms of finite sample properties and is more robust to serial correlation and time-dependent heteroskedasticity (Deme, 2002). Unlike the ADF, the PP test employs non-parametric statistical techniques instead of adding lag difference terms to account for a possible serial correlation in the error terms. The ADF test Statistic and this test's statistic have the same asymptotic distribution (Gujarati, 2004). Kirchgassner and Wolters (2007) countered that if the first-order autocorrelation coefficient is near to one under the alternative hypothesis, then both tests have low power. Large sample sizes are required to reject the null hypothesis if the mean reverting behavior is only slightly pronounced, according to these researchers. These authors further contended that, at least insofar as only monthly, quarterly, or annual data are available, it is impossible to achieve such a sample size when dealing with macroeconomic data.

3.5. Econometric Method

3.5. 1.Vector Autoregressive (VAR) Modeling and Co-Integration Analysis

The co-integration test has been used recently to examine long-term linear relationships between variables when there are short-term deviations from the long-term equilibrium. Initially differencing seems to offer suitable solutions for weakly stationary series when they have a unit root and are non-stationary. Nonetheless, a significant drawback of first differencing is its propensity to overlook the long-term characteristics of the data. If the integration of two time series, yt and xt, is of order d (i.e. e. I (d)), then any linear combination of the two series will, in general, likewise be I (d); in other words, I (d) is the residual that results from regressing Yt on xt. However, Engle and Granger (1987) define yt and xt as cointegrated of order (d,b) if there exists a vector b, such that the disturbance term from the regression (et = yt - bxt) is of a lower order of integration I (d-b), where b>0.

This study's co-integration testing and VECM process adheres to the methodology established and employed by Johansen (1988, 1991), as well as Johansen and Juselius (1990). For the following reasons, this approach is recommended over the Engel-Granger two-step procedure, which is based on a single equation. It is possible to check for the presence of multiple co-integration vectors using the Johansen (1988) procedure. Additionally, it allows the model to be estimated without prioritizing or restricting the variables as endogenous or exogenous. It is employed to ascertain the time-varying responses of each endogenous variable to a shock, both in that variable and in all other endogenous variables.

As demonstrated by Johansen (1988, 1991), a test of reduced rank of a regression coefficient matrix can be used to express the co-integration test. The test statistic can be calculated from the value problem solution, and the coefficient matrix can be reliably estimated using linear regression techniques. Additionally, the limitations of the Engle-Granger method likelihood ratio test statistic, which has a χ 2 distribution, can be calculated in order to assess linear constraints on the co-integrating parameters (Walls, 1993). The following formulation of the VAR model serves as the foundation for this process. The general pth-order VAR, as presented in Johansen and Juselius (1990), takes into account the K-lags of Zt and represents the interrelationships among the n variables in the model.

$$Z\,t = \Omega + \partial 1\ Z\ t\text{-}1 + \partial\ 2\ \ Z\ t\text{-}2 + \ldots + \partial p\ Z\ t\text{-}p + \varepsilon\ t = \Omega + \sum_{i=1}^{p} \partial i\ Zt - i + \boldsymbol{\varepsilon t} + \varepsilon\ t$$

Zt is a vector with dimensions of n rows and 1 column, containing the n variables ∂ i; ∂ i is a matrix with dimensions of n rows and n columns, representing coefficients; W is a vector containing deterministic terms such as trends and intercepts; and ε t is a vector of error terms with independent and identically distributed properties with a mean of 0 and a covariance matrix Σ.

3.5.2 The Vector Error Correction Model (VECM)

The Vector Error Correction Model (VECM) provides insights into both the short-term dynamics and long-term relationships within the model, where disequilibrium is seen as a mechanism for aligning with the long-run equilibrium. According to the Granger representation theorem, when certain variables are found to be co-integrated, the VECM can be expressed in the following form:

$\Delta Zt = \psi\Omega + \prod Zt\text{-}1 + \theta 1\Delta Zt\text{-}1 + \ldots + \theta p\Delta Zt\text{-}p\text{-}1 + \varepsilon t = \psi\Omega + \prod Zt\text{-}1 -$

$$\sum_{i=1}^{p-1} \theta i \Delta Zt - i + \varepsilon t$$

Where, ΔZt represents the first differences of the variables; $\theta 1 = -\sum_{j=i+1}^{r} a_j$ is (nxn) coefficient matrix in the error correction term (which contains short-run parameters); and

$\prod = \sum_{i=1}^{p} a_i - I$ is (nxn) matrix of long-run responses, which contains information about the long-run relationships. Further, the error terms are assumed to be Gaussian or well-behaved.

Davidson and Mackinnon (1999) state that since the cointegration result may be sensitive to the number of lags included in the VAR, determining the appropriate lag length is necessary for the estimation of the VECM. Therefore, we must first determine the appropriate lag length before performing cointegration testing and estimating the VECM. This can be done by applying the well-known model selection criteria, namely the Akaiki Information Criteria (AIC), the Final Prediction Error (FPE), the Hannan-Quinn Information Criteria (HQ), and the Schwarz (Bayesian) Information Criteria (SIC). Finding the number of unique linear combinations of the variables—or, to put it more technically, the number of independent co-integrating vectors—is the next task. Finding the rank of (r) of the long run matrix (Π) in the Johansen (1988) method yields the number of cointegrating vectors between the variables.

There are generally three scenarios that could happen. The first scenario is when r=0, in which case the levels of any variable in vector Z have no long-term relationship and the short-run dynamics rely only on the lagged changes in the variables (i.e. e. the system is non-stationary, all rows are linearly dependent, and there is no co-integration relation. All linear combinations, however, would be stationary if r=n. In this instance,

using unrestricted OLS to estimate the level VAR and the VECM will produce the same results (Davidson and Mackinnon, 1999). Apart from these two extreme scenarios, there is typically the intermediate case of $0<r<n$, which suggests a relationship of co-integration. The system is non-stationary in this instance, but there exist r stationary cointegrating relationships; Π is considered to have reduced rank and to contain stationary long-run equilibrium information. To get a linear relationship between the variables that can be understood economically, exogeneity and causality tests must be added to the rank determination process (Badawi, 2005). Utilizing the maximal eigenvalue (λ maximum) statistics and the two likelihood ratio tests (the trace, λ trace) yields the rank of the long-run matrix and, consequently, the number of co-integrating vectors.

These statistics are given by

$$\lambda \text{ trace } (r) = -T \sum_{i=r+1}^{n} \ln - (1 - \lambda i)$$

and λ maximum$(r,r+1) = -T \ln(1- \lambda r+1)$

where T is the number of observations, λ is the estimated characteristic root (Eigen values) from the matrix, and r is the number of co-integrating vectors under the null. The trace method verifies the fundamentals' current (actual) values.

3.5.3. ARDL model

Assume that a collection of K explanatory variables and an outcome variable yt should have an equilibrium connection. xt is equal to (x1t, x2t,..., xKt). 0: yt = x 0 tθ + et (1) + b0 + b1t

A linear time trend's slope coefficient is denoted by b1, while the regression line's intercept is denoted by b0. At successive time points t = 1, 2,..., T, the data are observed. Even in cases when there is no underlying relationship between the variables, ordinary least squares (OLS) estimation of the regression coefficients in such a static model may produce spuriously huge coefficient estimations. After taking into consideration the potential for a deterministic temporal trend, this is known to occur when the error component et is nonstationary due to the nonstationarity of yt and xt.

If yt and some or all of the variables xt are cointegrated, that is, when yt and xt are independently integrated of order 1, I(1), but there is a linear combination between them so that et is integrated of order 0, I(0), then equation (1) is still a viable regression model. If there is a conditional long-run equilibrium connection, which a process eventually returns to, it is reflected in equation (1). The process may deviate from this equilibrium in the near term, however the dynamic evolution of the process while it is not on the equilibrium path is not covered by the equation above. Since these aberrations are only temporary, I(0) is the element in the data-generating process (DGP) that governs them. Conventional hypothesis tests and regression diagnostics are rendered useless by these ignored I(0) components in the DGP, which have an impact on the finite-sample (and perhaps asymptotic) distributions of test statistics. We can include lags of the dependent and independent variables to the regression equation to get around the issues that come with fitting a static model.

We can even add a second set of L exogenous variables, zt, which do not alter yt's equilibrium path but might be able to anticipate its short-term variations. All of the variables in zt are assumed to be (trend) stationary. The goal of this model augmentation is to create a dynamically complete model with a regression error term ut that is serial correlation-free:

yt = c0 + c1t + Xp i=1 φiyt−i + Xq i=0 β 0 ixt−i + γ 0 zt + ut (2)

t = 1 + p ∗ , . . . , T. Leaving aside the variables zt, this is a general ARDL (p, q, . . . , q) model with intercept c0, linear trend c1t, and lag orders p ∗ [1, p∗] and q ∈ [0, p∗]. 4 To ensure that there are enough degrees of freedom available to fit the model's coefficients with sufficient precision, we may need to choose the maximum admissible lag order p ∗ conservatively. This is especially relevant when the number of observations in the dataset (T) is relatively small, the number of variables in xt (K) is relatively large, or both.

Given the initial observations y1, y2, . . . , yp∗ and the time paths of xt and zt, describes the dynamic evolution of yt over time, regardless of whether a relationship is in equilibrium. Depending on the characteristics of the variables being studied, the model may or may not include the intercept c0 and the linear time trend c1t. In order to eliminate any contemporaneous feedback from yt to xt and guarantee that the variables xt are weakly exogenous/long-run forcing, we assume that the ARDL model has enough lags to remove any residual serial correlation from the error term. Conventional asymptotic theory can be used for statistical inference on any of the coefficients if there is a stable long-term relationship, even if some of the variables are nonstationary (Pesaran and Shin 1998). This emphasises how crucial it is to check for the presence of such a long-term relationship.

All regressions must be based on the same estimation sample in order for the model-selection criteria to be comparable. For this reason, a predetermined maximum lag order p ∗ was initially chosen. The estimation of the model does not utilise all of the available observations when both p and q are less than p ∗. We must pay this cost in order to consult the model-selection criteria. We can then retrain the model using all of the available observations by setting p ∗= max(p, q) after determining the ideal lag orders p and q.

Bounds test

It takes a little more work to check for the presence of a long-term relationship, even if we can reliably estimate every coefficient in the ARDL model or its EC representations. The test statistics exhibit nonstandard distributions because the procedure for yt contains a unit root under the null hypothesis that there is no long-term association. Furthermore, the selection of deterministic model components affects the tests. We have permitted an intercept c0 and a linear temporal trend c1t in the ARDL model and its EC

representations.

To conclude that there is statistical evidence for a long-run relationship, i.e., $(\alpha > 0) \cap (\theta$ not equal to 0), the null hypotheses from all steps must be rejected. It is evident that the alternative theory is not excluded.

For the test statistics in, Pesaran, Shin, and Smith (2001) derive the asymptotic distributions under two scenarios. In the first scenario, all long-run forcing variables xt are individually I(0). In the second scenario, all of them are I(1) and not mutually cointegrated. When the cointegration properties of xt are unknown, the corresponding CVs form lower and upper bounds. Conclusive evidence is possible when the value of the test statistic falls outside these bounds. The region for not rejecting the null hypothesis is below the lower bound (closer to zero), and the rejection region is above the upper bound. The test is inconclusive if the test statistic falls between the two bounds. Because the distributions have nonstandard forms, CVs have to be obtained by simulations. This is complicated by the fact that the distributions depend on the number of variables in xt. For $K \leq 10$, Pesaran, Shin, and Smith (2001) tabulated near-asymptotic CVs for the F statistic and the t statistic. However, the asymptotic distributions might be poor approximations when the sample size is relatively small.

Note that the distributions and CVs are obtained under the assumption of independent and identically normally distributed errors ut. As mentioned earlier, a standard procedure for dealing with suspected serial correlation is to increase the lag orders p, q, or both in the ARDL model. While the p + Kq short-run terms in the EC representation do not affect the asymptotic distributions of the test statistics, they are relevant for the finite-sample distributions. Consequently, different CVs are needed for each combination of T, K, and p+Kq, separately for the lower and upper bounds. Kripfganz and Schneider (2020) estimated response-surface regressions, which can forecast CVs for any desired sample size, number of long-run driving variables, and lag order, as an alternative to tabulating enormous amounts of CVs. Asymptotic CVs are included in this. This method's capacity to calculate estimated p-values, which aid in statistical inference, is another significant benefit.

3.5.4 Diagnostic Checks

Vector Autocorrelation Test

The test of serial correlation of the residuals is an additional diagnostic tool for assessing the robustness and full specification of an econometric model's output. The Breusch-Godfrey Lagrange Multiplier (LM) test is a multivariate test for residual serial correlation up to a given lag order that is used in this study. An auxiliary regression of the residuals (εt) on the original variables and the lagged residuals (εt-L) yields the test statistic for the selected lag order (L).

LM= (T-q) R2

$\varepsilon^{\wedge}$

where the LM test statistic is χ 2 distributed, q denotes the degrees of freedom, and R2ε^ is the coefficient of determination derived from the auxiliary regression. The LM compares the alternative of auto-correlated residuals to the null hypothesis of no serial correlation.

Heteroskedasticity Test

The last diagnostic test included in this study is the test of heteroskedasticity. White's test is used to evaluate the residuals' heteroskedasticity. White's test confirms the null hypothesis that the residuals are both homoskedastic and that there is no misspecification problem. In order to test the joint significance of the regression, each cross-product of the residuals is regressed on the cross-products of the regressors.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1. Descriptive Analysis

Understanding the complex relationships between private investment, inflation, and interest rates is crucial for policymakers in developing countries like Ethiopia, as these macroeconomic variables play a pivotal role in shaping the country's economic trajectory. Private investment plays a crucial role in stimulating economic expansion, as it enables the expansion of production capacity, the adoption of new technologies, and the creation of employment opportunities. At the same time, inflation and interest rates can significantly influence private investment decisions, as they affect the cost of capital and the overall business environment.

summarize ln_inflation ln_InterestRate ln_PrivateInvestment

Table 1 Summary Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
ln_inflation	28	2.205	1.238348	-2.302585	4.010963
ln_Interes~e	32	2.508328	.1589018	1.916923	2.74084
ln_Private~t	32	8.482213	1.073004	5.780126	11.04276

Source: own computation, 2024

The summary statistics for the key variables; ln_inflation: This variable represents the natural logarithm of the inflation rate in Ethiopia. The dataset has 28 observations with a mean of 2.205 and a standard deviation of 1.238. The minimum value is -2.303 and the maximum is 4.011, indicating a wide range of inflation experiences over the sample period.

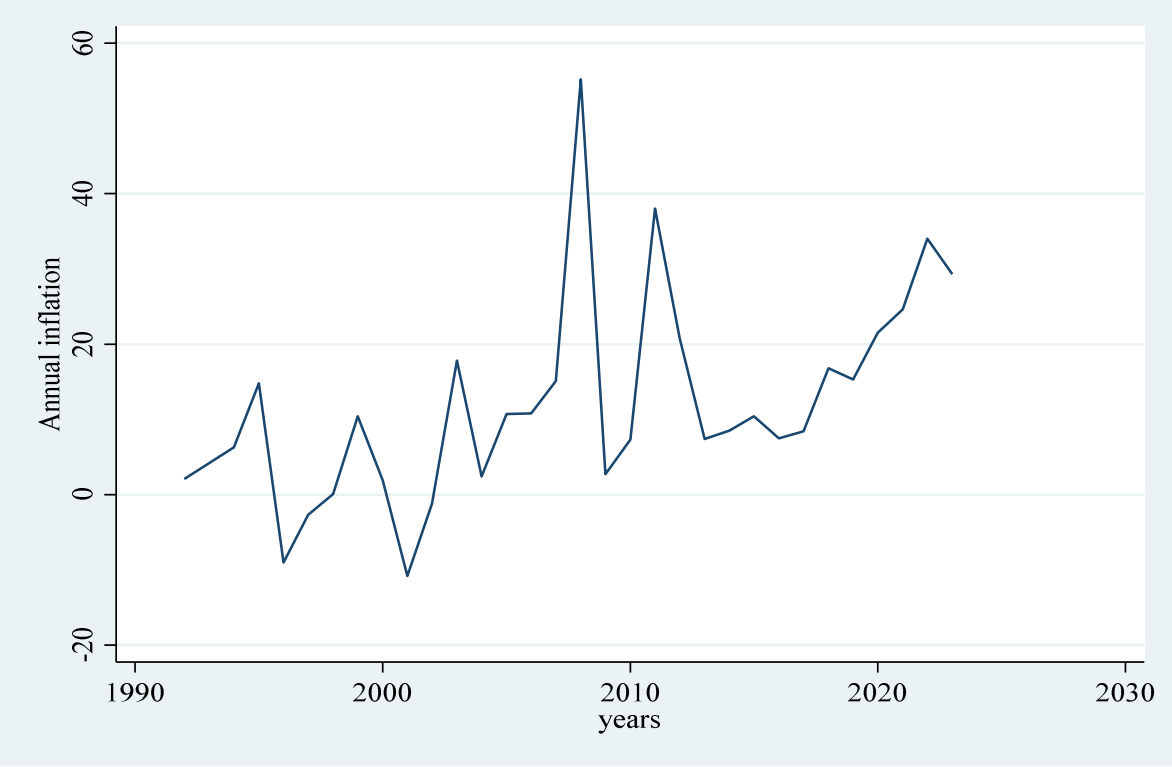
ln_InterestRate: This variable represents the natural logarithm of the interest rate in Ethiopia. The dataset has 32 observations with a mean of 2.508 and a standard deviation of 0.159. The minimum value is 1.917 and the maximum is 2.741, suggesting relatively less variation in interest rates compared to inflation.

ln_PrivateInvestment: This variable represents the natural logarithm of private investment in Ethiopia. The dataset has 32 observations with a mean of 8.482 and a standard deviation of 1.073. The minimum value is 5.780 and the maximum is 11.043, indicating a significant range in the level of private investment over the sample period.

4.1.1. Trends analysis in Private Investment, Inflation, and Interest Rates in Ethiopia

Annual Inflation

Figure 4-1 Annual Inflation rate Trend



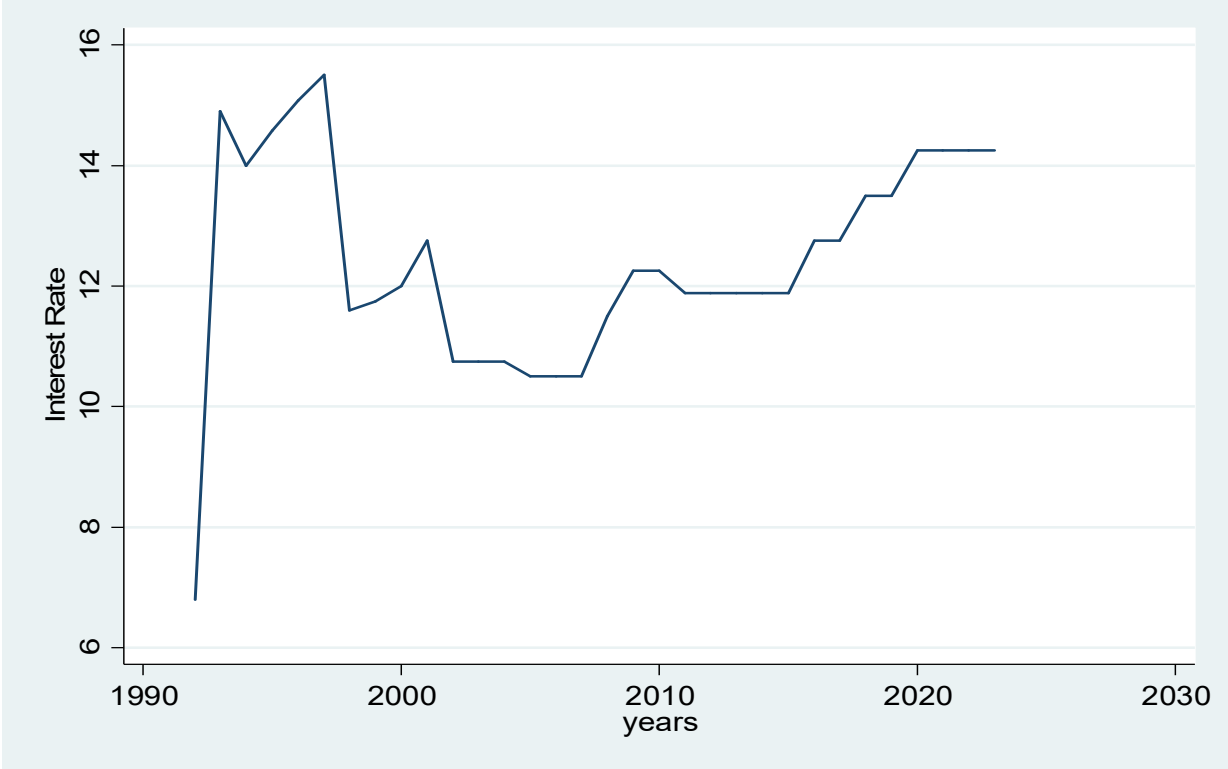
Source own computation, 2024

The graph presented in Figure 1 depicts the annual inflation rate from 1990 to 2030. This historical data provides insights into the fluctuations and trends in the macroeconomic environment over an extended period. The chart reflects a turbulent economic environment with periods of both inflationary and deflationary pressures, transitioning towards a more stable yet high-inflation regime in recent years. Between 1990 and 2000 Inflation rates are highly volatile. They fluctuate between negative values (deflation) and positive inflation, with spikes reaching up to 20% and dips as low as -20%.

During 2000-2010: The volatility continues, with a noticeable spike in inflation around 60% around 2010, followed by a sharp decline to nearly -20%. This dramatic rise in price pressures may have been influenced by various factors, such as supply-side shocks or changes in monetary policy. During 2010-2020 there are a few more spikes, but the volatility decreases. Inflation stabilizes somewhat, with rates generally ranging between 0% and 40%. After 2020 there is a gradual increase in inflation during this period, peaking at around 40% before experiencing a slight decline.

Interest Rate

Figure 4-2 Interest Rate Trend

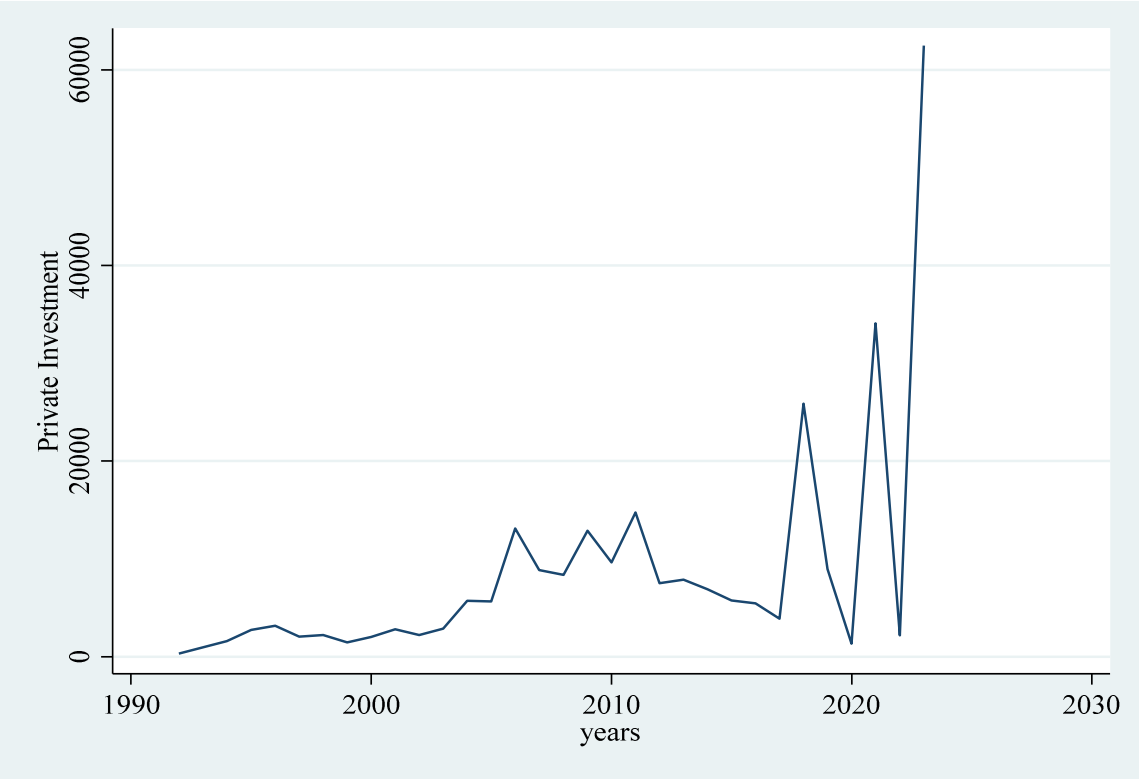


Source own computation, 2024

The graph depicts the fluctuations in the interest rate from 1990 to 2030. The key observations and interpretations are as follows: In the early 1990s there is a sharp increase in interest rates from around 6% to over 14%. Between 1995- 2000 , the interest rate fluctuates, showing a decline followed by a slight recovery, remaining above 12%. During 2000-2010 the interest rate then experienced a slight dip is observed, with rates falling to around 11% before stabilizing around 12%. Following 2010-2020 The interest rates are relatively steady but start to rise again from around 12% to 14%. After 2020 Interest rates exhibit a stepwise increase, reaching approximately 14.5% and stabilizing thereafter.

Private Investment

Figure 4-3 Private Investment Trend



Source own computation, 2024

The graph shows the trend in private investment in millions of units over the years from 1990 to 2030. 1990-2005: Private investment remains relatively stable at a low level, with minor fluctuations. The relatively low and stable levels of private investment suggest a period of steady but slow economic growth, likely characterized by cautious investment activities, possibly due to macroeconomic uncertainty or lack of significant growth opportunities. 2005-2015: There is a slight increase in private investment, with moderate fluctuations but no major spikes, staying around the 20,000 mark. The gradual increase could reflect improving economic conditions or greater confidence in investment opportunities, with investments trending upward as economies strengthen and opportunities expand.

During 2015-2020: The volatility increases, with noticeable peaks and troughs, and private investment begins to fluctuate more widely, spiking closer to 40,000 at certain points. The increasing volatility in this period likely indicates market disruptions, global economic shocks, or shifts in fiscal and monetary policies that affect private sector confidence and capital allocation. During 2020-2025 (projection): Investment becomes extremely volatile, with a massive spike

reaching nearly 60,000, followed by a rapid drop and subsequent rise again. During 2025-2030 (projection): The chart indicates a sharp rise in private investment, with the final value on the graph approaching the highest level observed, nearly 60,000. The extreme volatility seen in the private investment data suggests periods of economic turbulence, possibly due to significant global events such as the COVID-19 pandemic or political and economic instability. The spike in investment post-2020 could be a result of stimulus measures, a recovery phase, or new opportunities in emerging sectors, although the rapid swings imply a high level of uncertainty or speculative activity.

4.1.2. Correlation Analysis

The correlation analysis provides valuable insights into the linear relationships between the log-transformed variables ln_inflation, ln_InterestRate, and ln_PrivateInvestment. The correlation coefficients, presented in Table 2, reveal the nature and strength of these relationships.

Table 2 Correlation Analysis

Variables	ln_inflation)	ln_InterestRate	ln_PrivateInve~t
(1) ln_inflation	1.000		
(2) ln_InterestRate	0.301	1.000	
(3) ln_PrivateInve~t	0.403	0.324	1.000

Source own computation, 2024

The analysis shows a weak to moderate positive correlation of 0.301 between ln_inflation and ln_InterestRate, suggesting that higher inflation is generally associated with higher interest rates. This finding aligns with conventional monetary policy responses, where central banks increase interest rates to control inflationary pressures.

A moderate positive correlation of 0.403 between ln_inflation and ln_PrivateInvestment indicates that higher levels of inflation are associated with increased private investment. This relationship, although not very strong, might reflect businesses' tendency to invest more in assets as a hedge against inflation or to capitalize on nominal price growth during inflationary periods.

Interestingly, the correlation between ln_InterestRate and ln_PrivateInvestment is weaker, with a coefficient of 0.324. This positive but weak relationship is somewhat counter intuitive, as higher interest rates typically discourage private investment by raising the cost of borrowing. This finding suggests that other factors, such as economic growth, fiscal policies, and market conditions, may play more significant roles in influencing private investment during the study period.

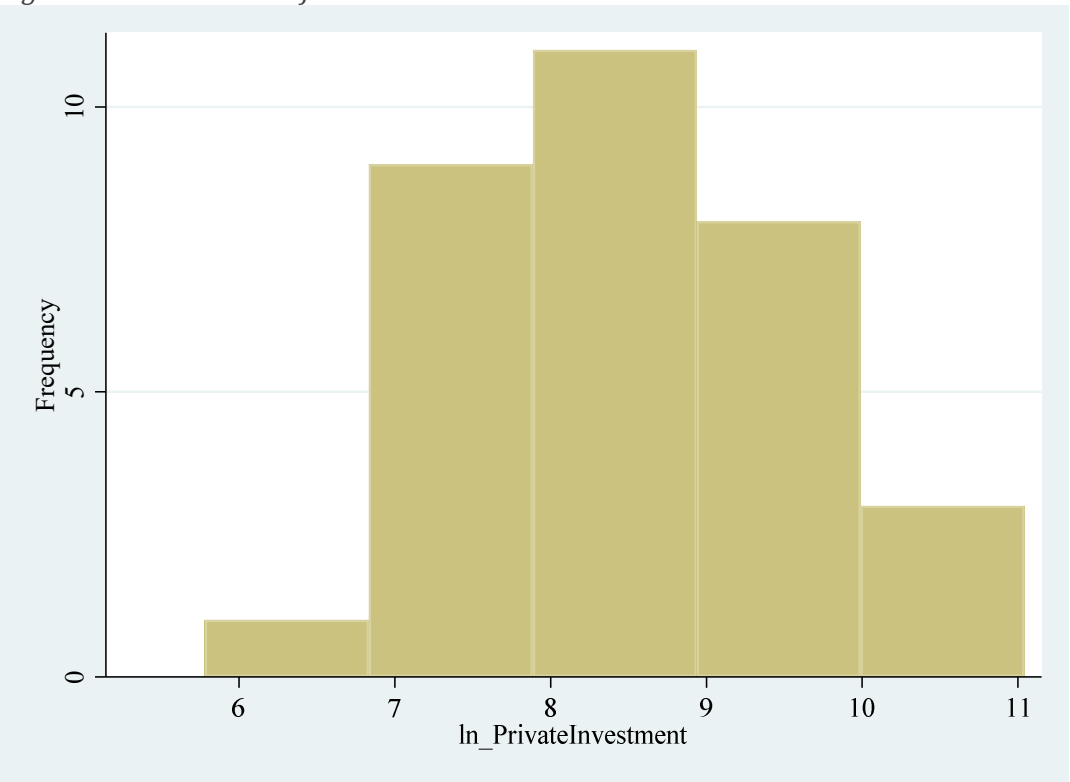
The correlation analysis indicates that while there are positive linear relationships between all pairs of variables, the strength of these relationships varies. The moderate correlation between inflation and private investment suggests that inflationary periods might stimulate investment to some extent. In contrast, the weak correlation between interest rates and private investment highlights the complexity of investment decisions, which are likely influenced by a broader range of economic factors. These initial insights underscore the need for further analysis, such as regression or cointegration tests, to explore the causal relationships and dynamics among these variables more comprehensively.

4.1.3. Distributional Analysis

Private Investment

The distribution of the natural logarithm of private investment shown in the histogram does not appear to be normal. A normal distribution would be expected to have a symmetrical, bell-shaped curve, but this histogram exhibits a clear right-skewed shape. This finding is consistent with the literature on the distribution of private investment data, which often deviates from the normal distribution. Private investment tends to have a positively skewed distribution, with a large number of observations clustered around lower values and a long right tail representing fewer but larger investment amounts.

Figure 4-4 Distribution of Private Investment

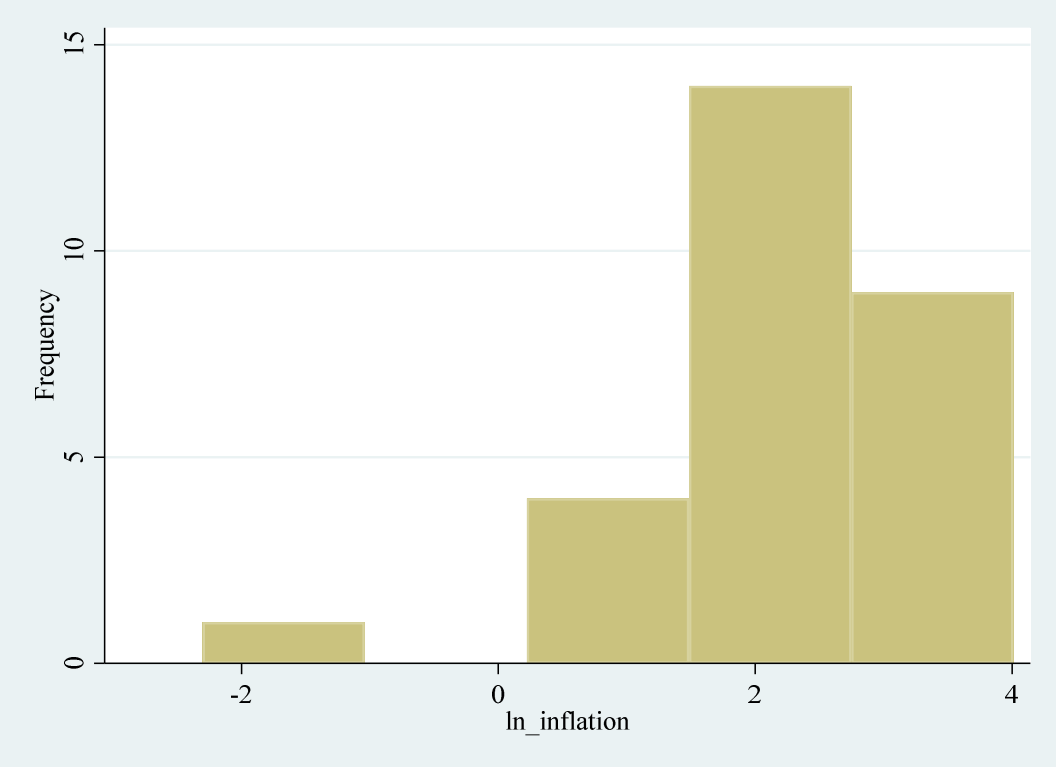


Source own computation, 2024

The right-skewed nature of the histogram suggests that the majority of private investment values are concentrated on the lower end of the scale, with a small number of much higher investment levels. This aligns with the typical patterns observed in empirical studies of private investment behavior, where a large number of firms or individuals make relatively modest investment decisions, while a smaller proportion engage in large-scale investment projects.

Inflation

Figure 4-5 Distribution of Inflation

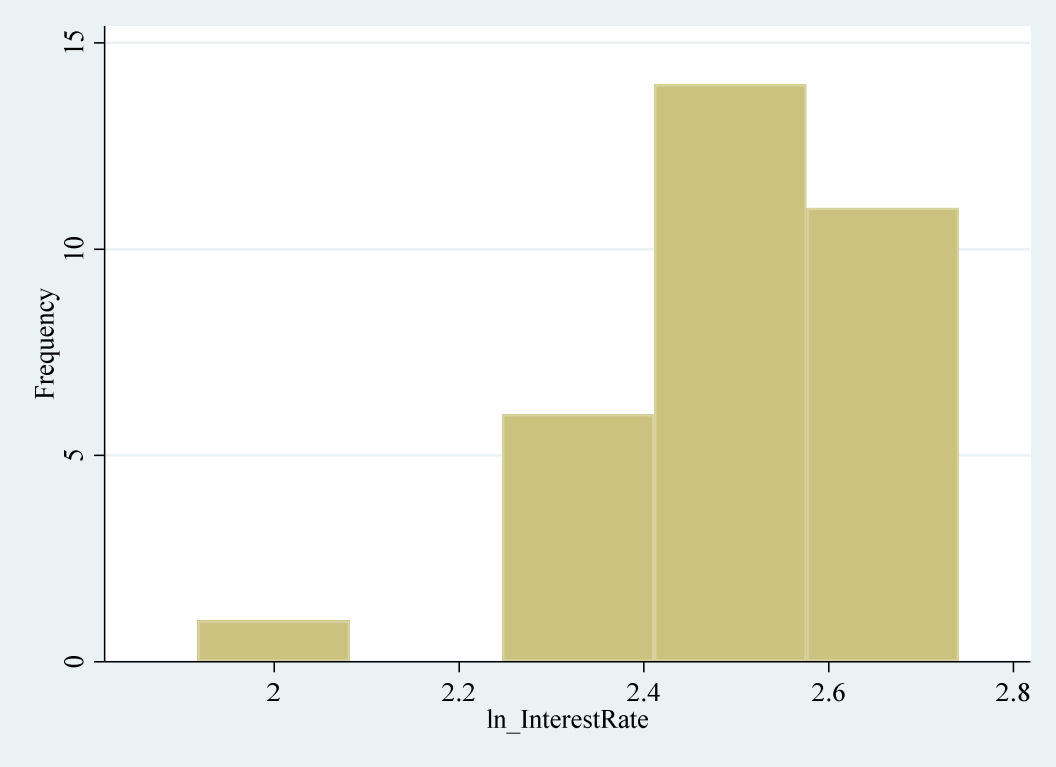


Source own computation, 2024

The histogram presents the frequency distribution of the ln_inflation variable in a clear and concise manner. The shape of the distribution provides insights into the underlying characteristics of the inflation rates in Ethiopia, such as the presence of high inflation periods and the typical or central tendency of the data. The right-skewed nature of the distribution, with a long tail on the right, suggests that the data is not normally distributed.

Interest rate

Figure 4-6 Distribution of Interest Rate



Source own computation, 2024

The histogram provides a clear visual representation of the frequency distribution of the ln_InterestRate variable in Ethiopia. The right-skewed shape of the distribution highlights the asymmetric nature of the interest rate data, with a tendency towards higher values compared to the more common lower rates.

The information gleaned from the histogram can inform further statistical analysis and modeling of the interest rate dynamics in the Ethiopian economy. The non-normal distribution of the data may necessitate the use of appropriate transformations or non-parametric methods to accurately capture and analyze the underlying patterns and relationships.

4.2. Econometric Analysis

4.2.1. Stationarity Test

Prior to working with time series data, stationarity must be tested. If we use data that hasn't had its stationarity checked, we can obtain a spurious, non-stationary time series that suggests the relationship between the variables might not be real. Thus, by differencing, we will convert the non-stationary data into stationary data in order to obtain a consistent and trustworthy result. The non-stationary process, on the other hand, could cause the long run mean to fluctuate over time or not roughly equal or near the variables' variance and mean. On the other hand, the stationarity process yields a round with a constant variance and long-term mean over time. The most common methods for testing stationarity are the ADF test, the Philips and Perron test, and a graphical representation of each variable over time, which is provided in the appendix. The ADF test, which is the most popular and trustworthy method of determining stationarity, is what I used for my data test. Tables 3,4 and5 below summarize the results. Every variable's lag length is automatically chosen by the Akaike Info Criterion (SIC), and the test equation includes both intercepts and trends for every variable.

Testing stationarity at first differencing

Table 3 Augmented Dickeyfuller Stationary Test for Inflation

```
. dfuller Annualinflation

Dickey-Fuller test for unit root                   Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic          Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -3.852            -3.709            -2.983           -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0024
```

Source own computation, 2024

The Dickey-Fuller test was conducted to evaluate the stationarity of the variable Annual inflation. Stationarity is a key assumption for time series data in econometric modeling, as non-stationary data can lead to misleading regression results. The null hypothesis of the Dickey-Fuller test posits that the series follows a random walk without drift, implying non-stationarity.

The test statistic for Annual inflation is -3.852. This value is substantially less than the critical values of -3.709, -2.983, and -2.623 at the 1 percent, 5 percent, and 10 percent levels, respectively. Consequently, at all conventional significance levels, the unit root null hypothesis is rejected. Additionally, the test statistic's MacKinnon approximate p-value of 0.0024 indicates that there is a very slim chance that the null hypothesis will be true.

The results imply that the variable Annual inflation is stationary. This stationarity suggests that the series does not exhibit a unit root and its statistical properties, such as mean and variance, remain constant over time. This finding is crucial for ensuring valid and reliable econometric models, which often require stationary data.

Interest rate stationarity:

Table 4 Augmented Dickeyfuller Stationary Test for Interest Rate

```
. dfuller InterestRate

Dickey-Fuller test for unit root                   Number of obs   =        29

                                 ———— Interpolated Dickey-Fuller ————
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
——————————————————————————————————————————————————————————————————————————
 Z(t)            -1.686           -3.723            -2.989           -2.625
——————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.4385
```

Source own computation, 2024

The test statistic for InterestRate is -1.686. This value is greater than the critical values at the 1%, 5%, and 10% levels, which are -3.723, -2.989, and -2.625, respectively. Therefore, the null hypothesis of a unit root is not rejected at all conventional significance levels. Additionally, the MacKinnon approximate p-value for the test statistic is 0.4385, suggesting high probability of observing such a test statistic under the null hypothesis. The results indicate that the variable InterestRate is non-stationary. This non-stationarity implies that the series is exhibit a unit root and its statistical properties, like mean and variance, does not remain constant over time.

Private investment

Table 5 Augmented Dickeyfuller Stationary Test for Private Investment

```
. dfuller PrivateInvestment

Dickey-Fuller test for unit root                   Number of obs   =        29

                                 ———— Interpolated Dickey-Fuller ————
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
——————————————————————————————————————————————————————————————————————————
 Z(t)            -3.773           -3.723            -2.989           -2.625
——————————————————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0032
```

Source own computation, 2024

The test statistic for PrivateInvestment is -3.773. This value is substantially less than the critical values of -3.723, -2.989, and -2.625 at the 1 percent, 5 percent, and 10 percent levels, respectively. This leads to the rejection of the unit root null hypothesis at all conventional significance levels. Additionally, the test statistic's MacKinnon approximate p-value of 0.0032 indicates that there is a very slim chance that the null hypothesis will be true.

The results indicate that the variable PrivateInvestment is stationary. This stationarity implies that the series does not exhibit a unit root and its statistical properties, such as mean and variance, remain constant over time. This finding is crucial for ensuring the reliability and validity of subsequent econometric models, which often require stationary data

4.2.2. Optimal Lag Length Determination

Optimal Lag Length Determination

The optimal lag length for the model is determined using a number of information criteria, such as the Schwarz Bayesian Information Criterion (SBIC), Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), Final Prediction Error (FPE), and Likelihood Ratio (LR) test. The results are summarized in the table below:

Table 6 Optimal Lag Order Selection Criteria

```
. varsoc PrivateInvestment Annualinflation InterestRate

   Selection-order criteria
   Sample:  1998 - 2023                        Number of obs      =        26
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-424.597				3.9e+10	32.8921	32.9339	33.0372
1	-403.393	42.407	9	0.000	1.5e+10	31.9533	32.1205*	32.534*
2	-393.665	19.457	9	0.022	1.5e+10*	31.8973*	32.1899	32.9134
3	-388.15	11.03	9	0.274	2.1e+10	32.1654	32.5834	33.617
4	-378.553	19.195*	9	0.024	2.4e+10	32.1194	32.6629	34.0066

```
   Endogenous:  PrivateInvestment Annualinflation InterestRate
    Exogenous:  _cons
```

Source own computation, 2024

The optimal lag length for is marked by the criteria with an asteriks (*). Specifically: Likelihood Ratio (LR) test: The value indicate lag 4 as optimal. Final Prediction Error (FPE): The FPE value is observed at lag 2, Akaike Information Criterion (AIC): The AIC value is observed at lag 2, Hannan-Quinn Information Criterion (HQIC): The lowest HQIC value is observed at lag 1, Schwarz Bayesian Information Criterion (SBIC): The lowest SBIC value is observed at lag 1.

Given these results, the optimal lag length for the Private Investment, Annual Inflation and Interest Rate is determined to be 2 because if the sample size is small AIC and FPE are recommended so they minimize the chance of underestimation. This selection ensures that the model captures the necessary dynamics of the time series data, providing a robust basis for further econometric analysis.

4.2.3 ARDL Bound Test

ARDL bound test is to ascertain stable long-run equilibrium relationship among the variables in the model and to determine the presence of long-run relationships between variables and to capture short-run and long-run causality relationships. This is done through this test:

```
. ardl PrivateInvestment Annualinflation InterestRate, ec btest

ARDL(1,1,0) regression

Sample: 1998 - 2023                             Number of obs     =         26
                                                R-squared         =     0.6883
                                                Adj R-squared     =     0.6289
Log likelihood = -273.34421                     Root MSE          =  9907.8954
```

D. PrivateInves~t	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ PrivateInves~t L1.	-1.891347	.2908728	-6.50	0.000	-2.49625	-1.286444
LR Annualinflat~n	335.0816	104.7243	3.20	0.004	117.2954	552.8678
InterestRate	2142.403	956.2489	2.24	0.036	153.7747	4131.032
SR Annualinflat~n D1.	-313.8151	158.8009	-1.98	0.061	-644.0597	16.42955
_cons	-40686.68	20911.91	-1.95	0.065	-84175.38	2802.029

```
note: estat btest has been superseded by estat ectest
      as the prime procedure to test for a levels relationship.
      (click to run)

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship                  F =  15.350
                                            t = -6.502

Critical Values (0.1-0.01), F-statistic, Case 3

        |  [I_0]   [I_1]  |  [I_0]   [I_1]  |  [I_0]   [I_1]  |  [I_0]   [I_1]
        |    L_1     L_1  |    L_05    L_05  |   L_025   L_025  |    L_01    L_01
--------+-----------------+-----------------+-----------------+----------------
    k_2 |   3.17    4.14  |   3.79    4.85  |   4.41    5.52  |   5.15    6.36
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3

        |  [I_0]   [I_1]  |  [I_0]   [I_1]  |  [I_0]   [I_1]  |  [I_0]   [I_1]
        |    L_1     L_1  |    L_05    L_05  |   L_025   L_025  |    L_01    L_01
--------+-----------------+-----------------+-----------------+----------------
    k_2 |  -2.57   -3.21  |  -2.86   -3.53  |  -3.13   -3.80  |  -3.43   -4.10
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)
```


.
.
.

Table 7 ARDL Bound test Result

Coefficients and Interpretation

Private Investment: -1.891347, p-value: 0.000 (Highly significant). This is the adjustment (or error correction) term, which captures how private investment adjusts towards the long-run equilibrium. The coefficient is negative, large, and significant, suggesting that when private investment deviates from its long-run equilibrium, it corrects at a high speed (1.89 units per period).

A negative coefficient on the lagged dependent variable indicates a quick return to equilibrium, meaning that disequilibrium is quickly corrected in the next period.

Long-Run Relationship (LR): Annual Inflation: Coefficient: 335.0816, p-value: 0.004 (Significant). This positive and significant coefficient shows that in the long run, an increase in the annual inflation rate leads to higher private investment. Specifically, a 1 unit increase in annual inflation corresponds to an increase of 335.08 units in private investment, assuming all else remains constant. This suggests that higher inflation may stimulate investment over time, perhaps as firms anticipate higher future returns and also suggests as businesses seek to hedge against price increases or capitalize on nominal growth.

InterestRate: Coefficient: 2142.403, p-value: 0.036 (Significant). The positive coefficient for interest rates is somewhat counterintuitive because rising interest rates are usually expected to discourage investment. However, in this model, it suggests that higher interest rates, in the long run, might be associated with increased investment, possibly because they reflect strong economic conditions or because firms anticipate higher returns in the future. This finding aligns with studies, such as the work of (Alebachew Legass et al., 2022) found a positive and significant correlation between interest rates and gross private investment at a 5% level of significance. This study indicated that interest rate plays a significant role in influencing private investment. Although rising interest rates tend to deter private investment because they make borrowing more expensive, but there are several situations in which they can actually encourage it. Signal of Strong Economic Growth and Confidence, sector-Specific Responses, Expectations of future growth, increased profitability in capital-intensive industries, better consumer demand, or certain company attributes like substantial cash reserves that lessen the impact of borrowing

costs are frequently involved in these circumstances. Each of these factors could contribute to the positive and significant relationship observed, suggesting that interest rates alone may not be a decisive factor in driving private investment for the sample analyzed.

Short-Run Relationship (SR): Annual Inflation: Coefficient: -313.8151, p-value: 0.061 (Weakly significant). In the short run, the effect of inflation on private investment is negative. This suggests that a short-term increase in inflation could reduce private investment, possibly due to increased uncertainty or costs. The negative impact in the short run contrasts with the long-run positive effect, indicating differing dynamics over time.

Constant (_cons): Coefficient: -40686.68, p-value: 0.065 (Weakly significant). The constant term represents the base level of private investment when all other variables are zero. While weakly significant, it suggests that in the absence of inflation and interest rate effects, there would still be a negative contribution to private investment (though the interpretation of constants in models like ARDL is often secondary to the dynamics between the variables).

Pesaran/Shin/Smith (2001) ARDL Bounds Test: The ARDL Bounds Test is used to determine whether there is a long-run relationship (cointegration) between the variables.

The F-statistic (15.350) This is compared to critical values for both I(0) (no cointegration) and I(1) (cointegration). At the 5% significance level, the critical values for I(0) and I(1) are 3.79 and 4.85, respectively. Since the F-statistic (15.350) is much greater than these critical values, you reject the null hypothesis and conclude that a long-run relationship (cointegration) exists between private investment, inflation, and interest rates.

t-statistic: -6.502 The critical values for the t-statistic range between -3.53 (at 5% significance) for I(1). Since the t-statistic is more negative than -3.53, this further confirms the presence of cointegration, strengthening the evidence that there is a stable, long-run relationship.

The ARDL model indicates that there is both a short-run and long-run relationship between private investment, inflation, and interest rates. In the long run, inflation and interest rates have positive effects on private investment, while in the short run, inflation has a temporary negative effect. The strong cointegration evidence suggests that these variables will revert to a long-term equilibrium relationship over time, with short-run fluctuations being corrected relatively quickly. The ARDL Bounds Test results confirm that the variables are cointegrated, meaning that despite

short-term fluctuations, inflation, interest rates, and private investment maintain a stable long-run relationship.

4.2.4 ARDL Result and Analysis

Table 8 ARDL Result

```
. ardl PrivateInvestment Annualinflation InterestRate, lags(2 3 1) regstore(ecreg
> )

ARDL(2,3,1) regression

Sample: 1997 - 2023                             Number of obs     =         27
                                                F(   8,     18)   =       3.35
                                                Prob > F          =     0.0157
                                                R-squared         =     0.5984
                                                Adj R-squared     =     0.4199
Log likelihood = -281.04017                     Root MSE          =  9825.0367
```

PrivateInves~t	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PrivateInves~t						
L1.	-.8884489	.3763832	-2.36	0.030	-1.679201	-.0976972
L2.	.2053028	.4333478	0.47	0.641	-.7051272	1.115733
Annualinflat~n						
--.	301.7828	207.426	1.45	0.163	-134.0031	737.5687
L1.	365.9422	177.0864	2.07	0.053	-6.10244	737.9868
L2.	173.9145	187.5857	0.93	0.366	-220.1884	568.0174
L3.	108.2647	172.4997	0.63	0.538	-254.1438	470.6731
InterestRate						
--.	2.151341	2573.372	0.00	0.999	-5404.302	5408.605
L1.	2511.619	2488.879	1.01	0.326	-2717.322	7740.561
_cons	-27433.77	19432.16	-1.41	0.175	-68259.23	13391.69

Source own computation, 2024

Coefficients and Interpretation

Private Investment (Lags):

Lag of Private Investment: Coefficient: -0.8884, p = 0.030. The first lag of private investment is statistically significant at the 5% level, indicating that an increase in Private Investment in the

previous period is associated with a reduction in the current period, likely an adjustment effect. The Second lag of private investment Coefficient: 0.2053, p = 0.641 (not significant). The second lag of private investment suggesting that Private Investment two periods ago does not have a clear impact on the current period's investment.

Annual Inflation: Contemporary Inflation (Coefficient = 301.7828, p = 0.163): Not statistically significant, though positive, suggesting a weaker immediate effect of inflation on Private Investment. L1. Annual Inflation (Coefficient = 365.9422, p = 0.053): Nearly significant at the 5% level, indicating that past-period inflation could influence investment, where an increase in past inflation is associated with higher Private Investment in the present. L2. and L3. Annual Inflation: Both are positive but not statistically significant, indicating that inflation from two or three periods ago does not clearly affect current investment levels.

InterestRate: Contemporary Interest Rate (Coefficient = 2.1513, p = 0.999): Not statistically significant, with a near-zero effect, suggesting that current interest rates do not impact Private Investment in this model. L1. Interest Rate (Coefficient = 2511.619, p = 0.326): Not statistically significant, though it has a large coefficient, implying some potential influence, but no conclusive impact at traditional significance levels.

This ARDL model suggests that the first lag of Private Investment and the first lag of Annual Inflation are the most significant predictors of current Private Investment. There is weak evidence for an adjustment mechanism in Private Investment, where past investment impacts current levels, and for the influence of past inflation on investment decisions. Interest rates, however, do not appear to have a significant effect on Private Investment within this model framework.

4.2.5. Diagnostic tests

Autocorrelation test

```
. estat bgodfrey

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.612	1	0.4341

H0: no serial correlation

The Breusch-Godfrey LM test for autocorrelation checks for the presence of serial correlation in the residuals of the regression model. The p-value is 0.4341, which is greater than 0.05. This means fail to reject the null hypothesis. Therefore, no evidence of serial correlation (autocorrelation) is found in the residuals of the regression model at the 5% significance level.

Heteroskedasticity test

```
. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(14)     =     23.60
         Prob > chi2  =    0.0512

Cameron & Trivedi's decomposition of IM-test
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Source	chi2	df	p
Heteroskedasticity	23.60	14	0.0512
Skewness	10.43	4	0.0338
Kurtosis	1.12	1	0.2901
Total	35.15	19	0.0134

The p-value (0.0512) is slightly higher than the conventional significance level of 0.05, meaning we fail to reject the null hypothesis at the 5% level of significance.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The analysis of the complex relationships between private investment, inflation, and interest rates in Ethiopia has yielded several important findings that contribute to a deeper understanding of the country's macroeconomic dynamics.

The descriptive analysis revealed significant fluctuations in the trend of these key variables over the study period. Inflation in Ethiopia experienced a sharp rise in the early 2000s, reaching a peak of over 50%, before declining and then trending upwards again in more recent years. Interest rates, on the other hand, exhibited a pattern of volatility, with periods of both high and low levels. Private investment showed an initial period of relatively low levels, followed by a steady increase starting in the mid-2000s, a subsequent decline, and a dramatic resurgence in the mid-2010s projected to continue through 2030.

The correlation analysis provided valuable insights into the linear relationships between the variables. The moderate positive correlation between inflation and private investment suggests that inflationary periods may stimulate investment to some extent, as businesses seek to hedge against price increases or capitalize on nominal growth. This finding aligns with studies conducted in other countries, such as the work of (Hussain & Malik, 2011; Shaalan, n.d.), in Pakistan and (Osinubi, 2005) in Nigeria, which have also reported positive correlations between inflation and private investment.

However, the relatively positive weak correlation between interest rates and private investment highlights the complexity of investment decisions, which are likely influenced by a broader range of economic factors beyond just the cost of capital. This observation is consistent with the findings of (Khan & Reinhart, 1990) Blejer and Khan (1984) who emphasized the role of factors such as economic growth, political stability, and market conditions in shaping private investment decisions in developing countries.

The distributional analysis of the variables further reinforced the distinctive characteristics of private investment data, which often exhibits a right-skewed distribution. This finding is in line with the literature on private investment dynamics, as discussed by (Caballero, 1999) and (Cagetti, 2003) where a large number of firms or individuals make relatively modest investment decisions, while a smaller proportion engage in large-scale investment projects.

The econometric analysis provided additional insights into the dynamic connections among the variables. The regression results showed that inflation had a positive and statistically significant long run effect on private investment, suggesting that higher inflation rates may incentivize businesses to increase their investment levels, potentially as a hedge against rising costs or to capitalize on nominal growth opportunities. This finding aligns with the positive correlation observed in the earlier analysis however; short-run changes in inflation may have a negative effect.

On the other hand, the regression results indicated Interest rates show positive and significant effect on private investment in the long run, suggesting that changes in interest rates may play a strong role in influencing investment decisions in this context. Signal of Strong Economic Growth and Confidence, sector-Specific Responses, Expectations of future growth, increased profitability in capital-intensive industries, better consumer demand, or certain company attributes like substantial cash reserves that lessen the impact of borrowing costs are frequently involved in these circumstances. Each of these factors could contribute to the positive significant relationship observed, suggesting that interest rates main factor in driving private investment for the sample analyzed. This finding aligns with studies, such as the work of (Alebachew Legass et al., 2022) found a positive and significant correlation between interest rates and gross private investment at a 5% level of significance. This study indicated that interest rate plays a significant role in influencing private investment. This finding aligns with the positive correlation observed in the earlier analysis.

The inclusion of a lagged dependent variable has a significant negative impact in the regression model also revealed the presence of persistence in private investment behavior, suggesting that current investment decisions are influenced by past investment levels. This highlights the importance of considering the dynamic nature of private investment when formulating policies and analyzing its determinants.

Overall, the comprehensive analysis of private investment, inflation, and interest rates in Ethiopia provides a nuanced understanding of the complex macroeconomic landscape and the interplay between these critical variables. The findings contribute to the existing body of knowledge on the determinants of private investment in developing economies, with potential implications for policymakers and researchers alike.

5.2. Recommendations

Based on the insights gained from this study, several recommendations can be made to inform policymaking and support the continued development of Ethiopia's private investment environment:

- ✓ Enhancing monetary policy coordination: The findings suggest that inflation and interest rates are not perfectly aligned, with interest rates exhibiting a relatively weak correlation with private investment. This underscores the need for policymakers to carefully coordinate monetary policy instruments, such as interest rate adjustments and inflation targeting, to achieve a more coherent and effective macroeconomic framework.
- ✓ Diversifying investment incentives: Given the complex nature of private investment decisions, policymakers should consider expanding the range of incentives and support mechanisms beyond just interest rate and inflation management. This could include measures such as targeted tax incentives, streamlining administrative procedures, improving infrastructure, and strengthening the legal and regulatory environment to foster a more conducive business climate.
- ✓ Addressing sector-specific challenges: The analysis of private investment trends highlights the potential for uneven development across different sectors of the economy. Policymakers should explore sector-specific strategies to address the unique challenges and opportunities faced by various industries, ensuring a balanced and inclusive approach to private investment promotion.
- ✓ Strengthening data collection and analysis: The study's reliance on historical data underscores the importance of robust and comprehensive data collection systems. Enhancing the quality, frequency, and accessibility of macroeconomic data in Ethiopia will enable more rigorous and informed

policy decisions, as well as facilitate collaborative research efforts with academic institutions and international organizations.

- ✓ Fostering international collaboration and knowledge sharing: Given the shared challenges faced by developing countries in stimulating private investment, policymakers in Ethiopia should actively engage in regional and global knowledge-sharing platforms. This could involve collaborating with counterparts in other nations, participating in capacity-building programs, and leveraging the insights and best practices from successful private investment promotion strategies implemented elsewhere.

By implementing these recommendations, policymakers in Ethiopia can work towards creating a more conducive environment for private investment, ultimately supporting sustainable economic growth and development in the country.

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