. **BINDURA UNIVERSITY OF SCIENCE EDUCATION**

**FACULTY OF COMMERCE**

**DEPARTMENT OF ECONOMICS**



**THE IMPACT OF INTEREST RATE ON PRIVATE SECTOR BORROWING IN ZIMBABWE FROM 1990 TO 2021**

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**DEDICATION**

To my mother and father.

I declare this to you with great love, respect and gratitude. Your love and concern over my life inspired me to strive through thick and thin scenarios I face as I was doing my dissertation. I will always care for you and love you.

**ABSTRACT**

This study investigated and examined the effects of interest rates on private sector borrowing in Zimbabwe using time series data from 1990 to 2021.Using the Ordinary Least Squares method, the research found a negative relationship between interest rates and private sector borrowing in Zimbabwe and this confirms the Keynesian view on interest rates. Other explanatory variables used in the model include, money supply, inflation, interest rate and Gross Domestic Product.

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**CHAPTER ONE**

**INTRODUCTION**

* 1. **Introduction**

This study is going to focus on the impact that interest rate has on private sector borrowing. Interest rate is referred to as the cost of borrowing or the amount that you pay for temporary use of financial resources or it is the reward from investment. Private sector borrowing is the act of hiring financial resources that is done by the individual firms so as to cater for their day today running of business. Interest rate is a broad term hence the theoretical literature will come from existing theories which are classical and neo classical. Chapter one is going focus on the objectives of the study. This is what the study intends to achieve. It will also focus on the limitations, delimitations, background and significance of the study. Chapter two will explain the theoretical literature which is past studies that have been done by other researchers. Following chapter will be chapter three which will explain the model to be used and the variables. Data presentation and analysis will be done in chapter four which will be followed by chapter 5 were conclusions and recommendations will be noted.

**1.2 Background of Study**

The private sector is the part of the national economy that is not under state control (Thomas Brock, 2020). Thomas Brock further defined private sector as the part of the economy that is run by individuals and companies for profit and is not state controlled. It encompasses all businesses that are profit oriented and are not owned or operated by the government for example ECONET. The private sector tends to make up a larger share of the economy in free market or capitalised based societies. Capitalised based societies refer to economic systems whereby monetary goods are owned by individuals or companies (Thomas Brock, 2020). For example, the United States has a strong private sector because it has a free economy while China, where the state controls many of its corporations, has a public sector (Thomas Brock, 2020). Private sector employs workers through individuals’ businesses or other non-governmental organisations. Workers in a private sector are paid with part of company’s profit. They also tend to have more pay increases, more career choice, opportunities for promotions and less job security than public sector (Thomas Brock, 2020). More so they work for more hours in a more demanding environment than working for the government.

The public sector is ruled or operated by the government. It provides goods which the private sector cannot for example streetlights. The public sector pays its workers through the portion of tax it collects. Typical civil service jobs are emergency services, armed forces and various regulatory and administrative agencies (Thomas Brock, 2020). Public sector workers tend to have more comprehensive benefits as compared to those in private sector. There is job security than in the private sector that is many government positions become permanent positions. When working for the public sector you can get your salary even if you are sick at home as compared to the private sector. It also provides a more stable work environment free of market pressures unlike the private sector.

The public and the private sector at times work together while upholding common interest. Private sector business control governmental assets and resources while developing, financing and operating public facilities or services (Thomas Brock, 2020). For example, a private company might pay a state a one-time fee to operate a specific length of free way for a set of time in exchange for revenue from tolls.

Private sector borrowing refers to the action of hiring financial resources for temporary use and repays them after a certain period of time (Barry Halloran, 2005). Credit is essential for every economy to function well. It funds new investments and allows firms to purchase fixed assets for example buildings.

In most African countries private firms have a role to play. This means that they need financial back up to carry out their activities. In high income countries credit to the private sector is about 147, 6% of Gross Domestic Product on average (World Bank Data, 2014). High income countries are China, Japan, United Kingdom and others. China private sector is bigger as compared to Zimbabwe. This is because China has a larger population that demands a variety of goods and services. In 2019 China private sector borrowing was 164,7% of Gross Domestic Product and Zimbabwe had a 51.8% of Gross Domestic Product value. United Kingdom private sector also had a value of 133, 6% of Gross Domestic Product. In high income countries credit available for the private sector is above 70% which reflects a good financial system (World Bank Data, 2014). Private sector borrowing is then high in these economies. In other high-income countries private sector borrowing can reach 200% of GDP (World Bank Data, 2014). This is because of availability of financial resources and a well-developed financial system.

Zimbabwe financial systems have weakened since it was suspended from borrowing money from the International Monetary Fund. In low income countries private sector borrowing is very low with a value of 13.1% of Gross domestic product on average. Low income countries refer to countries like Zambia, Zimbabwe, Ghana and Democratic Republic of Congo (DRC). In the early 1990s Democratic Republic of Congo had a low private sector borrowing as compared to Zimbabwe. This is because Democratic Republic of Congo was faced with war. Most infrastructures were damaged. People were afraid to start businesses as they were running for their lives (World Bank Data, 2014).

Before independence Zimbabwe private sector investments were low. This was because of lack capital and financial institutions were few. Nowadays we have so many financial institutions available to lend money to private firms. In 1979 Zimbabwe private sector borrowing recorded a value of 11.6% of Gross Domestic Product (World Bank Data, 2014). The interest rate was 17.54%. By that time people were still fighting for their sovereignty. Economic activity was affected by war. All the sectors of the economy were really affected. After independence Zimbabwe started rebuilding all its structures. It implemented the Economic Structural Adjustment Programme (ESAP). Zimbabwe was repaying servicing costs that had mounted. Private sector borrowing dropped by 3.1% and recorded a value of 8.5% of Gross Domestic Product (World Bank Data, 2014).

More so, the private sector after independence had to come up with ways that ensure sustainable production. During this time as the country had gained power and authority, most people were now eager to start businesses to develop the country. There was a pledge of $US1.4 billion to Zimbabwe between 1992 and 1993 after IMF suspended a loan of $US120 million in 1995 because the government had sustained a large deficit (World Bank Data, 2014). Private sector borrowing improved a little bit. It rose to 13.1% of Gross domestic Product (World Bank Data, 2019). Between 1990 and 1999 the country also experienced drought followed by economic hardships. Prices of goods and services were high and production was low. The private sector could not fully utilise its capacity as it was difficult. Hence some even reached the point of shutdown resulting in few private firms operating.

In 2004 the private sector seemed to be emerging at accelerated rate. Banks managed to disburse 40.3% of Gross Domestic Product to the private sector (World Bank Data, 2019). The banks were charging an interest rate of 278.92%. More private firms came into action. This means that private sector borrowing had a sharp increase causing big difference compared from other past years.

In 2008 private sector borrowing decreased, ending up at 6.12% of GDP in 2009 (World Bank Data, 2014). This was because of economic hardships. It was also difficult to determine the rate of interest due to uncertainty and unstable environment. Banks and other financial institutions pegged the interest rate at 565.11%. This resulted to most private firms withdrawing themselves from borrowing capital as it was costly. Zimbabwe had inflation which affected most businesses. This was one of the highest rates of inflation ever experienced in the world after the one that happened in German. Most investors were afraid of the environment that was unstable. The private sector could not borrow as some financial institutions closed down. Even some private companies were shut down as a result of lack of working capital.

More over the country gained stability in 2012 as they adopted the multicurrency regime. The private sector borrowing recorded a value of 18.21% of GDP. Interest rates were pegged at 11.57% (World Bank Data, 2014). Private sector borrowing improved from previous years. This was due to availability of more funds as the country had adopted multi-currency regime. In 2014 private sector borrowing was still rising. It reached a value of 20% of GDP whilst interest rate was 9.47% (World Bank Data, 2014). The rise in private sector borrowing was somehow influenced by the decrease in interest rate. The decrease in interest rate made the cost of acquiring funds cheaper, therefore increasing demand for funds by firms.

In 2020 private sector borrowing was reported to be 6.4526% of GDP whilst the interest rate 33.008% (World Bank Data, 2022). This is because of high expectations for better economic growth. More so the rise in interest rate is affected by demand and supply of credit. An increase in the demand for money or credit raises the interest rate ceteris paribus.

**1.3 Statement of the Problem**

Interest rates in Zimbabwe are high as compared to other countries or regions. As a result of high interest rate, the cost of doing business in Zimbabwe is also high. It’s surprising to see that in other countries private sector development, private sector borrowing and economic growth is high in general. The loanable fund theory assumes that interest rate is the price of credit which is determined by the demand and supply of loanable funds (Beardshaw, 2007). This clearly shows that at low interest rate private firms call for more money therefore increasing private sector borrowing holding other things constant. When interest rate is high firms demand less credit as it will be expensive to borrow. In this case private firms will be trying to minimise their costs. This study therefore seeks to investigate the effects of interest rate on private sector borrowing in Zimbabwe.

**1.4 Purpose of Study**

The purpose of this quantitative study is to determine the impact of interest rate on private sector borrowing in Zimbabwe. Interest rate affects most stakeholders in the economy which include households, government, private investors, businesses and financial institutions. Hence this study will be looking at private sector in totality or as a whole. The study aims at seeking strategies that would enhance private sector borrowing**.** This means that for private firms to borrow there should be favourable conditions. The conditions could either be time, tax consideration, credit risk and convertibility of that particular loan.

**1.5 Objectives of the Study**

* To determine the nature of the relationship between interest rate and private sector borrowing.
* To determine the magnitude of the relationship between interest rate and private sector borrowing.
* To find out the implication of the relationship between interest rate and private sector borrowing.
* To come up with strategies that would enhance private sector borrowing**.**

**1.6 Hypothesis of the Study**

The research is going to be guided by the following testable hypothesis:

**H0:** There is no relationship between interest rate and Private sector borrowing.

**H1:** There is relationship between interest rate and Private sector borrowing

**1.7 Significance of the Study**

This research is going to help the researcher by enhancing his knowledge and equipping him with the necessary research skills that he might need in future. It will also help the government by pointing out some of the policies it can implement that will improve private sector borrowing. We can take for example when the government buys more securities; the banks are injected with more money to lend hence the interest rate decrease making it cheaper for private firms to borrow. This study will also add literature in the University library that is it will be used to correct other past researches done.

**1.8 Assumption of the Study**

* The data will be available
* The study will use the Ordinary least Squares method
* The software that I will use will be the right one which is Eviews
* The researcher attempts to control research design for credibility, validity and reliability

**1.9 Scope of the study**

**1.9.1 Delimitations of the study**

The study is basically looking at the relationship between interest rate and private sector borrowing in Zimbabwe. It will use secondary data.

**1.9.2 Limitations of the study**

As with the majority of studies, the design of the current study is subject to limitations. The first is the cost incurred during the whole process of research. In gathering up information and doing the research, I have to meet up with the supervisor. He needs some refreshments, fuel and other few things not mentioned. The funds to pay for these are not available. I also need to travel and see him every time when there is need. This made the researcher to have an expected budget and restrict his spending and focus much on things that had to do with the study. The second limitation is time. All researchers have deadlines when they need to complete their studies. Participants are only available during a specified time period. Supervisors are not settled in one place, they move from one institution to the other. Time available to study a research problem might be constrained by such practical issues. Hence this could be solved by a more detailed future research. The other imitation is data accessibility. Our local statistical agency do not have the data, hence secondary data will then be used as it is found on the internet.

**1.10 Definition of Key Terms**

Interest rate reflects how high the cost of borrowing is, or high the rewards are for saving. This means that when one borrows the interest rate is the amount you are allocated for borrowing money. According to (Malkiel, 1964) interest rate measures the percentage reward a lender receives for deferring consumption of resources until a future date. Similarly, it measures the price a debtor pays to have resources now. In the context of this study interest rate will be referring to the price or cost of acquiring financial resources to use them now and repay them at a later date. Private sector borrowing refers to financial resources delivered by financial institutions, such as loans, trade credits, non-equity securities and other accounts receivable, which institute a claim for repayment.

**1.11 Organization of the Study.**

The rest of the research is organized as follows: chapter 2 discusses theoretical and empirical review on the effects of interest rate on private sector borrowing. Chapter 3 outlines the methodology to be employed in the study, and chapter 4 provides empirical results and their explanations. Chapter 5 concludes the paper and also provides suggestions for further researches.

**1.12 Chapter Summary**

This chapter was meant to elaborate on what the study is about. It gave a brief idea of what private sector borrowing is. It looked at the trend of the private sector borrowing of Zimbabwe compared to other countries. Zimbabwe private sector is playing a big role in the development of its economy as compared to other countries for example China. The government of China borrows money from financial institutions. Due to this action crowding-out effect arise because the government would have borrowed more funds leaving fewer funds for the private sector investment. This chapter also pointed out the objectives of this research that is what it intends to prove, null and alternative hypothesis, significant of the study, limitations and delimitations of the study. The next chapter is going to analyze empirical and theoretical literature review. Conceptual framework and research gap will also be explained in chapter 2.

**CHAPTER 2**

**LITERATURE REVIEW**

**2.0 Introduction**

The previous chapter explained the trend of private sector borrowing in general. It also looked at the objectives which is the main aim of carrying out this study. This section also discussed the significance, delimitations and the limitations of the study. Objectives of the study were also pointed out. This chapter serves to provide the relevant literature that had been used to analyze the impact of interest rate on private sector borrowing and to offer adequate policy recommendation and conceptual framework.

**2.1 Theoretical Literature review**

**i) The relationship between interest rate and private sector borrowing**

**2.1.1 Classical Theory of Interest**

According to this theory, interest is the return for the productive use of the capital which is identical to the marginal productivity of physical capital. Several economists who have hold the classical view postulated that the rate of interest is determined by the supply and demand of capital. The supply of capital is directed by the time preference and the demand for capital by the predictable productivity of capital (Beard Shaw, 2007). The theory is, therefore, also known as the supply and demand theory of waiting or saving.

**Demand for Capital**

Demand for capital entails the demand for savings. People who invests approve to pay interest on these savings because the capital projects which will be undertaken with the use of these funds will be so productive that the yields on investment recognised will be in surplus of the cost of borrowing, which is interest**.**

In other words, the demand for capital arises because of its productivity that is it is able to yield more return even after covering costs. The marginal productivity curve of capital thus defines the demand curve for capital. This curve after a point is a downward sloping curve. While deciding about an investment, the entrepreneur, however, compares the marginal productivity of capital with the prevailing market rate of Interest.

If the cost of acquiring funds low, the capitalist will be persuaded to capitalise more till marginal productivity of capital is equivalent to the rate of Interest. Thus, the investment demand increases when the Interest rate decreases and it diminishes when the Interest rate rises. As such, investment demand is viewed as the opposite function of the rate of Interest. This can be expressed in mathematical expression as**: Interest Rate = 1/ Investment demand**

**Supply of Capital**

Source of capital relies essentially on the availability of savings in the economy. Savings arise out of the people’s zeal and ability to save. According to (Keynes, 1936) time preference is the basic attention of the people who partake saving but some classical economists assume that self-restrain from consumption is essential for the act of saving. In Zimbabwe supply of capital is stimulated by government policy for example the printing of more bond notes. If the government print more bond notes supply of capital increases ceteris paribus. This will make more money available in the economy.

In all the opinions the rate of interest plays a significant role in the determination of savings. The classical economists commonly hold that the rate of saving is the direct function of the rate of Interest. That is, savings expand with the rise in the rate of interest and when the rate of interest falls, savings contract. It must be noted that the saving-function or the supply of savings curve is an upward-sloping curve.

**Equilibrium rate of Interest**

The equilibrium rate of Interest is determined at a point at which both demand for and supply of capital are equal (Beard Shaw, 2007). In other words, at the point at which investment equals savings, the equilibrium rate of Interest is determined**.** Figure 1.1 below shows the demand and supply of capital at a given interest rate.

**Figure 1.1** is showing a savings and investment graph. The y axis is representing the rate of interest and x axis represents saving and investment in a certain period of time.

**The relationship between interest rate and savings, investment**

**Y D S**

**r e**

**Rate of interest**

**O Q X**

**Savings and Investment**

**Figure 1.1**

The figure above shows the equilibrium rate of interest rate which is **Or**. It is determined at the point where investment demand curve meets the supply of savings curve, so that OQ amount of savings is supplied as well as invested. This suggests that the demand for capital OQ is equal to the supply of capital OQ at the equilibrium rate of interest **Or**. This reflects that the demand for capital is affected by the productivity of capital and the supply of capital.

**2.1.2 Loanable Funds Theory**

The loanable funds theory was developed by Knut Wicksel in the 1930s. The theory assumed that the rate of interest is determined by the supply and demand of loanable funds. This was an effort to increase upon the classical theory of interest. According to this theory, the rate of interest is the price of credit which is determined by the demand and supply for loanable funds (Beard Shaw, 2007). According to( Levine, 1997 ) interest is the price which equates the supply of ‘Credit’ or Saving plus the net increase in the amount of money in a period, to the demand for credit or investment plus net ‘hoarding’ in the period.

**Demand for Loanable Funds**

The demand for loanable funds arises primarily from three sources which are government, business and consumers who need them for the purposes of investment, hoarding and consumption. The Government demands funds for constructing public works or for public consumption (to maintain law and order, administration, justice, education, health), to reimburse budget deficit during recession or to invest other development purposes. Generally, government demand for loanable funds is not affected by the interest rate.

The business borrows funds to purchase capital goods and to start investment projects. The firms or businesses need altered types of capital goods in order to carry or increase their production. If the business does not own adequate money to acquire these capital goods, they borrow funds. Business or firms investment demand for loanable funds rely on the capacity of their production. The interest and firm’s investment demand for loanable funds has also contrary relationship (Musgrave, 1998). It means there will be decreased demand on higher interest and increased demand on lower Interest.

The consumers acquire loans for consumption purposes. There are two types of consumption namely durable which is the purchasing of goods that last long for example home furniture and secondly to purchase goods of daily use and they generally open their accounts with the seller. Besides these, they acquire funds for investment or speculative purposes also. Behind this they have profit motive (Keynes, 1936).

**Supply of Loanable Funds**

The supply of loanable funds arises from savings, dis-hoardings and bank credit. Private savings, individual and corporate are the main source of savings (Jappelli et al, 1989). Though personal savings depend upon the income level, yet taking the level of income as given, they are regarded as Interest elastic (Keynes, 1936). The higher the rate of Interest, the greater will be the inducement to save and vice-versa.

There is a positive relationship between interest-rate and the supply of loanable funds (Keynes, 1936). It means there will be more supply of loanable funds at higher interest rate and less supply at lower interest rate. Hence the supply curve of loanable funds will be an upward sloping curve from left to right. Fig 2 below shows the quantity of money demanded at a given interest rate.

**The relationship between interest rate and quantity of money demanded**

S

**Interest**

**Rate**

**O**

**Quantity of money**

**Figure 1.2**

The diagram below shows a supply curve were the horizontal axis represents quantity of money supplied at a given interest rate. The vertical axis represents the level of interest rate.

**Determination of Interest rate**

The equilibrium between the demand for and supply of loanable funds (or the intersection between demand and supply curves of loanable funds) indicates the determination of the market rate of interest.

SL2

DL **decrease** SL SL1

**Interest e1 in supply rise in supply**

**Rate e fall in interest rate**

**e2**

**O Q1 Qe Q2**

**Quantity of Loanable funds**

**Figure 1.3**

If the demand for loanable funds increases, the interest rate will also increase and if the demand for loanable funds decreases, the interest rate will also decrease. Similarly, given the demand for loanable funds, interest rate will increase with the decrease in the supply of loanable funds and will fall with the rise in the supply of loanable funds (Harvey, 1991). Hence the equilibrium rate of interest is thus determined where Supply of loanable funds (SL) =Demand of loanable funds (DL). Point e1 represent t an increase in interest rate and e2 a decrease in interest rate.

**2.2 Empirical Literature review**

There exist several studies that investigated the impact of interest rate on private sector borrowing. Khalil Jebran examined the effects of interest rate on private sector borrowing in Pakistan from 1975 to 2011. The Autoregressive Distributed Lag was employed for the estimation of long and short run relationship. The study supports the neoclassical theory of interest rate which is the loanable fund theory. The lending rate was used to accommodate the loanable fund theory. This is because the loanable fund theory suggests that interest rate is determined by the supply of loanable funds and demand for credit. The study concluded that lending rate influence negatively the private sector credit in the long run and short run. Inflation rate has a positive relationship with private sector credit in the short run and in the long run as well.

Mauellbauer and Aron carried out a research in South Africa. The research was meant to analyse the impact of interest rate on the Real Output (Gross Domestic Product) holding other things constant. This was a linear model which used quarterly time series data. It showed a positive relationship between interest rates and output

Odhiambo (2009) carried out a research to determine the relationship between interest rate reforms and economic growth in Zambia using time series data covering the period from 1969 to 2006 employing two models in a stepwise fashion. The research was carried out to provide answers to these two critical questions; does interest rate liberalization has any positive effects on financial deepening in Zambia? Is economic growth propelled by the financial depth which results from interest rate liberalisation? The efficacy of interest ꭇate liberalization, in the first model was examined and analysed by regressing interest rates on financial deepening. Odhiambo created a simple model which is the second model by including savings as an intermittent variable in order to find the casual relationship between financial depth and economic growth. Results obtained from the research using the co-integration-based error correction model maintain that interest liberalization impacts positively financial deepening. From the same study, it was concluded that financial deepening which is a result of the liberalization of the interest rates causes economic growth.

Anaripour (2011) also carried out a research to investigate the relationship between industrial output and interest rates. In the research panel data of 22 European and Islamic countries covering the period from 2004 to 2010 was used to test cause relationship between industrial output and interest rates. Empirical results obtained from the study showed that there exists a negative relationship between interest rates and output and the results also showed that the relationship is a unilateral causal relationship between output and interest rates in statistical view. Basing on the results, therefore it was concluded that an increase or a decrease in interest rates has no effect on output. Anaripour findings confirm the parking-it view that monetary policy through the use of interest rates is important in affecting economic growth and output.

**2.3 Conceptual Framework**

Private sector borrowing is the dependant variable and interest rate is the independent variable. There is an inverse relationship between private sector borrowing and interest rate. This means that at high interest rate private sector borrowing will be low and at low interest rate private sector borrowing will be high.

**(Independent Variable) (Dependent Variable)**

**Interest rate Private sector borrowing**

**Impact of interest**

**prpir rate on private**

**sector borrowing**

When interest rate increases, private sector borrowing moves in a different direction going downwards. The impact of interest rate on private sector borrowing results in the decrease in private sector borrowing.

**2.4 Research Gap Analysis**

Khalil Jebran conducted a study a study on impact of interest rate on private sector borrowing in Pakistan. Mine will be looking at the impact of interest rate on private sector borrowing in Zimbabwe. He employed the Autoregressive Distributed lag Approach for the estimation of short run and long run relationship, whilst mine will be using the Ordinary Least Squares. His research looked at the impact of interest rate on private sector borrowing from 1975 to 2011 and mine will be looking at the impact of interest rate on private sector borrowing from 1990 to 2021.

**2.5 Chapter Summary**

This chapter discussed theoretical and empirical literature. Theoretical literature help to establish what theories already exist. It also brings out the relationship between the theories and to what degree were the theories investigated. This will lead to the development of new hypothesis to be tested. Empirical literature arises as a result of few things left in isolation from historical practice. Historical practices are intended to examine research throughout a period of time. The agenda is to place research in historical context to show familiarity with state of the art development and to identify the likely ways for the future. This section also assisted in identifying some of the variables to be used in the model. Theoretical literature involved Keynesian concept which assumed that there is a negative relationship between interest rates and output. The next chapter focuses on methodology that is going to be implemented and justification of variables.

**CHAPTER 3**

**RESEARCH METHODOLOGY**

**3.0 Introduction**

The previous chapter focused on empirical and theoretical literature. Literature review helps to come up with a mathematical model by pointing out some variables to be used in the research. Methodology of the study focuses on the logical basis of the study and it provides the model to be used in carrying out the research, the variables to be considered in the model both the dependent and the explanatory variables, explanation of these variables and sources of data.

**3.1 Research Approach**

We have different types of research approaches which include qualitative, quantitative and mixed. This study adopted a quantitative research approach. The justification of using quantitative research approach is to observe situations or events that affect people. Secondly this is as a result of objective data that can be clearly communicated through statistics and numbers. More so this study adopted a quantitative research because it has four research methods which are descriptive, correlational, experimental and comparative approach. Descriptive approach describes the current status of the factor being studied. Correlational approach studies the relationship between factors which are measured and recorded as research variables. Experimental approach studies if there is a cause and effect on relationship between variables. Comparative approach looks at the comparisons that are the effect of independent variable on dependent variable.

**3.2 Research strategy**

This study adopted a research strategy which is called a survey. A survey allows both the use of quantitative and qualitative methods of analysis. A survey is a list of questions aimed for extracting specific data from a particular group of people. The justification for the use of a survey is because it asses thoughts, opinions and feelings. Surveys can also be specific and limited or they can have more global, widespread goals. Conducting a survey means you are using an unbiased approach to decision making. In collecting survey data sensible decisions are developed based on analysed results. More so survey information helps to provide a snapshot of the attitude and behaviour of your survey population. This valuable feedback act as a bench mark which will help you to compare results overtime.

**3.3 Research Design**

It is the framework of research methods and techniques chosen by a researcher. This study is adopted an explanatory research design method. Explanatory research design uses a researcher’s ideas and thoughts on subject to further explore their theories. It explains unexplored aspects of a subject and details about what, how and why of research questions.

**3.4 Population of the Study**

This study used data from period of 1990 to 2021. The study used private sector borrowing as the independent variable (PSB). The independent variables were interest rate (IR), money supply (MS), inflation (INF) and gross domestic product (GDP).

* 1. **Sample size**

The sample size of this research consisted of 31 observations with five variables which are private sector borrowing, interest rate, money supply, inflation and gross domestic product.

* 1. **Sampling Method**

This study adopted a sampling method which is probability. This is because the population of the study is quantifiable. This means that every object in the population can be counted. This gives a sense in which every object is assumed to have an equal chance of being selected in the sample. This is only possible when using probability sampling method.

* 1. **Sampling Techniques**

The study picked data from 1990 to 2021. This enables the researcher to use a technique called simple random. This is because it gives relevant information which is current and hence making it possible to predict future trend of your variables

* 1. **Data Sources**

The research is going to use secondary data for the reason that it is readily available and easy to use for a research covering such a wide span. The research is also going to make use of time series data from 1990 to 2021. Annual publications from ZIMSTATS for statistics on private sector borrowing, inflation rates and money supply and RBZ on interest rate trends will be used. Other sources include online publications on economic indicators by the World Bank and the International Monetary Fund. Using e-views 4, the Ordinary Least Squares method is going to be employed in determining the effects of interest rates on the private sector borrowing in Zimbabwe.

* 1. **Data analysis**

This study adopted e-views software to regress data. This is because it is easy to understand as compared to the other soft wares. More so since annual data will be used e-views is suitable and simpler.

**3.9 Model specification**

(Nadeem Aftab etal, 2016) did their research on the effects of interest rate and private sector borrowing. They came up with a mathematical model. They applied the following model

PSB= (INF, EX, LR) …………………..equation (1)

The equation (1) can be formulated into equation (2) by removing exchange rate and adding 2 variables which are GDP and money supply and it becomes

PSB= (LR, INF, MS, GDP)…………………equation (3)

The equation 3 can be formulated into equation 4 as follows

**PSB=β0+β1 LR+β2 INF+β3 MS+β4 GDP + ε**

**3.10 Justification of variables**

The dependent variable is private sector borrowing (PSB). Private sector credit refers to claims of financial institutions on non-financial sector to GDP, which reflects domestic asset allocation (Khalil Jebran, 2016).

**3.11 Real Interest Rates (LR**).

Real interest rate plays an important role in private sector credit. Interest rate refers to the cost of borrowing. Due to the fact that it is a cost, it is therefore negatively related to private sector borrowing measured in monetary terms. Businesses need funds to invest and expand. These funds are made available through borrowing from financial institutions. The prize charged for the temporary ownership of these funds by businesses is called interest rate. The lending rate by banks is going to be used as interest rate in this study that is the cost of capital or funds which is the key drive to economic growth. More so investors seek to invest in market which offers a low rate. It is necessary to keep interest rate low so as to attract investors. The real interest rate can be measured as:

**Real interest rate = Nominal interest rate - inflation**

**3.12 Inflation**

Inflation is referred to as the general increase in price level of goods and services over a specified period of time. This discourages savings and investment. During periods of inflation borrowers tend to have a great advantage at the expense of lenders. This is because when one borrows money today, he or she will repay it after sometime but with less value than it has originally. In other words, a dollar spend today will be better than a dollar spends tomorrow.

**3.13 Money Supply**

Money supply refers to every currency and other liquid instruments in a country’s economy. Money supply includes both cash and deposits that can be easily used as cash. Money supply can be measured in so many different forms. It can be classified as M1, M2, M3 and M4. It’s not every classification that is used by every country. Money supply or broad money reflects each type of liquidity a country has in its economy. M1 is regarded as narrow money and it includes notes and coins that are in circulation and other assets that can be easily converted to cash.

**3.14 Gross Domestic Product**

Gross domestic product refers to the monetary measure of the market value of all final goods services produced in a specific period of time. It is one of the most common indicators used to track the health of a nation’s economy. GDP can be expressed in two ways which are nominal and real GDP. Nominal GDP includes current market prices without factoring in deflation and inflation. Nominal GDP considers natural movement of prices and tracks the gradual increase of an economy’s value over time (Kramer 2020). On contrary, real GDP factors in inflation. This means that it takes into account the overall price levels. The model will factor in real GDP.

**3.15 Error Term**

It is a residual variable produced by a statistical or mathematical model which is created when the model does not fully represent the relationship between the independent variables and the dependent variables (Hayes, 2020). As a result of this incomplete relationship, the error term is the amount at which the equation may differ during empirical analysis. The error term is also known as the residual disturbance or remainder term and is variously represented in models by the letter e, ε and μ (Hayes, 2020).

**3.16 Diagnostic Tests.**

**3.16.1 Normality Test**

To test if the series is normally dispersed we make use of the Jarque Bera test static. We then This study under the null hypothesis that the series is normally distributed and alternative hypothesis that the data is not normally distributed. The probability value of the Jarque Bera F-statistic value must be greater than 5% for the null hypothesis not to be rejected, kurtosis must be equal or close to 3 and the mean of the series must be equal or close to zero.

**3.16.2 Correlation Test**

Correlation is the statistic that measure the degree to which two variables move in relation to each other and is expressed numerically by the correlation coefficient. The correlation coefficient ranges from -1.0 and 1.0. When interpreting perfect positive correlation the correlation coefficient will be exactly 1. This suggests that when one variable moves up or down the other variable move in lockstep in the same direction. Perfect negative correlation implies that the variables move in opposite directions and a zero correlation means no linear relationship between variables.

**3.16.3 Unit Root Test**

According to Gujarati D.N (2003), if time series data is stationary, the variance, mean, and auto covariance at different time intervals does not change no matter at what point or size. As postulated by (Cuthbert son et al 1995) such data will tend to go back to its mean and changes around this mean will have a broadly persistent bigness. Stationary time series is very crucial because if such data is non-stationary, we can predict its trend only for the period under study. As a result, we cannot generalize it in other time periods. Therefore, for the sack of projecting such non-stationary data time series may be of little use. There is a varied test for stationarity which contains the graphical exploration, the correlogram test and the unit root test. It is important to know whether or not an economic time series has a unit root (Gujarati 1995). It is crucial to note the presents of a unit root in an economic time series. The distribution of approximate values and test statics which falls in the category I (1) regressors may change from those that fall in category I (0). In testing the present of a unit root, the study used the Argumented Dickey Fuller concept in this study.

**3.16.4 Co-integration Test**

Cointegration is a statistical method that is used to test the correlation between two or more non stationary time series in the long run or for specific time period. This is a bivariant technique which helps to identify long run parameters or equilibrium for two or more sets of variables. Cointegration test determine the magnitude, significant and nature of the relationship between variables. When interpreting results we use H0 and H1 which is our null and alternative hypothesis.

H0: There is no cointegration (no long run relationship between variables)

H1: There is cointegration (there is long run relationship between variables)

Reject H0 when probability value is less than or equal to 5

**3.16.5 Model Specification Test**

Specification tests are going to be done and help which model fits the data. The largely significance of the model is going to be observed making use of the F-static value after computing the regression equation. The F-test defines the validity of the whole model. The Ramsey Regression Error Specification test (Ramsey RESET) test is going to be used. The significance of the variables in the model is going to be determined by the t-statistic values attained after running the regression. If t-statistic values are greater than 2, then it means that the variables are significant the opposite is true. H0 for the test is that the model is incorrectly specified and H1 is that the model is correctly specified.

**3.17 Validity of Results**

**3.17.1 Normality Test**

To test if the series is normally dispersed we make use of the Jarque Bera test static. We then This study under the null hypothesis that the series is normally distributed and alternative hypothesis that the data is not normally distributed. The probability value of the Jarque Bera F-statistic value must be greater than 5% for the null hypothesis not to be rejected, kurtosis must be equal or close to 3 and the mean of the series must be equal or close to zero.

**3.17.2 Lagrange Multiplier Test**

Lagrange Multiplier test is used to test for higher order autocorrelation in residuals of VAR models. This ensures that the data has no serial correlation. If the probability of chi squared is less than 5% it means that there is serial correlation. When chi squared is greater than 5% it means that there is no serial correlation.

**3.17.3 Multi-collinearity Test.**

Multicollinearity refers to a situation where a number of independent variables in a multiple regression model are closely correlated to one another. This makes it difficult to separate individual impacts of the exogenous variables on the endogenous variable. It can lead to skewed or misleading results when a researcher or analyst is attempting to determine how well each one of a number of individual independent variables can most effectively be utilized to predict or understand the dependent variable in a statistical model. Multicollinearity can also lead to wider confidence intervals and less reliable probability values (p-values) for the independent variable. The existence of correlation between explanatory variables is detected through the use of the correlation matrix. Correlation coefficient that is greater or equal to 0.8 reflects the problem of multicollinearity. According to Gujarati 2004, to correct for multicollinearity; the least important variable between the correlated variables is dropped. The null hypothesis for the test will be that there is no multicollinearity and another hypothesis will be the series does have the problem of multicollinearity.

**3.17.4 Heteroscedasticity Test**

One of the assumptions of the Classical Linear regression Model states that the error terms should be homoscedastic that is, they must be constant over time. The presence of heteroscedasticity leaves the estimators unaffected since they remain unbiased and consistent but the t-statistic values and the F-statistic values will be distorted and employing an OLS will lead to spurious regression. In detecting the existence of heteroscedasticity, the ARCH test method is going to be employed with the null hypothesis of homoscedasticity and the alternate hypothesis of heteroscedasticity. The null hypothesis of homoscedasticity is rejected if the probability value of the F statistic is less than 5% and the OLS method will be abandoned and the Weighted Least Squares Method will be implemented.

**3.18 Ethical and Legal Consideration**

Plagiarism is one of the issues to be considered when dealing with research ethics and consideration. In this research the writer used the plagiarism checker before submitting the paper. Secondly the writer managed to keep source of information that was consulted. The writer also managed to paraphrase his sources and adding his own ideas. Lastly to manage plagiarism the writer credited the original author in an in text citation and reference list.

**3.18 Chapter Summary**

This chapter identified the model of the impacts of interest rates on private sector borrowing in Zimbabwe. Private sector borrowing is the dependent variable with interest rate being the key explanatory variable. The Argumented Dick Fuller unit root test is to be engaged to test for stationarity of the data. The proposed technique is the Ordinary Least Squares Method (OLS). Diagnostic tests to be carried out on the data were also outlined. In the next chapter empirical results are presented together with their interpretation.

**CHAPTER 4**

# PRESENTATION AND INTERPRETATION OF RESULTS

# 4.0 Introduction

In this chapter, results that explain the effects of interest rates on private sector borrowing in Zimbabwe are going to be presented making use of annual time series data for the period which stretches from 1990-2021. In section 4.1, diagnostic tests results are going to be presented in relation to the estimation of the model. The following section presents results obtained from estimating the model and section 4.2 gives an outline of results analysis.

**4.1 Diagnostic Tests Results.**

**4.1.1 Normality Test**

The Jarque Bera normality test was employed to test for normality of the series. Empirical results from the test had a Jarque Bera statistic of 3.338058 and probability value of 0.188430. Since the probability value of the Jarque Bera test is above 0.05 the null hypothesis of normal distribution of the data is not rejected and concludes that the data is normally distributed.

**Table 4.1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean | Skewness | Kurtosis | Jarque Bera Statstic | Probability |
| 22.87235 | 0.792985 | 2.327792 | 3.338058 | 0.188430 |

**4.1.2 Correlation Test**

Correlation for first order using Durban Watson statistic. The Durban Watson statistic has a value of 1.823513. This value is near 2 which defined no correlation area which start from 1.7 to 2. Hence there is no correlation because the value is in between 1.7 and 2.3.

**4.1.3 Unit root Test**

All the variables were tested for unit root problems using the Phillip Peron test statistic and **table 4.2** presents the results obtained.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | P statistic | Critical value | | Order of integration | Intercept | | |
| PRIVATE SECTOR  BORROWING | 0.2802 | 1% **-3.711457** | | I(0) | yes | | |
|  |  | 5% **-2.981038** | | I(0) | yes | | |
|  |  | 10% **-2.629906** | | I(0) | Yes | | |
| INFLATION | 0.0008 | 1% **-3.699871** | | I(0) | Yes | | |
|  |  | 5% **-2.976263** | | I(0) | Yes | | |
|  |  | 10% **-2.627420** | | I(0) | Yes | | |
| REAL INTEREST  RATE | 0.4371 | 1% **-3.699871** | | I(0) | Yes | | |
|  |  | 5% **-2.976263** | | I(0) | Yes | | |
|  |  | 10% **-2.627420** | | I(0) | Yes | | |
| MONEY SUPPLY | 0.6640 | 1% **-3.711457** | I(0) | | Yes | |
|  |  | 5% **-2.981038** | I(0) | | | Yes | | |
|  |  | 10% **-2.69906** | I(0) | | | Yes | | |
| GROSS DOMESTIC PRODUCT | 0.9967 | 1% **-3.699871** | I(0) | | | Yes | | |
|  |  | 5% **-2.976263** | I(0) | | | Yes | | |
|  |  | 10% **-2.627420** | I(0) | | | Yes | | |

If probability value is less than 0.05 reject null hypothesis and the series is regarded as stationary. If the probability value is greater than 0.05 accept the null hypothesis and the series is regarded as non-stationary. Inflation is stationary and the rest of the variables are non-stationary.

**4.1.4 Co-integration Test**

**Table 4.3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unrestricted Cointegration Rank Test (Trace)** | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **Hypothesized** |  | **Trace** | **0.05** |  |
| **No. of CE(s)** | **Eigenvalue** | **Statistic** | **Critical Value** | **Prob.\*\*** |
|  |  |  |  |  |
|  |  |  |  |  |
| **None \*** | **0.803781** | **80.06788** | **79.34145** | **0.0440** |
| **At most 1** | **0.484287** | **39.35479** | **55.24578** | **0.5517** |
| **At most 2** | **0.383585** | **22.79965** | **35.01090** | **0.5219** |
| **At most 3** | **0.330956** | **10.70377** | **18.39771** | **0.4151** |
| **At most 4** | **0.025904** | **0.656144** | **3.841466** | **0.4179** |
|  |  |  |  |  |
|  |  |  |  |  |
| **Trace test indicates 1 cointegrating eqn(s) at the 0.05 level** | | | | |
| **\* denotes rejection of the hypothesis at the 0.05 level** | | | | |
| **\*\*MacKinnon-Haug-Michelis (1999) p-values** | | | |  |
|  |  |  |  |  |
|  | | | | |

From the above table the probability values are greater than 5%, we accept H0 and conclude that there is no long run relationship between variables  
**4.1.4 Actual model**

**Table 4.4**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Coeficient** | **Standard Error** | **t-statistis** | **Probability** |
| **C** | **-38.11080** | **41.27939** | **-0.923241** | **0.3659** |
| **Money Supply** | **0.768879** | **0.637344** | **1.206380** | **0.2405** |
| **Gross Domestic Product** | **8.91E-10** | **7.32E-10** | **1.217106** | **0.2365** |
| **Inflation** | **-0.066184** | **0.023346** | **-2.834859** | **0.0096** |
| **Real interest rate** | **-0.024794** | **0.009536** | **-2.00003** | **0.0163** |

**R2 = 0.567748**

**Adjusted R2 = 0.4898157**

**F statistic = 7.224056**

**Prob (F-stat) = 0.000713**

**DW = 1.823513**

The effects of interest rate on private sector borrowing as presented in the table above can be illustrated using equation below

**PSB=** *-38.11080***+***0.768879***MS***+8.91E-10***GDP***-0.0066184***INFLTN***-0.024794***RIR***……………..*

**Where *MS represents money supply*, *GDP* is the gross domestic product, *INF* reflects the level of inflation and *RIR* denotes the real interest rate.**

**4.1.5 Multi-colinearity Test Results.**

The null hypothesis is rejected if there is a pairwise correlation value of variables exceeding 0.8 a situation which represents severe multi-colinearity. From **table 4.5** below it can be noted that there is no multi-colinearity between the variables hence we fail to reject null hypothesis.

**Table 4.5**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PSB** |  | **GDP** |  | **INFLTN** |  | **INTRTE** |  | **MS** |
| **PSB** | **1.000000** |  | **0.435709** |  | **-0.271157** |  | **-0.564082** |  | **0.118093** |
| **GDP** | **0.435709** |  | **1.000000** |  | **0.404409** |  | **-0.394592** |  | **0.502962** |
| **INFLTN** | **-0.271157** |  | **0.404409** |  | **1.000000** |  | **0.016351** |  | **0.269453** |
| **INTRTE** | **-0.564082** |  | **-0.394592** |  | **0.016351** |  | **1.000000** |  | **0.300713** |
| **MS** | **0.118093** |  | **0.502962** |  | **0.269453** |  | **0.300713** |  | **1.000000** |

**See appendices for results**

**4.1.6 Heteroscedasticity test results**

The Arch Test was used to test for heteroscedasticity and the probability value of the f static was above 5% meaning the series is homoscedastic. The *p* value of the test statistic was

0.0536

**4.1.7 Model Specification test results**

To check if our model is correctly specified we used r squared. If r squared is greater than 50% the model is correctly specified and if the r squared is less than 50% the model is not correctly specified. R squared reflected a value of which is 0.567748 greater than 50% hence the model is correctly specified.

**Table 4.1.6**

|  |  |  |
| --- | --- | --- |
| **R-squared** | **0.567748**   |  | | --- | |  | |

See appendices for results

**4.2 Interpretation of results**

From the data given in the table 4.4 above the established regression equation was

PSB=-38.11080+0.768879MS+8.91E-10GDP-0.0066184INFLTN-0.02479RIR,

From the directly above equation it was discovered that holding money supply, gross domestic product, inflation and interest rate to a constant zero, private sector borrowing of Zimbabwe will be negative 38.11080. A unit increase in money supply will lead to increase in Zimbabwe private sector borrowing by a factor of 0.768879, a unit increase in gross domestic product will result in an increase in Zimbabwe private sector borrowing by a factor of 8.91, a unit increase inflation will lead to decrease in Zimbabwe private sector borrowing by a factor of 0.0066184 and further unit increase in interest rate would lead to decrease in Zimbabwe private sector borrowing by a factor of 0.0247

More so all the variables were tested at 5% and 95% level of significance. Money supply showed 0.2405 level of significance, gross domestic had 0.2365 level of significance, inflation had 0.0096 level of significance and real interest rate had 0.0163 level of significance hence the most significance factor is real interest rate.

From the noted Adjusted R Squared the study found that there was variation of 49% on private sector borrowing in Zimbabwe due to changes in money supply, gross domestic product, inflation and real interest rate. The study further revealed that there was no strong positive correlation between the variables as shown by the correlation test in table 4.2. More so the findings of this research revealed that money supply, inflation, gross domestic product and real interest rate influences private sector borrowing in Zimbabwe.

**CHAPTER FIVE**

**SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

**5.1 Introduction**

From the data collected and analysis prepared, the following discussions, conclusions and recommendations were made. The answers were mainly centered on the objectives of the study. The researcher intended to establish the impact of lending interest rate on private sector borrowing in Zimbabwe.

**5.2 Summary Findings**

The main objective was to establish the impact of interest rate on private sector borrowing in Zimbabwe. Secondary data was collected from World Bank, ZimStat and multiple regression analysis was used to analyze the data. From the research found on the Adjusted R squared, the study revealed that there was 49% variation of private sector borrowing due to changes in money supply, inflation, gross domestic product and real interest rate. The study further revealed that there was no strong positive correlation between variables. The research found that inflation and real interest rate were more significant in explaining variations in private sector borrowing in Zimbabwe, hence these variables influence changes in the private sector borrowing of the country. The study also revealed that the established regression equation was

PSB=-38.11080+0.768879MS+8.91E-10GDP-0.0066184INFLTN-0.024794RIR

From the regression equation above the study found that there was positive relationship between private sector borrowing, money supply and gross domestic product. The study further revealed that there was a negative relationship between private sector borrowing, inflation and real interest rate. More so at 5% level of significance and 95% level of confidence, real interest rate had the greatest effect on private sector borrowing in Zimbabwe, followed by inflation then gross domestic product and money supply had the least effect to private sector borrowing of Zimbabwe.

**5.3 Conclusion**

The findings of the study concluded that a unit increase in real interest rate negatively affect private sector borrowing in the country. This was found from the regression and correlation analysis that there was negative relationship between private sector borrowing and interest rate in Zimbabwe. The study also concluded that money supply and gross domestic product in the country positively influence the private sector borrowing as this was revealed in the regression equation that increase in money supply and gross domestic product positively influence the country’s private sector borrowing.

More so the study further revealed that increase in inflation rate and lending interest rate negatively affects private sector borrowing in Zimbabwe. Increase in inflation rate tends to cause an environment of uncertainty. This is because private investors will not be sure of what their future earnings will be like as economic environment will not be predictable. This reduces the zeal to borrow funds by private investors in Zimbabwe.

**5.4 Recommendation for the Study**

This study advocates that policy makers may create monetary policies for the drive of managing interest rate. This is because a decrease or increase in interest rate will unfavorably affect private sector borrowing or credit. Therefore private sector may be stimulated to go for the credit investment because it is a source of funding in the economy. If additional liquidity happens in the financial system holding other things constant, the domestic resources other than Reserve Bank of Zimbabwe may be used to shield the public expenditures and deficit without using private sector investment. High amount of funding would be given to the private sector by banks at low interest rate to stimulate business activity in the economy. More so there is need for more deregulation of the private sector and financial liberalization so that foreign investors take interest in investment in the private sector. The research further recommends that there is need for the government to control inflation rate through various fiscal policies as it is discovered from the regression equation that a unit increase in inflation rate negatively affects private sector borrowing in the country.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **APPENDICES PAGE**  Dependent Variable: PSB | | | | | |  | |  | |
| Year | | PSB | | INFLTN | | INTRTE | | GDP | | MS | |
| 1990 | | 11,6432494 | | -0,92043 | | 11,70833 | | 8,78E+09 | | 68,257 | |
| 1991 | | 14,3175915 | | -6,7773 | | 15,5 | | 8,64E+09 | | 68,263 | |
| 1992 | | 17,3490936 | | -14,1297 | | 19,77083 | | 6,75E+09 | | 68,162 | |
| 1993 | | 21,3165884 | | -3,79112 | | 36,33083 | | 6,56E+09 | | 68,119 | |
| 1994 | | 20,8978085 | | -3,89567 | | 34,86083 | | 6,89E+09 | | 68,122 | |
| 1995 | | 24,4391606 | | 3,038538 | | 34,73167 | | 7,11E+09 | | 68,074 | |
| 1996 | | 21,2115446 | | 8,984383 | | 34,23417 | | 8,55E+09 | | 68,045 | |
| 1997 | | 26,2315383 | | -2,87905 | | 32,54667 | | 8,53E+09 | | 67,962 | |
| 1998 | | 24,2824784 | | -27,0486 | | 42,05583 | | 6,4E+09 | | 66,177 | |
| 1999 | | 15,7448629 | | 8,006813 | | 55,38583 | | 6,86E+09 | | 64,327 | |
| 2000 | | 20,8769956 | | 0,6279 | | 68,20833 | | 6,69E+09 | | 67,1 | |
| 2001 | | 27,1192138 | | -0,13089 | | 38,02083 | | 6,78E+09 | | 69,886 | |
| 2006 | | 0 | | -2,01768 | | 508,7408 | | 6,34E+09 | | 72,601 | |
| 2007 | | 0 | | 0,894887 | | 572,9363 | | 5,73E+09 | | 75,2 | |
| 2008 | | 0 | | 1,349223 | | 1158,026 | | 5,81E+09 | | 77,646 | |
| 2009 | | 0,6769 | | 95,40866 | | 1175 | | 5,76E+09 | | 77,682 | |
| 2010 | | 10,01384 | | 4,098405 | | 578,9583 | | 5,44E+09 | | 77,776 | |
| 2011 | | 10,67281 | | 2,553176 | | 496,4583 | | 5,29E+09 | | 77,873 | |
| 2012 | | 18,41819 | | 4,028577 | | 11,59667 | | 4,42E+09 | | 77,973 | |
| 2013 | | 35,97721 | | 9,370603 | | 9,74 | | 9,67E+09 | | 78,077 | |
| 2014 | | 38,12543 | | -0,25214 | | 9,4675 | | 1,2E+10 | | 78,184 | |
| 2015 | | 40,31234 | | 0,607814 | | 8,541771 | | 1,41E+10 | | 78,356 | |
| 2016 | | 50,12362 | | 2,160993 | | 7,113333 | | 1,71E+10 | | 78,557 | |
| 2017 | | 51,92341 | | 2,442946 | | 6,914167 | | 1,91E+10 | | 78,717 | |
| 2018 | | 52,9878364 | | 5,220227 | | 5,123403 | | 1,95E+10 | | 78,861 | |
| 2019 | | 0,54752 | | -4,03523 | | 4,123231 | | 2E+10 | | 78,968 | |
| 2020 | | 1,1552 | | 557,2 | | 33,01 | | 2,05E+10 | | 79,071 | |
| 2021 | |  | | 60,7 | | 45,48 | | 2,2E+10 | | 79,431 | |
|  | |  | |  | |  | |  | |  | |
| Method: Least Squares | | | | | |  | |  | |
| Date: 05/21/22 Time: 21:19 | | | | | |  | |  | |
| Sample (adjusted): 1990 2020 | | | | | |  | |  | |
| Included observations: 27 after adjustments | | | | | | | |  | |
|  | |  | |  | |  | |  | |
|  | |  | |  | |  | |  | |
| Variable | | Coefficient | | Std. Error | | t-Statistic | | Prob. | |
|  | |  | |  | |  | |  | |
|  | |  | |  | |  | |  | |
| C | | -32.11890 | | 39.87360 | | -0.805518 | | 0.4291 | |
| GDP | | 9.57E-10 | | 7.07E-10 | | 1.353535 | | 0.1896 | |
| INFLTN | | -0.070679 | | 0.022551 | | -3.134132 | | 0.0048 | |
| INTRTE | | -0.015415 | | 0.009211 | | -1.673514 | | 0.1084 | |
| MS | | 0.681318 | | 0.615639 | | 1.106685 | | 0.2804 | |
|  | |  | |  | |  | |  | |
|  | |  | |  | |  | |  | |
| R-squared | | 0.502242 | | Mean dependent var | | | | 22.45177 | |
| Adjusted R-squared | | 0.411741 | | S.D. dependent var | | | | 14.51109 | |
| S.E. of regression | | 11.12972 | | Akaike info criterion | | | | 7.822691 | |
| Sum squared resid | | 2725.155 | | Schwarz criterion | | | | 8.062661 | |
| Log likelihood | | -100.6063 | | Hannan-Quinn criter. | | | | 7.894047 | |
| F-statistic | | 5.549553 | | Durbin-Watson stat | | | | 1.821655 | |
| Prob(F-statistic) | | 0.003032 | |  | |  | |  | |
|  | |  | |  | |  | |  | |
|  | |  | |  | |  | |  | |
| Nor | |  | |  | |  | |  | |

**Normal Distribution Test Results**



**Cointegration Test Results**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Date: 05/23/22 Time: 17:34 | | |  |  |  |  |
| Sample (adjusted): 1992 2020 | | |  |  |  |  |
| Included observations: 25 after adjustments | | | |  |  |  |
| Trend assumption: Quadratic deterministic trend | | | |  |  |  |
| Series: GDP INFLTN INTRTE MS PSB | | |  |  |  |  |
| Lags interval (in first differences): 1 to 1 | | | |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Unrestricted Cointegration Rank Test (Trace) | | | |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Hypothesized |  | Trace | 0.05 |  |  |  |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.\*\* |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| None \* | 0.803781 | 80.06788 | 79.34145 | 0.0440 |  |  |
| At most 1 | 0.484287 | 39.35479 | 55.24578 | 0.5517 |  |  |
| At most 2 | 0.383585 | 22.79965 | 35.01090 | 0.5219 |  |  |
| At most 3 | 0.330956 | 10.70377 | 18.39771 | 0.4151 |  |  |
| At most 4 | 0.025904 | 0.656144 | 3.841466 | 0.4179 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Trace test indicates 1 cointegrating eqn(s) at the 0.05 level | | | | |  |  |
| \* denotes rejection of the hypothesis at the 0.05 level | | | | |  |  |
| \*\*MacKinnon-Haug-Michelis (1999) p-values | | | |  |  |  |
|  |  |  |  |  |  |  |
| Unrestricted Cointegration Rank Test (Maximum Eigenvalue) | | | | |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Hypothesized |  | Max-Eigen | 0.05 |  |  |  |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.\*\* |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| None \* | 0.803781 | 40.71310 | 37.16359 | 0.0187 |  |  |
| At most 1 | 0.484287 | 16.55514 | 30.81507 | 0.8134 |  |  |
| At most 2 | 0.383585 | 12.09588 | 24.25202 | 0.7565 |  |  |
| At most 3 | 0.330956 | 10.04762 | 17.14769 | 0.3929 |  |  |
| At most 4 | 0.025904 | 0.656144 | 3.841466 | 0.4179 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level | | | | |  |  |
| \* denotes rejection of the hypothesis at the 0.05 level | | | | |  |  |
| \*\*MacKinnon-Haug-Michelis (1999) p-values | | | |  |  |  |
|  |  |  |  |  |  |  |
| Unrestricted Cointegrating Coefficients (normalized by b'\*S11\*b=I): | | | | |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| GDP | INFLTN | INTRTE | MS | PSB |  |  |
| -4.56E-10 | 0.106413 | -0.003632 | 0.395079 | 0.149153 |  |  |
| 3.65E-10 | 0.062148 | -0.000601 | -0.032741 | -0.095069 |  |  |
| 1.05E-10 | -0.004866 | 0.003973 | -0.349005 | 0.090494 |  |  |
| -2.44E-10 | -0.021529 | 0.005246 | -0.297713 | 0.072308 |  |  |
| 4.77E-11 | 0.202429 | -0.016534 | -0.095337 | -0.270252 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Unrestricted Adjustment Coefficients (alpha): | | | |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| D(GDP) | 1.21E+08 | -6.92E+08 | -3.68E+08 | -1.66E+08 | 26697791 |  |
| D(INFLTN) | -29.90081 | 5.851106 | -12.74160 | -19.39418 | 4.240700 |  |
| D(INTRTE) | -74.27321 | -68.71653 | 39.62178 | -46.29853 | -11.52955 |  |
| D(MS) | -0.277969 | -0.312732 | 0.257875 | 0.322373 | 0.005933 |  |
| D(PSB) | -1.238885 | -0.150915 | -6.589099 | 3.053155 | -0.407044 |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 1 Cointegrating Equation(s): | | Log likelihood | -960.9312 |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Normalized cointegrating coefficients (standard error in parentheses) | | | | |  |  |
| GDP | INFLTN | INTRTE | MS | PSB |  |  |
| 1.000000 | -2.33E+08 | 7958169. | -8.66E+08 | -3.27E+08 |  |  |
|  | (6.2E+07) | (4770109) | (1.5E+08) | (7.5E+07) |  |  |
|  |  |  |  |  |  |  |
| Adjustment coefficients (standard error in parentheses) | | | |  |  |  |
| D(GDP) | -0.055051 |  |  |  |  |  |
|  | (0.13358) |  |  |  |  |  |
| D(INFLTN) | 1.36E-08 |  |  |  |  |  |
|  | (5.6E-09) |  |  |  |  |  |
| D(INTRTE) | 3.39E-08 |  |  |  |  |  |
|  | (1.8E-08) |  |  |  |  |  |
| D(MS) | 1.27E-10 |  |  |  |  |  |
|  | (9.3E-11) |  |  |  |  |  |
| D(PSB) | 5.65E-10 |  |  |  |  |  |
|  | (1.3E-09) |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 2 Cointegrating Equation(s): | | Log likelihood | -952.6536 |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Normalized cointegrating coefficients (standard error in parentheses) | | | | |  |  |
| GDP | INFLTN | INTRTE | MS | PSB |  |  |
| 1.000000 | 0.000000 | 2409486. | -4.17E+08 | -2.89E+08 |  |  |
|  |  | (3159110) | (2.3E+08) | (7.8E+07) |  |  |
| 0.000000 | 1.000000 | -0.023800 | 1.922187 | 0.163622 |  |  |
|  |  | (0.01397) | (1.00338) | (0.34580) |  |  |
|  |  |  |  |  |  |  |
| Adjustment coefficients (standard error in parentheses) | | | |  |  |  |
| D(GDP) | -0.307328 | -30166077 |  |  |  |  |
|  | (0.14007) | (3.0E+07) |  |  |  |  |
| D(INFLTN) | 1.58E-08 | -2.818195 |  |  |  |  |
|  | (7.1E-09) | (1.49700) |  |  |  |  |
| D(INTRTE) | 8.85E-09 | -12.17422 |  |  |  |  |
|  | (2.1E-08) | (4.44079) |  |  |  |  |
| D(MS) | 1.29E-11 | -0.049015 |  |  |  |  |
|  | (1.1E-10) | (0.02338) |  |  |  |  |
| D(PSB) | 5.10E-10 | -0.141212 |  |  |  |  |
|  | (1.7E-09) | (0.36378) |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 3 Cointegrating Equation(s): | | Log likelihood | -946.6057 |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Normalized cointegrating coefficients (standard error in parentheses) | | | | |  |  |
| GDP | INFLTN | INTRTE | MS | PSB |  |  |
| 1.000000 | 0.000000 | 0.000000 | -2.20E+08 | -3.70E+08 |  |  |
|  |  |  | (2.6E+08) | (5.4E+07) |  |  |
| 0.000000 | 1.000000 | 0.000000 | -0.030990 | 0.967331 |  |  |
|  |  |  | (1.38719) | (0.29336) |  |  |
| 0.000000 | 0.000000 | 1.000000 | -82.06526 | 33.76889 |  |  |
|  |  |  | (45.4645) | (9.61484) |  |  |
|  |  |  |  |  |  |  |
| Adjustment coefficients (standard error in parentheses) | | | |  |  |  |
| D(GDP) | -0.346104 | -28373971 | -1485721. |  |  |  |
|  | (0.13208) | (2.7E+07) | (1205179) |  |  |  |
| D(INFLTN) | 1.44E-08 | -2.756196 | 0.054480 |  |  |  |
|  | (7.0E-09) | (1.44888) | (0.06363) |  |  |  |
| D(INTRTE) | 1.30E-08 | -12.36701 | 0.468473 |  |  |  |
|  | (2.1E-08) | (4.28332) | (0.18812) |  |  |  |
| D(MS) | 4.00E-11 | -0.050270 | 0.002222 |  |  |  |
|  | (1.1E-10) | (0.02209) | (0.00097) |  |  |  |
| D(PSB) | -1.83E-10 | -0.109151 | -0.021586 |  |  |  |
|  | (1.5E-09) | (0.30611) | (0.01344) |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4 Cointegrating Equation(s): | | Log likelihood | -941.5819 |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Normalized cointegrating coefficients (standard error in parentheses) | | | | |  |  |
| GDP | INFLTN | INTRTE | MS | PSB |  |  |
| 1.000000 | 0.000000 | 0.000000 | 0.000000 | -8.57E+08 |  |  |
|  |  |  |  | (1.9E+08) |  |  |
| 0.000000 | 1.000000 | 0.000000 | 0.000000 | 0.898614 |  |  |
|  |  |  |  | (0.23840) |  |  |
| 0.000000 | 0.000000 | 1.000000 | 0.000000 | -148.2046 |  |  |
|  |  |  |  | (52.8979) |  |  |
| 0.000000 | 0.000000 | 0.000000 | 1.000000 | -2.217424 |  |  |
|  |  |  |  | (0.71944) |  |  |
|  |  |  |  |  |  |  |
| Adjustment coefficients (standard error in parentheses) | | | |  |  |  |
| D(GDP) | -0.305738 | -24810483 | -2354114. | 2.48E+08 |  |  |
|  | (0.14045) | (2.7E+07) | (1650300) | (1.3E+08) |  |  |
| D(INFLTN) | 1.92E-08 | -2.338662 | -0.047270 | -1.783958 |  |  |
|  | (6.9E-09) | (1.34776) | (0.08118) | (6.52706) |  |  |
| D(INTRTE) | 2.43E-08 | -11.37026 | 0.225573 | -27.13843 |  |  |
|  | (2.1E-08) | (4.11456) | (0.24783) | (19.9265) |  |  |
| D(MS) | -3.86E-11 | -0.057210 | 0.003913 | -0.285555 |  |  |
|  | (1.0E-10) | (0.02017) | (0.00121) | (0.09769) |  |  |
| D(PSB) | -9.28E-10 | -0.174882 | -0.005568 | 0.906148 |  |  |
|  | (1.5E-09) | (0.29658) | (0.01786) | (1.43633) |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**CORRELATION LM TEST RESULTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Breusch-Godfrey Serial Correlation LM Test: | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| F-statistic | 1.235259 | Prob. F(2,20) | | 0.3120 |
| Obs\*R-squared | 2.968512 | Prob. Chi-Square(2) | | 0.2267 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Equation: | |  |  |  |
| Dependent Variable: RESID | | |  |  |
| Method: Least Squares | | |  |  |
| Date: 05/25/22 Time: 15:06 | | |  |  |
| Sample: 1990 2020 | | |  |  |
| Included observations: 27 | | |  |  |
| Presample missing value lagged residuals set to zero. | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | -2.546335 | 40.87739 | -0.062292 | 0.9509 |
| GDP | 3.71E-11 | 8.50E-10 | 0.043653 | 0.9656 |
| INFLTN | 0.035852 | 0.042988 | 0.833987 | 0.4141 |
| INTRTE | -0.003274 | 0.009706 | -0.337323 | 0.7394 |

HETEROSKEDASTICITY TEST RESULTS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Heteroskedasticity Test: Breusch-Pagan-Godfrey | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| F-statistic | 2.899666 | Prob. F(4,22) | | 0.0455 |
| Obs\*R-squared | 9.320726 | Prob. Chi-Square(4) | | 0.0536 |
| Scaled explained SS | 23.44417 | Prob. Chi-Square(4) | | 0.0001 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Equation: | |  |  |  |
| Dependent Variable: RESID^2 | | |  |  |
| Method: Least Squares | | |  |  |
| Date: 05/26/22 Time: 12:58 | | |  |  |
| Sample: 1990 2020 | | |  |  |
| Included observations: 27 | | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | -96.71336 | 956.2991 | -0.101133 | 0.9204 |
| GDP | 4.36E-08 | 1.70E-08 | 2.569399 | 0.0175 |
| INFLTN | -1.011965 | 0.540857 | -1.871042 | 0.0747 |
| INTRTE | 0.185220 | 0.220920 | 0.838404 | 0.4108 |
| MS | -3.057444 | 14.76503 | -0.207073 | 0.8379 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.345212 | Mean dependent var | | 108.1740 |
| Adjusted R-squared | 0.226160 | S.D. dependent var | | 303.4359 |
| S.E. of regression | 266.9271 | Akaike info criterion | | 14.17740 |
| Sum squared resid | 1567501. | Schwarz criterion | | 14.41737 |
| Log likelihood | -186.3950 | Hannan-Quinn criter. | | 14.24876 |
| F-statistic | 2.899666 | Durbin-Watson stat | | 2.073870 |
| Prob(F-statistic) | 0.045510 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |