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The Direct and Indirect Effect of Interest Rates on Economic Growth in Botswana

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Dissertation submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in fulfilment of the requirements for the degree of Master of Management in Finance and Investment

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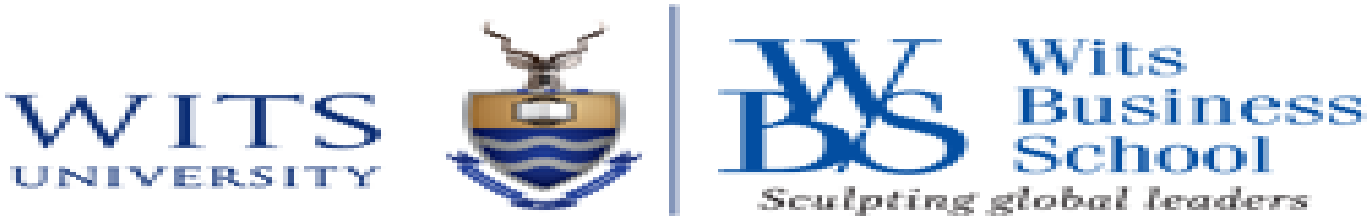

DECLARATION

I, Mbako Masole of student number 2369216, declare that the research work reported in this dissertation is my own, except where otherwise indicated and acknowledged. It is submitted for the degree of Masters of Management in Finance and Investment at the University of Witwatersrand, Johannesburg, South Africa. This dissertation has not, either in whole or in part, been submitted for a degree or diploma to any other university.

Signature of candidate: _____ Date:

ABSTRACT

The study determines the direct and indirect effects of interest rates on economic growth through domestic investment, real exchange rate, inflation, foreign direct investment (FDI), trade openness and human capital. The results of this study will guide the appropriate intervention in the use of interest rates in stimulating economic growth.

The study uses a quantitative method with multiple regression analysis. It examines the effects of interest rates on economic growth and domestic investment, FDI, inflation, real effective exchange rate and trade openness from 2004 to 2019 in Botswana. The study is highly reliant on secondary data, and quarterly data is used to run the regressions.

The results show that the real interest rate in Botswana has a negative effect on domestic investment and inflation, with domestic investment being statistically significant and inflation not statistically significant. However, it has a positive effect on real exchange rate, FDI and trade openness. FDI and real exchange rate is statistically significant whereas trade openness is stastically insignificant. Real exchange rate and trade openness have a positive effect on economic growth, while domestic investment, inflation, real interest rate and FDI have a negative effect on economic growth. Domestic investment is statistically significant, while real exchange rate, inflation, FDI and trade openness are statistically insignificant.

On the path analysis, exchange rate, inflation, FDI and trade openness cannot mediate the effect of interest rates on economic growth, whereas domestic investment mediates the effect of interest rate on economic growth.

The study concludes that it is critical for policy makers, when making policy decisions on the monetary policy, to bear in mind the influence of interest rate on other macro-economic factors, and how these subsquently affect economic growth. The use of interest rate did not yield the desired results in Botswana, it is therefore rather recommended to consider the use of fiscal policy to stimulate economic growth.

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LIST OF ABBREVIATIONS

FDI - Foreign Direct Investment

BOB - Bank of Botswana

GDP - Gross Domestic Investment

CHAPTER 1: INTRODUCTION

1.1. Background of the study

Botswana is a middle-income country which shares borders with Namibia, Zambia, Zimbabwe and South Africa. It is situated in Southern Africa. Botswana is amongst the most successful natural resource-rich countries in the world, with minerals being the main contributor to the economy. She achieved a sustained and uninterrupted annual economic growth rate of around 9 per cent for three decades, between 1966 and 1996 (Manatsha and Maharjan, 2009). Since then the economy has been declining and in 2018, Botswana recorded an economic growth of 4.45 per cent.

The World Bank (2020) shows that from 1961 to 2018, the highest achieved growth was in 1964, where the world registered an economic growth of 6.715 per cent. The figures have since been declining, with the worst being in 2009, when the world registered an economic growth of -1.679 per cent. Following the 2009 global financial recession, the world economy has been recovering, and it reached a maximum of 4.299 per cent in 2010. The latest world economic growth was 3.053 per cent, and it was recorded in 2018. Globally, economic growth was estimated to increase from the projected 2.9 per cent in 2019 to 3.3 and 3.4 per cent in 2020 and 2021, respectively. However, due to the outbreak of Covid-19 in December 2019, the International Monetary Fund (IMF) (2020) indicates that the global growth will fall to -3 per cent.

At a continental level, the African Development Bank (2020) indicates that the continent economy achieved a 3.4 per cent growth in 2019. This growth was to reach 3.9 and 4.1 per cent in 2020 and 2021 respectively which is still low considering what has been achieved in the past. The above estimated economic growth rates were made without anticipating the outbreak of COVID-19, which has disrupted the economic activities of almost all countries. As such, Africa is also projected to record a growth of -1.7 per cent due to the pandemic (IMF, 2020).

In Botswana, according to the World Bank (2020), in 1966, the economic growth was 6.344 per cent and continued to experience growth registering a record 26.362 per cent in 1972. In 1973, the economic growth started to fall reaching 8.446 per cent in 1975. Since then the economy has been fluctuating and the highest level of growth recorded after 1972 was 19.45 per cent in 1988. In 2009, the economy fell to the lowest point ever recorded, reaching -7.652 per cent. Since then the economy has been recording a positive growth and was predicted to fall to -7.893 per cent in 2020.

It is almost all countries' desire to achieve prosperity and economic growth. Economic growth is the principal element in measuring people's wealth and well-being. Boldeanu and Constantinesu (2015) contend that economic growth was at a high point in the twentieth century, and it helped in the development of the developed countries, leading to improved living standards of many. Policymakers have used both monetary and fiscal policies with the view of stimulating some economic activities that can influence future economic development. These policies have yielded different results depending on the time and dynamics of the economy. In reference to Botswana, the monetary policy has been used to stimulate economic growth through the adjustment of interest rates. The government of Botswana, through the central bank, has reacted to recessions and any economic hardships by reducing the interest rate to stimulate economic growth. Using interest rates to respond to financial crises and economic downturns is not peculiar to Botswana. Cao and Illing (2015) argue, that following the financial crises in 2007, the monetary policy adopted by countries around the world has been to cut interest rate with an effort to respond to the global financial crises and economic downturns. Subsequent to 2007 financial crisis, Botswana, through the central bank, has been reducing the interest rates. The latest was in the first quarter of 2020, and this was done to mitigate the effects of COVID-19 on the economy. The reduction of the interest rates was meant to facilitate the recovery of the economy. Even prior to the 2009 financial crisis, the central bank has been reducing the interest rates. The Bank of Botswana (2015) notes that in 2006 the bank rate was 15 per cent and was reduced to 14.5 per cent in 2007. The GDP growth decelerated to 3.9 per cent in 2008/2009 below 5.7 per cent recorded in the preceding fiscal year. The Bank of Botswana (2020) further notes that in 2008 the bank rate was 15 per cent and since then the rate has been reduced reaching 4.75 per cent in the first quarter of 2020.

The Bank of Botswana (2020) also reveals that the first cut of interest rate, which was a response to the 2009 financial crisis, was by 50 basis point from 10 per cent to 9.5 per cent. This was followed by an increase in capital investment. According to Statistics Botswana (2020), the contribution of capital investment to the GDP escalated to 41.41 per cent from 38.58 per cent, and the overall economy experienced an increase in economic growth from -7.65 per cent in 2009 to 8.56 per cent in 2010. This is supported by the interest rate classical theory, which states that a fall in interest rate results in an increase in investment.

However, subsequent reduction in the interest rates did not yield the same results. In 2013, the Bank of Botswana reduced the bank rate from 9.5 per cent to 7.5 per cent. The contribution of capital investment to the GDP fell from 38.84 per cent to 29.41 per cent in 2013, and according to Statistics Botswana, (2020) in 2014, the economic growth dropped from 11.34 to 4.15 per cent. The same results were observed when the bank rate was reduced in 2015 and 2016 respectively, with a reduction from 7.5 per cent to 5.5 per cent. The contribution of capital investment was reduced to 28.24 per cent after recording 32.6 per cent in 2017. In the same year, the economy recorded a growth of 2.91 per cent while in 2016 it recorded 4.3 per cent.

Shaukat, Zhu and Khan (2019) argue that real interest rate has an inverse relationship with economic growth. Ramlan and Suhaimi (2017), Olaniyi (2019), Hatmanu, Cautisanu and Ifrim (2020), Suyuan and Khurshid (2015) and Ogege (2019) confirm that the growth of the economy moves in the opposite direction with changes in the rate of interest. They found that this adjustment if it is downwards it will cause the economy to grow. It is, therefore, expected that a reduction in the rate of interest causes the economy to grow as loans will be cheaper hence individuals will borrow and buy goods and services, and this include houses which are classified as investment. As a result of loans, individuals become more liquid resulting in an increase in consumption and investment. Coccia (2018) avers that the reduction in interest rate leads to reduced cost of borrowing, which is expected to increase borrowing by companies for investment purposes.

The analysis above show that economic growth did not respond to the reduction in the interest rate as the empirical literature suggests. Both theoretical and empirical literature show that a fall in the rate of interest is expected to cause the economy to grow. However, these changes are not expected to have an immediate effect in the economy. The above statistics show that in Botswana even for a prolonged period, the reduction in interest rates did not yield the expected outcome.

The above scenario suggests that interest rates might have an influence in other factors that have a bearing on the economy. Therefore, it is imperative to study other factors that are affected by interest rate and have an influence on economic growth. Literature suggests that there are several other variables responsible for growth. According to Van Dan and Binh (2019), with high investment, productive and efficient labour and an open trade economy, a significant growth in the economy is realised. However, increase in prices, reduction in money supply and continued rise in interest rate negatively affected the growth of an economy and this was prevalent in developing countries. It is, therefore, necessary to ascertain how each of these variables will affect economic growth in Botswana. Considering that economic growth is a multifaceted macroeconomic phenomenon, explaining the crucial determinants that influences it, has been difficult. According to Kryeziu (2016), the fiscal indicators were found to influence economic growth, however, it was difficult to establish which indicator has major impact in this relationship. It is therefore important to examine how these factors react to changes in interest rate before they influence economic growth that is, determining how interest rate would indirectly affect economic growth.

It has been observed that no study on the indirect effects of interest rates on economic growth through multiple channels has been done in Botswana. Where Botswana is mentioned, it is done as a contrast to a more typical developing country experience. The only available related study used the regression analysis to test the influence of interest rates on saving and investment and there was no evidence to support a positive effect between interest rate and savings (Matsheka, 1998). Kebret Taye (2013) assessed the determinants of inflation using Auto Regressive Distributed Lag (ARDL) technique and found that inflation in Botswana was caused by among others continual adjustment of prices, real GDP, money aggregates in the economy and the prevailing prices in the neighbouring South Africa. Atta,

Jefferis, Mannathoko, and Siwawa-Ndai (1999) used the cointegration analysis to determine how price and exchange rate was determined in Botswana. They found that price levels in South Africa and the Pula to Rand exchange rate has an influence in determining prices in Botswana, which was also verified by Kebret Taye (2013). Phetwe and Molefhe (2016) explored the connection between inflation and GDP growth in Botswana, and a non-linear relationship was established. The inflation threshold level for GDP growth is 6.9 per cent.

Mbulawa (2015) investigates the direct impact of having an open economy, investment, FDI and inflation on the growth of an economy. The study used a generalised movements of moments (GMM) estimator. Mbulawa (2015) found out that the quality of institutions impacted on growth indirectly through liberalisation of the financial markets, opening the economy for trade, investment, availability of experienced and skilled workers and the savings ratio while political calmness, peace and the efficient and effective provision of services by government have direct effect on economic growth.

Elsewhere, a similar study was conducted by Shaukat et al. (2019). Shaukat et al. (2019) conclude that high interest rates do not only directly limit economies ability to grow, but also does it through its multivariable factors. From the foregoing, it can be noted that no empirical studies extensively looks at the indirect impact of interest rates on economic growth through domestic investment, inflation, human capital, real effective exchange rate, FDI and trade openness in Botswana.

1.2. Problem Statement

The research purpose is to identify how interest rates directly and indirectly affect the growth of the economy in Botswana. Economic theory predicts that the reduction in interest rate leads to reduced cost of borrowing, making loans cheaper and this would make investors access loans to make productive investment. This has been verified by Ogege (2019), Suyuan and Khurshid (2015), Olaniyi (2019) and Hatmanu et al. (2020). The invested loans are expected to increase productivity. Shaukat et al. (2019) further note that upward movement in interest rate negatively affects economic growth. Therefore, the expectation is that reduction in the rate of interest will increase economic growth through consumption and

investment, with individuals borrowing and buying goods and services, including houses, which are classified as investment. Empirical studies show that the reduction in interest rates lead to economic growth. Regarding Botswana, when the central bank reduced interest rate, the economy did not grow as expected. Instead, it continued to decelerate. According to the Bank of Botswana (2020), economic growth fell from 8.56 to 6.05 per cent in 2010 and 2011 and a further fall to 4.46 per cent in 2012. This was despite the fall in interest rates from 10 per cent in 2009 to 9.5 percent in 2010.

Shaukat et al. (2019) contend that the vast majority of studies attempted to find how the growth of the economy was directly affected by change in interest rates and with less emphasis on determining how change in the rate of interest affected the growth indirectly. Shaukat et al. (2019) observe that real interest rates also indirectly affect economic growth through other channels. Kryeziu (2016) found that macroeconomic variables profoundly have impact on economic growth. Hansen and Seshadri (2013), Ghafari, Atiq-ur-Rehman and Muhammad (2014), Stiglitz and Furman (1998) and Kar (2013) show that a relationship exists between interest rates and some macroeconomic variables, like domestic investment, FDI, inflation, exchange rate and human capital. Based on this, it is imperative that any change in interest rates should be evaluated to determine how it affects other macroeconomic variables and the ultimate impact on the growth of the economy.

1.3. Objectives of the study

The study seeks to:

i) Examine the relationship between economic growth and interest rates.

ii) Analyse the relationship between interest rates and inflation, trade openness, domestic investment, real exchange rate and FDI.

iii) Assess the relationship between economic growth and inflation, trade openness, domestic investment, real exchange rate and FDI as a result of changes in interest rate.

1.4. Research questions

This research seeks to provide a response to the following questions:

I. What is the relationship between interest rates and economic growth in Botswana?

II. What is the relationship between interest rates and inflation, trade openness, domestic investment, real exchange rate and FDI?

III. What is the relationship between economic growth and inflation, trade openness, domestic investment, real exchange rate and FDI as a result of changes in interest rate?

1.5. Significance of the study

In an attempt by countries to find a balance in growing their economies, the interaction between interest rates, investment, FDI, inflation, the exchange rate, the country openness to trade and economic growth have been examined. But investigations on how changes in interest rates affect some macro-economic variables and how these variables subsequently affect economic growth have received less attention from researchers. Therefore, the results of this study would guide in the appropriate intervention in the use of interest rates in stimulating economic growth. With the recent global economic crises, this study will be of benefit in observing the missing link on the measures taken by policymakers in trying to stimulate the economy following the economic crises. The recommendations and conclusions would help policymakers make informed decisions on the factors that can stimulate economic growth. The study also hopes to contribute literature on the subject matter.

The findings will benefit economists, considering that interest rates have been widely used to inspire economic growth. The wide use of interest rates to stimulate economic growth justifies the need for more analysis into how it, directly and indirectly, affects economic growth.

CHAPTER 2: LITERATURE REVIEW

The chapter discusses the literature on the subject matter. It provides an understanding of how interest rates interact with other macro-economic factors and, ultimately, economic growth. Lastly, the chapter introduces the study's theoretical framework.

2.1. The concept of economic growth

Denison (1962) posits that the growth of an economy is measured by a positive change in the GDP per capita or the national product when measured using constant prices. In simple terms, it measures a change in output a country produces per person over a given period. Palmer (2012) defines economic growth as a rise in output, that is, the goods market growing in the economy as a result of the rise in the industrious capability. Palmer (2012) further highlights the importance of economic growth as the means by which countries improve the lives of their citizens. Economic growth helps less developed and developing countries to transform their economies to a steady level of income. This transformation comes in the form of positive impact on the national income and high levels of employment leading to increased standard of living. This transformation also allows countries to cater for any population increases without having to lower the citizens' living standards. A country with growing GDP is more productive and has a high number of its people being employed.

Udoka and Anyingang (2012) contend that one of the important features in the developmental process of all developed nations is to ensure that they are mostly industrialised. Industrialisation is accompanied by heavy investments, which increases the value of assets. Thus, a speedy, continued, and maintainable economic growth is important for economic development. For this growth to happen, a fairly steady macro-economic environment, which acts as a conduit in attracting investment and boosting entrepreneurial activities is needed because such environment indicates low risk. A low-risk economic environment is key in attracting investment.

2.2 Theoretical literature

This section establishes the existing theories and the relationships between them and the degree to which they support this study.

2.2.1. Economic growth theories

The key theories on economic growth include the Keynesian theory, classical theory and neo-classical theory. Some economic philosophers, such as John Maynard Keynes, Adam Smith, Robert Solow and Trevor Swam, developed these theories to explain how different factors of the economy affect economic growth.

2.2.1.1. Keynesian theory

The Keynesian approach in economics advocates for the use of the government's ability to spend and borrow money in order to keep the economy stable and growing. This approach was put forward by Keynes (1936). Keynes (1936) believes that there was only one way out of recession, and that is for the government to put more money into the hands of the private sector through spending. By increasing government spending, Keynes (1936) argues that the demand of goods and services goes up, causing the economy to grow.

The Keynesian theory helps us understand how government and consumption spending affects economic growth. Inflation, domestic investment and savings affects both government and consumption spending, which are the key components of this theory. Understanding this theory helps in analysing how some economic variables from a theoretical point of view are expected to affect economic growth.

According to Arestis and Sawyer (1998), the Keynesian theory considers how the economic level of a country is set, with the use of production of products and lack of those forces that can lead the economy to achieve full employment. The theory advocates for the increase in demand through government and consumption spending in order to boost economic growth. Keynesians believe that consumer demand is key in an economy, and, as a result, it supports

the expansionary fiscal policy through tax cuts and government spending in order to provide excess money to the consumer. The main components of this theory are government spending on infrastructure, unemployment benefits, and education. These are geared towards stimulating consumption through excess money from individuals as a result of reduced tax and payments of grants, and by pumping money into the economy through infrastructure projects.

2.2.1.2. Classical theory

Smith (1937) founded what is known as classical economics. This approach argues that when the government lets the economy run itself, the market will allow the economy to create sufficient output needed in the economy through an "invisible hand". This market dynamic will thus lead to an economy finding a balance between what is produced and demanded in the economy. According to Coccia (2019), the theory of stages of growth, also known as the classical theory of development, suggests that in an economy where there is more saving and investment, such economy can facilitate increase in the rates of economic growth. He, however, notes that the theory on stages of growth do not show how poor nations achieve economic development because the suggested enablers such as physical capital are needed, but not necessarily very key in supporting economic growth. In fact, Coccia (2019), observed that many countries that heavily invested in production equipment and heavy infrastructure in an attempt to achieve the desired economic development have not succeeded as a result of failure to consider other social-economic factors such as skilled manpower, robust and relevant education system to support such investments and the proper governance structures including proper economic management. This, therefore, means it is critical that investment in industrialisation should be accompanied by investment in human resources.

The classical theory provides a guide on how investment and saving are expected to influence the growth of a free economy. This is important in that it would help in predicting the expected relationship between investment and saving and economic growth. It further helps in understanding how investment in human capital affects economic growth through an increase in physical investment.

2.2.1.3. Neo-classical theory

Neo-classical economics determines supply of produce and the demand for that produce as the key in determining how much the economy should produce and how the produce should be priced and how much is needed in the economy for consumption. Supply and demand of goods and services will therefore create competition which will guide in the distribution of resources in the economy. Thus, as a result of this competition these economic activities will create a market equilibrium that is, where supply meets demand.

According to Coccia (2019), two economists, Swan (1956) and Solow (1956), developed the Solow-Swan growth model which is used to determine economic growth. According to the theory, labour, capital, and technology, or more specifically, technological advances are crucial factors in achieving economic growth. They observe that when output produced by a worker increases, the output per capita also increases, but at a decreasing rate ultimately reaching a point of diminishing marginal returns. Therefore, as a result of these movements there will reach a point where labour and capital will be at equilibrium.

Since interest rates have an effect on investment, a downward cut of interest rates affects the production and the consumption side of goods market, which are the key components of this theory. With a downward change in interest rates, investment will rise, which will increase the production capacity leading to an increase in output. When production or output increases, the prices of goods and services would go down leading to an increase in consumption.

2.2.2. Interest rates theories

According to Udoka and Anyingang (2012), theories have been developed focusing on the management of interest rates, and some of the notable ones are the classical, the loanable funds, the Keynesian and the modern theory of interest. Spahija (2016) notes the importance of interest rate in an economy and indicates that it can act both as a dependent variable and independent variable by influencing product when it is a dependent variable and by

influencing factors when it is an independent variable. This means that interest rates can be influenced by the economy and can also influence the economy, implying that the level of growth of an economy can determine the interest rates in an economy, and also the rate of interests can influence how the economy grows.

2.2.2.1. The classical theory or the real theory of interest?

The classical theory or the real theory of interest rate was developed by Fisher (1930). Fisher's (1930) contribution rests fundamentally on two components of interest rates being interest rate that has incorporated inflation adjustment and the prevailing market rate. According to Pal (2018), this concept determines the rate, only through actual factors like output and economy, while monetary factors are of less importance. In classical theory, where the demand for investment meets the supply of investment, it is considered to be the prevailing rate of interest. Interest rate is what an investor pays for the money borrowed in order to invest. Thus, how much is invested in the economy will be dependent on the level of interest rate. With a low rate, people and companies will take advantage of low rates and invest more because of cheap loans and when the rate goes up, people and companies will not afford to hold debt because of high financing costs, and therefore investment is expected to decrease. Thus, interest rate has an inverse effect on investment. The classical theory, therefore, helps in the development of a hypothesis for this study, which is, a fall in interest rate leads to increase in investment. Understanding this theory would help in guiding the analysis of the results obtained in this study and relate such to the case of Botswana.

At household level, individuals save excess money to earn more money on paid interest. When interest rates are high, people save more which leads to high saving and when interests are low people save less leading to low saving. Thus, in this case saving has a direct (or positive) relationship with interest rate. The money used by firms for investment is surplus money from household savings and is channelled to firms through financial intermediaries as loans. Thus, saving serves as supply of funds and investment serves as demand of funds hence the saving is equal to investment.

Udoka and Anyingang (2012) also posits that the rate of interest is set at the equilibrium where savings meets investment. Savings act as the supply while investment act as the demand. In conclusion interest rate is the reward extended to consumers for forgoing consumption and providing those funds to the firms and a charge to the borrowers for being interested in present consumption, while they do not have money.

2.2.2.2. The Keynesian liquidity

Keynes (1936) avers that the liquidity preference theory is defined by the demand for money which is observed through liquidity. He indicates that as interest rate keeps going down, it reaches a point where liquidity preference would be apparent because almost everyone will want to hold cash rather than hold a debt instrument, because of low interest return on debt instruments. According to Spahija (2016), importance of interest rate cannot be undermined because it can influence the economy without regard on how the economy is performing and it is regarded as a monetary component. He notes that interest rate can act as a dependent variable, as it can be influenced by how much money is in the economy and how much money are individuals holding or should hold and can be an independent variable by influencing the interest rate related to government bonds, change in prices, and inflation adjusted interest rate relating to securities, and the movement in the price of goods.

This theory helps in understanding the behaviour of people in the use of money in response to the change in interest rate. It explains the willingness to hold on to money or save depending on the expected returns. This is an important aspect in that it will ultimately determine how much money is available to influence economic growth through borrowing and lending. The demand and supply of money would influence individuals' decision on whether to hold money or to save in interests bearing assets depending on the expected returns.

Pal (2018) also emphasised that in this theory, the rate of interest is uses purely for monetary policy issues, which is seen as a compensation for losing liquidity. A change in interest rates reflects a response to availability of money in the economy and demand for such money in the economy. It determines how people would make decisions on money, by deciding how

much to hold, and also provides an opportunity cost for holding money. When interest goes up, individuals would want to hold less money, but rather hold onto some interests earning assets.

Udoka and Anyingang (2012) also observe that the Keynesian liquidity theory uses the stock theory through the amount of money needed in the economy and how much money the economy can provide to determine the rate of interest. With money supplied at any given time, the corresponding demand of such is determined using the stock theory.

2.2.2.3. Neo-classical theory/the loanable funds theory

Ohlin, Robertson and Hawtrey (1937) developed the loanable funds theory of interest, which is an improved version of the classical theory of interest. Just like in the classical theory, the loanable funds theory treats interest rate as a compensation for the use of an individual's money however, in this case the money available is used for loan purposes. The rate of interest is controlled by availability of loanable funds and the demand for these funds. The notion that in the loanable funds theory, the rate is dependent on the availability of loanable funds and how much of that is required in the economy is also shared by Udoka and Anyingang, (2012). The determining factor to encourage the use of savings and bank money on the supply side and the purchasing of goods and services on the demand side is the interest rate.

Saunders, Cornett, Anolli, and Alemanni (2008) further indicate that this considers the financial markets interest rate as determined by those factors which influence availability and the uptake of loanable funds. It follows the same principle on the 'law of supply and demand' in the goods market. When the rate of interest goes up, the aggregate quantity of funds supplied also goes up, and the aggregate quantity of the funds demanded goes down. This determines how much money individuals are willing to supply, which increases loanable funds. With increased loanable funds, a decrease in interest rate causes an increased demand for loans, which causes investment to grow, resulting in economic growth.

Pal (2018) also notes that this theory combines both the financial and non-financial factors that influence savings and acquisitions. The saving which forms part of the supply side and the investment being on the demand side determines the rate of interest. When individuals save money, they are availing funds for loaning and those who want to invest can utilise such funds creating the demand. The interest rate is then determined by what is paid as compensation to those who save and what is paid by those who want to use the funds that have been saved.

2.2.2.4. Neo-Keynesian theory of interest or Hicks IS – LM curve or modern theory of interest?

Hicks (1936) developed this model. According to Hicks IS – LM curve, the availability of money is determined by how much can be supplied by the economy, and that the determination of how much to invest and consume is made by individuals.

According to Pal (2018), the Hicks IS-LM model is a macro-economic model that indicates the link between interest rate and assets market. He suggests that the theory has taken out the saving, investment, the will to hold onto money or the need for money, and the availability of money to establish the rate of interest and how much money is made in both goods and money market using the IS and LM curve. The IS curve shows the intersect between savings and investment in the goods market whereas the LM shows the will to hold into money (liquidity) and the availability of money (supply) in the money market. This means that the IS curve shows were interest rate meet income in the goods market. On the other hand, the LM curve indicates a point where the rate of interest rate meets the income in the money market.

This theory provides the basis in which interest rates are set. According to this theory, interest rates are set at a point where in the goods market the interest rate and level of income meets interest rate and income in the money market.

2.2.3. Summary of theories

From the foregoing theories, it has been observed that the way rate of interest relates to economic variables vary from one variable to the other. In the classical theory, a fall in the interest rate causes investment to grow. However, at household level, when interest rates are high, households save more. The Keynesian theory emphasises that when interest rates go up, individuals want to hold less funds and invest those funds in interest earning assets whereas the loanable funds theory states that when interest rates are high, there would be an increase in funds supplied to be loanable, and when interest rates are high the demand for loans decreases. The neo-Keynesian theory focusses on the linkage that exists between interest rates and the assets market. According to this theory, when interest rate rises, asset prices fall because of the alternative risk-free investment. In the neo-classical theory, an increase in loanable funds increases the availability of money, which, in turn, boast the purchasing power. With the increase in the purchase power, there would be an increase in prices because the demand is more than the supply. With the availability of loanable money, the resultant effect would be an increased consumption, which would lead to increase in prices.

A decrease in interest rate also makes locally produced goods to be cheaper as a result of increase in borrowing. This encourages domestic spending and an increase in domestic spending affects the exchange rate because the demand for foreign currency would decrease. The effect of rate of interest on FDI is through availability of loanable funds, which is influenced by interest rate. A robust money market with cheaper loans and investable assets attract foreign investors into the country. It can, therefore, be concluded that interest rates influence some economic factors which, in turn, affect economic growth. These theories present both positive and negative effects of interest rate depending on the availability and demand for money. From the supply side, when interest rate goes up the supply of money goes up, while on the demand side, an increasing in interest rate causes less demand for loans hence the fall in investment.

2.3. Determinants of economic growth

These are factors that influence economic activities of any country. According to Chirwa and Odhiambo (2016), economic growth is influenced by different factors from one country to the other depending on the level of development. They found that developing countries, depended on donor funding, foreign investment, taxes, natural resources, up skilling the labour force and political stability among others to influence economic growth. In developed countries, these include developed infrastructure, skilled labour force, international trade, technological advancement, research and development among others. The developing countries depend on funding assistance from the developed countries and international organisations to meet their budget needs. They depend on attracting foreign investors to invest in their countries and import more expertise with the hope of bringing new technologies for efficiency, and huge investment that would create employment and for skill transfer while developed countries have fully developed the financial sector, invested in research and development for better technologies. These countries have also invested in physical infrastructure in the form of good road and communication networks and also in labour force, which is instrumental in the economic growth.

Boldeanu and Constantinesu (2015), however, classify factors which determine growth under the supply, efficiency, and demand. Natural resources, capital goods, human resources, and technology are classified as supply factors. These are considered supply factors as they are inputs in the supply side and directly affect the value of produce supplied. Efficiency factors considers how efficient and effective are the factors of production, and the demand side provides the market for such produce in the economy. Acemoglu (2010), however, classifies economic growth determinants into economic and non-economic determinants, where economic determinants include investment assets, new and improved methods of production, skilled manpower whereas non-economic determinants include government proficiency, effective and competent institutions, stable and transparent political environment and social considerations which include access to services by the citizens (geographic and demographics considerations).

Ogege (2019) identifies social factors as key in economic growth. Access to education, good health and education, personal economic wellbeing and high life expectancy are some of

those social factors that were found to influence economic growth. For example, Azam (2011) states that in Pakistan and India, to attract FDI it is important to have a stable economic and political environment, develop the domestic infrastructure, and adopt forward looking macro-economic policies and upholding peace and security which are conduits for economic development.

Shaukat et al. (2019) observe the significant role of interest rate in promoting economic growth in transitionary economies. They, however, believe that interest rates did not only affect the economic growth directly. They identify inflation, trade openness, domestic investment, real exchange rate and FDI, human capital, the need to have strong governance institutions, political unrest or uncertainty and high levels of corruption as channels through which real interest rates indirectly affects economic growth for the economies in transition.

2.4 Macro Economic factors, Economic Growth and Interest rate

A number of factors have been found to affect economic growth among others inflation, trade openness, domestic investment, real exchange rate, FDI, human capital and interest rate. These factors are prone to changes in changes in interest rate.

2.4.1. Domestic investment

Tan and Tang (2016) note that policymakers and governments are keen in coming up with ways that can help government to achieve sustained economic growth, particularly countries classified as less developed and developing countries. Less developed and developing countries are faced with the challenges of upgrading themselves to better status and improving the lives of their citizens. As a result of this, researchers have discussed and explored the potential factors that influence economic growth, with a view of establishing where the focus should be to attain favourable growth. In economics, the key element for achieving sustained economic growth is investment in production assets or equipment, which is capable of helping a country reach the full productive capacity. This is because investment results in the accumulation of new capital goods, which is key for production, and as a result capital stock will grow quickly resulting in increased output.

Shaukat et al. (2019) state that domestic investment has always been considered instrumental in increasing the income levels of an economy. For any country to reach the highest level of income, it is important to encourage investment. Investment helps in the development of industries, which results in employment creation and an increase in the levels of income. The results also show that in an economy where investment is high, such economy experienced a significant growth. Jagadeesh (2015) investigates how savings promote economic growth in Botswana and concluded that savings and economic growth show a significant relationship. This is because the saved money is channelled to firms as loans for investment purposes.

Bakari (2017) focuses on the impact of investing in companies and products in Malaysia and found that, such investment is responsible for the country's economic growth. However, the study found that such relationship did not exist in the short term. These results show that in Malaysia the influence of investment on economic growth is not immediately felt, but comes at a later stage.

Muyambiri and Chabaefe (2018) examine how the growth of the financial sector, investment, saving and economic growth relate in Botswana. They conclude that investment is responsible for promoting the banking sector and the stock market in the short term, and for bank supported financial sector in the long term. It was also found that the stock market is responsible for supporting the banking sector and savings. Economic growth was observed to Granger-cause investment and savings, while the banking sector Granger-cause economic growth in Botswana. Therefore, to encourage financial sector development, pro-investment policies should be implemented in the short run. These policies should put more emphasis in promoting economic growth and encouraging savings as they are key in boosting investment. Ismail and Le Roux (2004) theoretical analysis also shows that cumulatively the structure of capital stock was affected by changes in interest rate.

Key to the domestic/economic growth relationship is how domestic investment is affected by change in interest rate. Studies have been done on how interest rates relate to domestic

investment, and the results are contradictory. Shaw (1973) found that interest rate did not have an effect on investment. However, Hansen and Seshadri (2013) show that interest rate and investment have negative relationship. They observed that when interest rates go up, the cost of borrowing goes up, which discourages borrowing, hence a negative effect on investment.

According to Shaukat et al. (2019), movement in interest rate has a significant effect on domestic investment with a larger magnitude. The study also found that interest rate is responsible for the indirect positive effects on the economy, implying that a change in interest rates affects the growth of the economy through changes in domestic investment caused by change in interest rate.

In summary, the reviewed literature indicates that domestic investment is crucial for promoting economic growth and that when interest rate goes up domestic investment goes down.

2.4.2. Foreign direct investment

Malesevic-Perovic, Simic and Mustra (2014) studied the correlation between open economy trade, foreign investment and the GDP growth. Opening the economy for trade and FDI were found to have substantial effect on the economy. Quazi (2014) also suggests that FDI is influential in determining the level of growth in an economy. He avers that FDI leads to economic growth.

Fornah and Yuehua (2017) found that the GDP growth and FDI have a positive relationship and they are statistically significant. They note that a high GDP growth leads to a larger market size, and that it is important for countries to maintain GDP growth to attract FDI inflows. Ali, Wang, Morales and Wang (2019) results reveal that inward FDI acted as a substitute to domestic investment, while outward FDI complements it. Outward FDI is responsible to replace the substitutional effect on inward FDI to the host nation’s domestic investment. FDI flows can be important to the economy in countries where policies

promotes cross boarder investment for local firms. According to De Gregorio (2005), FDI through the new technologies and knowledge acquired from investing companies' productivity will increase throughout the economy. The new knowledge will be in the form of new expertise which were previously not there in the country. Investing companies may also have connections and better access to international markets.

Faroh and Shen (2015) avers that FDI is determined by free trade and prevailing exchange rates. Inflation, economic growth and the interest rate did not influence FDI inflows. Chakrabarti (2001), however, found that in India, when interest rate went up, FDI also increased, while in Zimbabwe the rate of interest did not have a significant impact on FDI (Chingarande et al. (2012)) and this could be attributed to the economic and political situation in the country which is detrimental to the attraction of investors. Gross and Trevino (1996) opine that a country with a relatively high interest rate attracted inward FDI but cautioned that if the foreign investors depend on the host country's capital markets for raising FDI funding, the high interest rate will negatively affect FDI. It is worth noting that an investor would want to fund their investment where the cost of borrowing is low and invest in higher return investments, that is investments that pay high interest rates. In such a scenario, investors will want to move capital from a low-rate paying country to high-rate paying country. The findings of Siddiqui and Aumeboonsuke (2014) is that low interest rate in Singapore and Malaysia did not attract the inflow of FDI. Emmanuel, Ike and Alhasan (2019) found that interest rate and FDI have an inverse relationship. However, the relationship was not statistically significant.

Empirical literature has mixed findings on how interest rate affects the attraction of FDI. However, it can be concluded that countries with high FDI had high economic growth and countries with high interest rate had low investment by foreign firms.

2.4.3. Inflation

In a study done in Turkey, Uddin, Ali and Masih (2020) found that inflation had an inverse relationship with economic growth implying that when inflation goes up, the economic rate of growth goes down.

Ramlan and Suhaimi (2017) found that in Malaysia there was no significant change in the economy when the country experienced high inflation. The reason for that was that when prices go up, the people's buying capacity goes down because more money is used to acquire same units of goods as before the price increase. Due to increase in prices the purchasing power will be eroded making people buy less. Due to reduced consumption, production will go down causing a fall in economic growth. This, therefore, shows that when prices go up demand for goods and services will fall causing production to go down which ultimately causes a fall in economic growth.

Mbulawa's (2015) findings show that in Botswana when inflation was high the economy also grew. He indicates that previous performance of inflation was the key driver of economic growth.

Ghafari et al. (2014) opine that researchers reached diverse conclusions on how inflation relate with the rate of interest rate. Some concluded that increasing interest rates reduces inflation, while others hold a view that increasing the rate of interest is inflationary. Ghafari et al. (2014) further note that the monetary policy affected the economy particularly through assets prices. The effect is such that when the rate of interest rate go up there will be reduction in money supply and demand for goods and services, hence inflation, while in terms of cost associated with production, increasing the rate of interest will have an incremental effect on the total cost of production due to increase in the cost of borrowing, and this leads to the rise in inflation. A fall in prices as a result of the fall in demand is compensated by an upward push caused by high cost of production and the net effect is immaterial.

Shaukat et al. (2019) also observe that interest rates also discourage growth of the economy for growing economies when inflation is the mediating variable. High interest rates adversely affected investment resulting in a reduced production. To address this, economists would increase money supply, which will lead to inflation rising. The availability of funds (money supply) in the economy and the general performance of the economy which are on

the demand side and cost side (effect on the production cost) of the monetary transmission mechanism is key in determining the appropriate policy to be used in controlling inflation.

Akhtar's (1983) findings is that fluctuations in carrying costs (interest rates) and inflation are key in determining the inventory investment. He found that estimated coefficients show that a "one percentage point rise in short-term interest rates would decrease aggregate inventory investment by around US$2 billion, and that a *pari passu* rise in expected inflation would offset less than half of that decline".

In summary, when prices go up, the buying capacity of individuals go down, consumers buy less goods and services, which will, in turn, cause a fall in economic growth. Therefore, inflation leads to low economic growth. Even though Ghafari et al. (2014) argue that the relationship between interest rate and inflation is not consistent, however, considering the reviewed literature an increase in interest rates, reduces the chance of increasing capacity to fund buying through a loans, as they would be expensive. With an upward movement in the rate of interest, production goes down due to reduced consumption and investment and the supply of goods will also go down. The output will therefore not be able to satisfy the market because of shortages in the supply of goods and services caused by the demand being more than the supply. With the high demand for goods, the prices will go up because of a shift in the supply curve upward causing inflation. Therefore, when the rate of interest goes up, prices wil go up. Thefore there is a positive relationship between these two variables.

2.4.4. Real effective exchange rate

Eichengreen (2007) suggests that for most developed and developing countries, it is evident that countries that have kept competitive real exchange rate levels have experienced economic growth. He indicates that there is no developing country that has experienced sustained growth accelerations when its currency is overvalued. The more the country has exchange rate volatility the more disruption it caused to exports and investment, which are key to the growth of any economy.

According to Rapetti, Skott and Razmi (2012), a lot of emphasis has been made in determining how the economy performs because of exchange rate fluctuations. The results show that when a currency is undervalued or competitive, the resultant effect is an increase in economic growth. Thus, an undervalued exchange leads to high economic growth for countries which are not net exporters, and for net exporters undervaluation of the domestic currency will make imports expensive and exports cheaper causing a harm to the economy of such a country. A devalued domestic currency will require more of that currency in exchange of a foreign currency causing imports to be expensive and less money will be needed by individuals holding foreign currency to buy a local currency causing exports to be cheaper. A net export country will suffer more because a lot will be paid outside the country as compared to what it is selling outside the country. When exchange rate is undervalued it re-distributes resources towards industries whose output is for the international market (tradable sector) and that a favourable real exchange rate helps cushion the foreign exchange restraint on growth. Habib, Mileva and Stracca (2016) opine that an increase in the value of the domestic currency led to reduction in the GDP growth.

Barguellil, Ben-Salha and Zmami (2018) also note that exchange rates instability affects the growth of the economy negatively while Edwards and Yeyati (2005) opine that the flexibility of exchange rate helps adjust for shocks and in the process helping the exchange rate to show a beneficial GDP growth. Doğanlar (2002) and Demir (2010) show that GDP growth is influenced by how the volatile exchange rate affects some macro-economic variables such as foreign trade, human resource development and Investment. Belke and Gros (2001) and Servén (2003), supported the above findings.

According to Barguellil et al. (2018) the currency exchange rate regime for a particular country, and its financial openness determine how exchange rate volatility affect economic growth. Thus, exchange rate fluctuations was detrimental in countries that have adopted a floating exchange rate regime and financial open economy. The fluctuations in the exchange rate have an indirect effect on economic growth when foreign trade flows, human capital and investment are mediating. Sekkat and Varoudakis (2000) emphasise that export-led economies in sub-Saharan Africa experience depreciation in their currencies. The depreciation of a country's currency makes domestic goods (exports) comparatively

inexpensive to foreign buyers, and this makes them buy less of their domestic goods and services. In Turkey, Uddin et al. (2020) found that the lagged value of exchange rate implies that decreasing value of Turkish lira puts downward pressure on the economic growth. However, Kogid, Asid, Lily, Mulok and Loganathan (2012) and Vorlak, Abasimi and Fan (2019) found that in Malaysia and Cambodia the real exchange rate positively and significantly affects economic growth.

According to Gala (2007), when the currency is devalued with an intention to grow the economy, exports, income and employment will increase. The undervalued currency helps prevent financial crises and achieve economic stability. He further notes that exchange rate levels helps to achieve sustainable growth on aggregate investment, that is, a favourable currency increases investment through importation of production equipment and savings since the importation of assets will be cheaper, allowing firms to expand their business or save from the discount that comes as a result of the strong currency exchange. Therefore, exchange rate affects aggregate savings, through consumption and investment. A favourable exchange rate will mean that imports become cheaper. As a result, individuals and businesses will save the extra money, which could be channelled to investment or consumption.

Stiglitz and Furman (1998) studied the nexus between interest rate and exchange rate, and found that high interest rate is followed by devaluation of exchange rate and that is mostly in countries with low inflation. According to Sargent and Wallace (1981), high interest rate countries often had a low demand for money and high price level. Increase in price level causes local goods and services to be expensive leading to the low demand of such by foreigners. As a result of the fall in foreign currency (from exports), due to low demand of goods by foreign (less payments) there would be exchange rate depreciation.

Kaminsky and Schumulkler (1998) argue that there is a view that when interest rate is high, the economy attracts capital inflows, and this restores confidence causing the domestic currency to appreciate. On the other hand, an alternative view suggests that high interest rates, when used as a defence for the domestic currency, can lead to investors to anticipate

that the government will abandon the defence of the domestic currency to avoid the recessionary impact of high interest rates. Supporters of this opinion argue that investors can also speculate that high interest rates increase the fragility of the banking sector, and this might lead to a government bailout of the financial sector, abandoning the tight monetary policy and depreciating the exchange rate. Generally, when investors anticipate the above two to happen, the effect of high interest rate will not cause the domestic currency to appreciate. Kaminsky and Schumulkler (1998) found that when the rate of interest goes up, the deteriorating domestic Asian currency did not seem to stop deteriorating further. Chen's (2006) empirical results indicate that Indonesia, South Korea, the Philippines, Thailand, Mexico, and Turkey did not manage to control the exchange rate fluctuations due to high interest rate.

It can, therefore, be concluded that an undervalued and competitive exchange rate were responsible for high economic growth. When interest rates are high in an economy, lenders receive high returns from their investment compared to what they would get in foreign countries. Due to higher interest rates, foreign investors are attracted to invest in the local economy to maximise on the returns and this cause the currency value to rise, and lower interest rates tend to decrease currency value because investing in the local economy by foreign investors is not appealing because of low yield on return, causing the currency to fall in relative value.

2.4.5. Trade openness

Trade openness is critical in influencing economic growth. Key components of open trade are imports and exports, which are traded using currency exchanges. According to Gala (2007), exchange rate is a key tool in determining how trade openness influence economic growth. It is the centre piece in the promotion and development of those industries that produce for the international market, which are evolving and contribute to the modernisation and efficiency of the production process. Rodrik (2007) notes that the tradable economic activities are "special" in emerging countries as they are a source of foreign currency and with a continued depreciation of the exchange rate, the country will increase the chances of investing in tradable activities. Imports and exports play a very crucial role in channelling goods and services outside the country when there is surplus and bringing goods when there

is shortage. A country experiencing a shortage of goods and services will import more while one with surplus will export more. Barro (2003) shows that when the economy is open for trade the growth of the economy is imminent.

Blanchard (2013) states that an economy with real export growth will experience a positive effect on growth while real import growth negatively affects growth. He further notes that openness of markets allows people and firms to choose domestic and foreign goods/assets and that their choice depends on the rate of return, which depends on interest rates and currencies. Furuoka (2018) also found that exports and economic growth were statistically significant in several sub-Saharan African countries. However, linkages were weak and unstable. Increasing exports means an increase in production, which comes about as a result of aggregate demand going up in and outside the country. This leads to increase in employment, which is good for the economy. The increase in export brings money into the country, whereas money spent on import leaves the economy, resulting on a positive net effect on the economy. A healthy economy should have exports being greater than imports.

Zahonogo (2018) suggests that globalisation is important in promoting economic development up to a certain level, and that after reaching that level the effects start to go down and that trade openness favour growth. He observed that benefits of globalisation on economic growth are not given as evidenced by its nonlinearity. This means that the growth effects on globalisation differ depending on the level of openness.

Lin, Li and Sim (2014) conclude that when trade openness goes up, government consumption will also go up. They show that a 1 per cent expansion in trade openness raises government consumption by approximately 0.1-0.2 per cent points on average. The above suggests that trade openness and increase in consumption are positively related. When consumption go up, GDP goes up, causing the economy to grow. The extent at which a country exports or imports rely on prevailing exchange rate levels and the devaluation or appreciation of the domestic currency. Therefore, imports and exports which are influenced by exchange rates are key in the growth of the economy and on the reverse, there are also affected by economic growth.

Keho (2017) notes the importance of trade openness on the economy. Kong, Peng, Ni, Jiang and Wang (2020) also emphasise the importance of trade openness. They indicate that trade openness is responsible for economic growth over a period of time. A positive complementary relation between trade openness and capital formation has been observed to influence economic growth.

According to Madsen (2009), the debate on how trade openness influences the growth of the economy remains controversial. Some researchers proved that it has a direct impact on trade, while some suggest that trade openness does not influence the growth of an economy.

Shaukat et al. (2019) further note that the only factors that define trade openness positively are economic growth and FDI. Higher real effective exchange rate discourages trade by increasing imports at the expense of exports. However, in poor, developing and transitory economies when the rate of interest go up trade openness goes down.

Stiglitz and Furman (1998), opine that when interest rate goes up, exports will be affected negatively, reducing the anticipated inflow of foreign exchange reserves into the country. This will lead to depreciation of currency. When interest rate goes up, price will also go up, which will make local goods to be expensive, and this will adversely affect exports. It will be expensive for foreigners to buy local goods and services. In conclusion, it is expected that export growth causes the economy to grow, while imports growth suggest the economy is dependent on foreign trade to meet its demand. In simple terms a country with high imports experiences a sluggish growth and promotes foreign exporting countries economy at the expense of the importing economy. Interest rate adversely affects export performance.

2.4.6. Human capital

Mankiw, Romer and Weil (1990) and Caselli, Esquivel and Lefort (1996) point out that there is a positive correlation between what the economy has in terms of human capital and the growth of the economy and to a large extent, with indicators such as average schooling

years as the agent variable of human capital level. Da Veiga, Ferreira-Lopes, Neves Sequeira and Serra Santos (2019) found that when public debt is excluded in the regression model, human capital and economic growth were positively related.

Jun and Mingfeng (2019) suggest that the proportions of high-level human capital and medium-level human capital boost economic development, while that of low-level human capital has an inhibitory effect. The low-level human capital consists of low skilled labour force whose contribution in a high industrialised economy is minimal. They state that it is important to raise the proportion of high and medium human capital because it has a driving effect on the economy. Cutting the proportion of low human capital is important because of its restraining impact on the economy. With the educated labour force, the economy tends to be efficient, hence more output than the economy with unqualified labour force.

Oyinlola and Adedeji (2019) findings show a positive effect on inclusive growth as a result of human capital and financial development. Increasing effectiveness in the financial sector has a greater spill over effect on human capital development, resulting in economic growth. The findings by Shaukat et al. (2019) corroborate the existing literature, which suggests an economy with a highly skilled labour force experience growth compared to low skilled labour dominated economy. Developed human capital means efficiency, which leads to productivity, which subsequently leads to more output. High interest rate causes the quality of human capital to go down in developing economies. When interest rate is high, investment in education is considered secondary. The cost of education funded by borrowings increases due high cost of borrowing resulting in low self-development by the labour force.

Kar (2013) argues that interest rates are critical in determining how individuals value their investment plans. If an investor is risk adverse, a high interest rate will drop the risk appetite below equilibrium obtained prior to the change in interest rate. This reduces the human capital formation in the economy. Increase in interest rate would make loans that could have been invested in human capital development expensive, and this, therefore, discourages investment in human capital. The literature reviewed indicates that the development of

human capital leads to economic growth and that interest rates are negatively associated with human capital development.

2.5. Interest rate effect on economic growth

According to Peter (2008), monetary policy can be used to control economic activities. In situations where a country has an economy that is experiencing faster growth rates with high inflation, the central bank may cool the activities of the economy using monetary policy to reduce money supply by making borrowing expensive by raising short-term interest rates.

One key component of the monetary policy is the use of interest rate to stimulate or slow down the economy. This causes both the direct and indirect impact on investment. The direct impact is on how change in the rate of interest affects investment, that is, the level and direction of investment due to change in interest rates, while the indirect effect is through expectations about how inflation responds to changes in interest rate. Thus, interest rate has an effect on inflation, which, in turn, affects investment.

Peter (2008) opine that the use of the monetary policy in managing the economy affects the economy in different ways. When the rate of interest changes different components of the economy are affected differently with some being hard hit compared to others. For example, an export-led economy and import-led will respond differently. The markets and businesses whose demand are interest elastic are most affected by the changes in interest rate. Thus, a change in the rate of interest makes demand to responds elastically or meanderingly because of changes in the exchange rate.

In the western world, according to Khurshid (2015) interest rate is a key factor that is used to predict the functioning of an economy and in managing the operations of the economy through its adjustment. The variations in the interest rates can reflect what is happening in the macroeconomy space. It also affects all the macro-economic variables. Therefore, the importance of interest rate cannot be overemphasised as it is pivotal for both macro and micro economy activities.

Ramlan and Suhaimi (2017) show a significant relationship and impact between interest rates and GDP. The existence of interest rate encourages lending, which allows borrowers to have money to spend immediately rather than having to wait to save to have enough money to make a purchase. When interest rate is low, lots of people are willing to borrow money because of low interest to be paid in order to make purchases, such as houses and cars. Low interest rate leads to savings that comes as a result of a gap between what they would ordinarily pay when interest rates are high and what is being paid now. This also encourages businesses to make large equipment purchases. Besides that, when the consumer pays less interest, this gives them extra money to expand their ventures, and this creates a ripple effect of increased spending throughout the economy.

Olaniyi (2019), Hatmanu et al. (2020), Khurshid (2015), Ogege (2019), Skare and Benazie (2015), Tan and Tang (2016) and Udoka and Anyingang (2012) have researched on how interest rate affects economic growth. According to Olaniyi (2019), the GDP growth rate is on the highs when the interest rates on loans is low and when it is high the economy experience sluggish growth. This means that when interest rate falls, the cost of borrowing reduces, making loans cheaper; hence investors borrow loans to make a productive investment. Olaniyi (2019) also suggests that when the rate of interest go up, savings go up and these savings are channelled to investment. The results on the nexus between interest rate and GDP growth is significant. People with excess money are motivated to save due to high interest rate. In this way, the bank can access the excess money which it loans to investors; thereby increasing productivity investment.

Hatmanu et al. (2020) contend that in an economy, when interest rate goes up, individuals avoid getting bank loans because of high cost of borrowing on bank loans, thus, this means lower investment. This means that the population would respond to the fall in interest rate by borrowing loans. However, the risk with this scenario is that low rates would lead to excessive borrowing which might bring the risk of loan default. The loan default as a result of excessive borrowing causes a crunch in the economy. The recent adopted monetary policy actions are a threat to causing serious economic distortions. Hatmanu et al. (2020) opine that during low levels of interest rates people invest in high-risk financial sector activities, which

exacerbates inequalities in the economy. Hatmanu et al. (2020) suggest that empirical tests on interest rates and the growth of the economy have been mostly in favourable of their negative relation.

Khurshid (2015) also note that when interest rates go up, the cost of investment also go up, which would affect the lower income investors and inevitably cause them to withdraw their investment, causing the demand for investment to fall, whereas, a reduction in the rate of interest means that the cost of investment declines. This would then stimulate investment causing the total social investments to increase.

Khurshid (2015) establish a positive correlation in interest rates and investment. He observes that with reduction in interest rates, such move promotes investment, though the impact is fairly low. Besides interest rate, other economic factors influence investment. These factors include but not limited to the size of the market to help in the estimation of the demand, the performance of the economy, attractive investment environment and preferential schemes.

In the Nigerian context, Ogege (2019) argues that interest rates are used to make a satisfactory and appealing investment environment climate. He further argues that the reduction of interest rates by the Nigerian Central Bank moderates the money market and leads to economic growth. Skare and Benazic (2015) establish an adverse correlation between interest rates and economic growth in Croatia. However, Tan and Tang (2016) found that the rate of interest has no impact on the economy, implying that a change downwards in short-term interest rates, is not significant in growing the economy in Singapore. On the other hand, Udoka and Anyingang (2012) found that when the rate of interest goes up, the growth of the economy also goes up. Savers are motivated to save in an effort to benefit on high interest payable on deposits causing the economy to grow.

In summary a fall in the rate of interest will lead to economic growth, when investment is mediating. Cutting interest rates means that those holding mortgages pays less interest compared to what they used to pay before the reduction on interest rate, thus savings. This

effectively increases the income available for alternative uses. When the rate of interest goes down, loans become cheaper, therefore, facilitating borrowing, which is used for investment, and also businesses pay less interest payments on their loans. However, lower interest rates may cause a fall in value of the domestic currency; in so doing boosting the competitiveness of the export sector. A period of low interest rate has low impact on the economy because banks are unwilling to lend. This is due to being cautious on avoiding loan repayments default because of excessive borrowing, and this has led to banks taking a backward stance in the issuance of loans.

2.6. Indirect effect of interest rate on economic growth

The interest rate is a variable that affects both the investors and borrowers. The influence of the interest rate on the economy even affects non debt and asset holders indirectly. Interest rate is also used as an instrument in economic policy. It is the responsibility of the central bank to set interest rate to achieve a monetary policy objective. Barro and Sala-i-Martin (1990) and Harvey (1988), emphasises the impact of interest rate on the economic growth both in the short and long run. They indicate that in the context of the short-run economic growth, the increase in interest rates make the population avoid getting bank loans or investing, these determining a lower economic activity and, implicitly, a lower level of economic growth. This shows that when interest rate is increased, investment will be affected thereby leading to lower level of growth. This shows an indirect effect of interest rate on the economy through investment.

Hossain (2015), when studying the determinants of economic growth in Bangladesh, indicates that a fall in interest rate causes an increase in the inflation and exchange rate volatility, both affecting economic performance. Low and Chan (2017) results supported Hossain (2015), where it shows that the interest rate plays an important role in the economy and indirectly influences economic growth through its effects on the inflation rate and exchange rate. The two main factors that drive the influence of the exchange rate on the economic growth have been identified as international trade and investments. International trade and investment are also affected by interest rate.

2.7. Economic Growth Model

According to Coyle (2015), GDP can be determined using three primary methods. All generally yields the same results. These three approaches are often termed the income approach, expenditure approach andthe output (or production) approach. The income approach states that all economic expenditures should equal the total income generated by the production of all economic goods and services. However, in this study the growth model focus will be on the production and expenditure approach.

According to Feldstein (2017), the Output/Production theory defines economic growth rate from the supply side with three economic forces that plays an important role in the production function being labor, capital, and technology. The general production function in the neoclassical growth model takes the following form:

$Y = AF(K, L)$ …….(1)

Where:

Y – Income, or the economy's GDP

K – Capital

L – Amount of unskilled labor in the economy

A – Determinant level of technology

According to Palmer 2012, the supply side of the production function has to be meet by the corresponding demand side which is defined by the Expenditure Approach. The expenditure approach, also known as the spending approach calculates spending by the different groups that participate in the economy. In simple terms what is produced in an economy has to find a corresponding consumption. This approach can be calculated using the following formula:

$Y = C + G + I + NX$ ……(2)

where

Y= GDP

C=consumption;

G=government spending;

I=investment; and

NX= (X-M)= net exports

The above equation suggest that economic growth is realised when consumption, government spending, investment and net exports increases. The increase in this components more especially consumption, investment and net exports are affected by changes in interest rates.

According to Friedman (1957), the consumption function which is derived from equation 2 is defined as:

C= c + bY …….(3)

where

C= consupmtion

c= consumption at zero income

b= marginal propensity to consume

Y= income

Wyplosz (2005) defines investment as a function of Interest rate and income and expressed as:

I= f(Y,r) ……(4)

Where: I= investment

Y= income

r= interest rate

According to Wyplosz (2005) the export and import function derived from the growth model in equation 1 are expressed in equation 5 and 6 respectively:

$E = E(A^{*}, \delta)$ …….(5)

Where: E= export

A^{*}= total foreign absorption

δ= real exchange rate

$M = mY$……..(6)

Where: M= imports

m= marginal propensity to import

Y= income

From equation 3, 4 and 6 it is evident that as a result of income being a independent variable, any change in interest rate will affect the dependent variables. Likewise equation 5 is affected as a result of the effect of interest rate on the real exchange rate. The real exchange rate influences trade openness and foreign direct investment and income also affect inflation. It is therefore eviedent that the growth model in equation 1 best fits the proposed econometric model in equation 7.

2.7.1. Effects of interest rates on the Growth Model

From the production and the expenditure approach equations it can be seen that interest rate influences capital acquisition and affects labour through inflation. Inflation leads to more employment and high wages due to increased production due to high prices. It has also been observed from the literature that interest rates affect consumption through increase in purchasing power as a result of availability of cheap loans, and at firm level high interest rates discourages investment while at household level high interest rate encourages savings. The effect of interest rates has also been noted on the exports and imports through their influence on the exchange rate. According to Khondker, Bidisha and Razzaque (2012), net exports is expected to vary with domestic income and directly with the exchange rate. As domestic income increases the imports increases and the net exports worsens.

2.8. Conceptual framework

Figure 1: Interaction of some macro-economic factors on economic growth

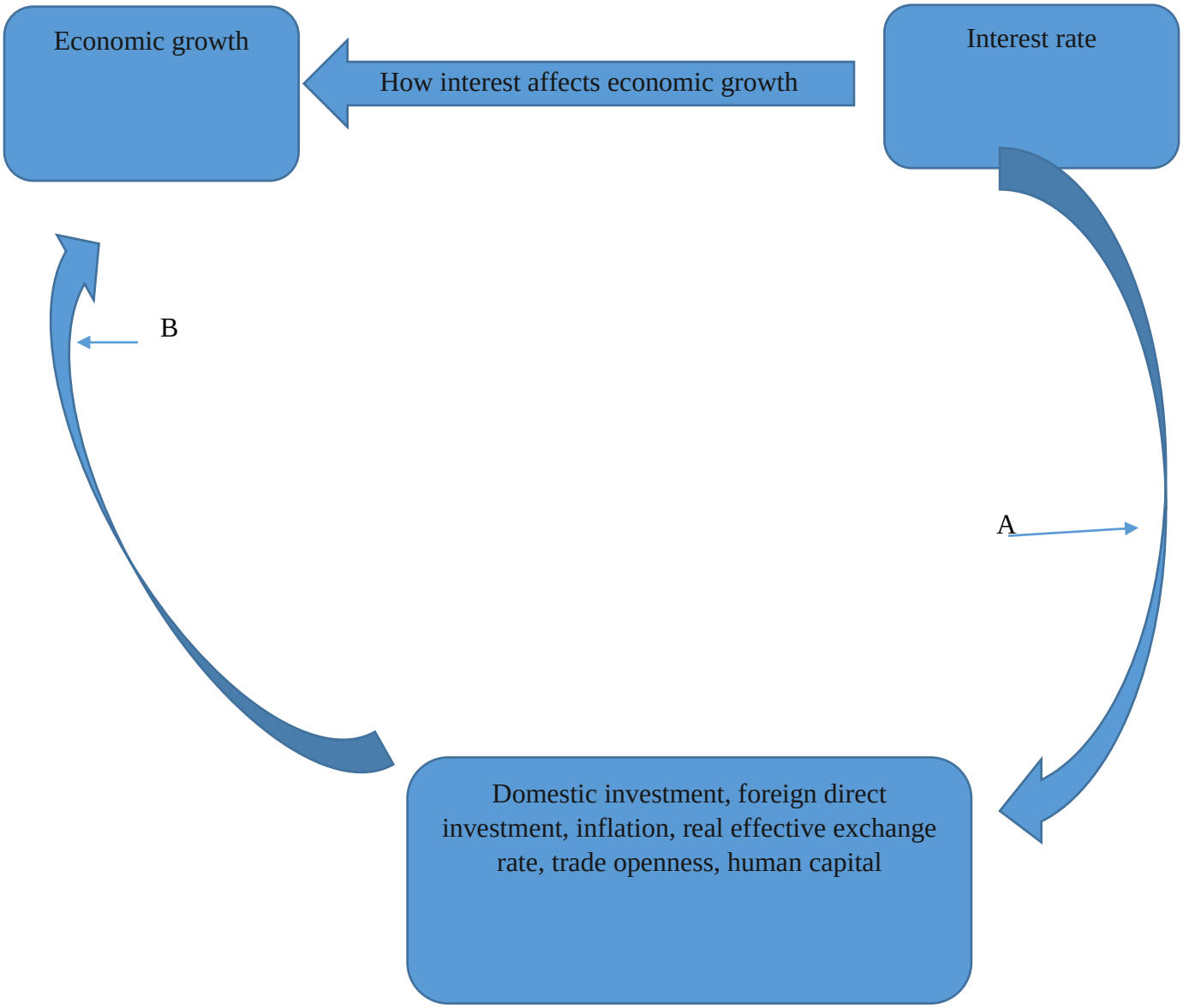


Figure 1 shows the interaction of some macro-economic factors in the economy. It shows how the interest rate would affect the economy, how domestic investment, FDI, inflation, real interest rate and trade openness would affect the economy, and also how these macro-economic variables are affected by interest rate. The other critical linkages shown in this theoretical framework is how the interest rate would affect economic growth indirectly through domestic investment, FDI, trade openness, inflation and real interest rate. Arrow A

shows how interest rate would affect domestic investment, FDI, inflation, real interest rate and trade openness, while arrow B shows how as a result of change in interest rate; domestic investment, FDI, trade openness, inflation and real interest rate would affect economic growth.

CHAPTER 3: RESEARCH METHODOLOGY

The chapter explains the research method that has been adopted for this study.

3.1 Research methodology/paradigm

In addressing the study objectives this research adopted a quantitative approach. According to Bloomfield and Fisher (2019), quantitative research is used when a problem is transformed into numerical data (usable statistics) to examine the relationships in variables. According to Burns (1989), quantitative research describes variables, test relationships and examine the cause-and-effect associations between these variables and generates numerical data. Davies and Fisher (2018) opine that quantitative research tests the hypotheses to determine the true answer using objective and impartial scientific methods.

3.2 Research Design

Bloomfield and Fisher (2019) describe research design as the strategy that has been adopted to conduct a research/study. It is used to answer a specific research question. This study uses correlational research and further determines how other variables mediate in such a relationship. According to Shields and Smyth (2016), correlational research seeks to examine the nature of the relationships between variables if such relationship does exist, that is, it examines associations or correlations between variables. It predicts relationships. According to Lewis-Berk and Mohr (1976), the possible relationship between two variables falls into four categories. The first is the direct effect, which is the impact of the variable on the other one when no other variable intervenes between them. Secondly, the indirect effect, which is the effect of one variable on another when one or more specific variable/s intervene(s) between them. Thirdly, it is the explicit spurious relation, which is a relationship between dependent variable and another endogenous variable. Lastly, the unanalysed effect, which is the relation between the dependent variable and some exogenous variable. This study established if such relationship existed, and the first two relationships are tested to identify the direct and indirect relationship between the variables.

3.3 Dataset

The research examines how interest rates influence the GDP growth and the indirect effect of interest rate on economic growth when domestic investment, real effective exchange rate, inflation, trade openness and FDI are mediating. This study relies on secondary data from 2004 to 2019 in Botswana. Quarterly data was used. Simple and multiple regressions are used to test the relationship and the strength between the variables is checked using correlation analysis. The impact and direction of association between variables is checked using multiple regression analysis. The GDP growth is the dependent variable and inflation, real interest rate, exchange rate, trade openness, FDI and domestic investment are the independent variables. Variance inflation factor (VIF) is assessed to recognise the multicollinearity problem. All variables included in the sample do not have missing values. The study excludes other social factors that influence economic growth. Human capital was initially part of the study, however the data was only found to be computed annually. It was then excluded from the regression model.

The data on the GDP growth, inflation, real interest rate, exchange rate, trade openness, FDI and Botswana's domestic investment was obtained from the Bank of Botswana through Botswana financial statistics (BFS). The Botswana financial statistics provided data in all the variables under consideration.

The study used data expressed in percentage, except for real exchange rate.

i) Domestic investment (DI) – percentage of gross capital formation against GDP.

ii) FDI – percentage foreign direct investment against as a percentage of GDP.

iii) Trade openness (TO) - is calculated by summing up exports and imports of goods and services in the economy and then divide it by its GDP multiplied by 100.

iv) Real effective exchange rate (ER)- taken as provided in the BFS.

v) Real interest rate (RIR) - taken as provided in the BFS.

vi) Inflation (INF) - taken as provided in the BFS.

3.4 Data Analysis

The study uses the statistical technique of a multiple regression using Eviews 11. This tool helps to establish if a linear relationship exists between variables. Multiple regression is a technique where several independent variables are used to predict the outcome of a dependent variable, with the view of establishing how explanatory variables mathematically relate. In analysing the data descriptive statistics, correlation analysis and regression analysis is used. In addressing objectives 1 and 2, the regression model techniques are used, while in addressing objective 3, in addition to running regression models, two more models were employed to help in the analysis. The total effect model and the mediation model were used to explain the effect of interest rate on economic growth through domestic investment, FDI, real exchange rate, inflation and trade openness.

3.4.1 Estimation Technique

The study uses least square method as it is used to predict the behavoiur of the dependent variable. According to Larson and Farber (2003), the method of Least Squares is a procedure to determine the best fit line to data through the use of simple calculus and linear algebra. The least-squares method finds the optimal parameter values by minimizing the sum of squared residuals.

3.4.2 Multiple regression model

According to Ismail and Le Roux (2004), when analysing how interest rate affects the economy it is best to use an econometric model in order to capture all the linkages. This study analyses the effect of the rate of interest on the growth of the economy and also show how changes in the rate of interest affects domestic investment, FDI, trade openness, inflation, trade openness and the subsequent impact of these variables as a result of change in the rate of interest rate on economic growth. Following Ismail and Le Roux (2004) view, it is, therefore, imperative to analyse these relationships via an econometric model. These variables are standard in growth and investment literature. The econometric model adopted is influenced by the growth model at section 2.7. Tan and Tang (2016), in examining the

nexus between some macro-economic variables and economic growth in the Association of Southeast Asian Nations (ASEAN), developed the following model: $GDP_t = f (DI_t, FDI_t , XM_t , R_t)$, where DI is domestic investment, FDI is Foreign Direct Investment, XM is trade and R is real interest rate. Emmanuel et al. (2019) also used the above economic model to estimate the relationship between FDI and inflation, interest rate and exchange rate. The functional relationship of the model was represented in a model form as: FDI = f (EXR, INT, INF). Mbulawa (2015) and Fornah and Yuehua (2017) also used the same model when analysing the relationship between GDP growth and trade openness, FDI, inflation and gross fixed capital formation and FDI and interest rate, GDP, inflation, trade openness and inflation respectively.

This study, therefore, adopted the similar model, as used by Tan and Tang (2016), Emmanuel et al. (2019), Mbulawa (2015) and Fornah and Yuehua (2017), in examining the relationship between economic variables. The study examines the influence of interest rates on the output which is a direct impact and indirectly through other well-known exogenous determinants of growth. The study adopted an endogenous growth model, where EG is determined by other variables and the other six macro-economic namely DI, FDI, RIR, INF, TO and ER explains the dependent variable. The connection between economic growth (the dependent variable) and domestic investment, FDI, inflation, trade openness, real exchange rate and the real interest rate (independent variables) and also between interest rate and the above independent variables was analysed using the following framework:

g = f (DI, FDI, INF, RIR, TO, ER) ---------- (7)

DI = f (RIR) ---------- (8)

FDI = f (RIR) ----------.---------- (9)

Inf = f (RIR) ----------(10)

ER = f (RIR) ---------- (11)

TO = f (RIR) ---------- (12)

Equation 7 is transformed into an econometric model as follows:

$$EG_t = \alpha_0 + \alpha_1 DI_t + \alpha_2 FDI_t + \alpha_3 INF_t + \alpha_4 RIR_t + \alpha_5 TO_t + \alpha_6 ER_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Where:

EG = GDP growth rate

DI = Domestic investment to GDP

FDI = Foreign direct investment ratio to GDP

INF = Inflation

TO = Trade openness

ER = Real exchange rate

RIR = Real interest rate

μ = Error term

α = Constant

t = Time

The independent variables and the error term follows the least square assumptions.

Data on the variables is changed into percentage hence no need to transform it into natural log.

With the data having been transformed into percentages, the model was expanded into multiple equations to cater for relationship between the rate of interest and explained variables since changes GDP growth and these variables happen simultaneously in an economy. To find the effect of RIR on DI, FDI, INF, TO and RER and the subsequent effect

on economic growth, the study establishes RIR/Independent variables connections using the following models:

$DI_t = \alpha_0+\alpha_1 RIR_t + \mu_t$----------(14)

$FDI_t = \alpha_0+\alpha_1 RIR_t + \mu_t$----------(15)

$INF_t = \alpha_0+\alpha_1 RIR_t + \mu_t$----------(16)

$ER_t = \alpha_0+\alpha_1 RIR_t + \mu_t$----------(17)

$TO_t = \alpha_0+\alpha_1 RIR_t + \mu_t$----------(18)

The above equations (14) to (18), determine the effect of rate of interest on each economic variable as indicated in equation 3,4,5 and 6.

3.4.2 Total effect model

To establish how interest rate affects economic growth, the effects coefficient model was used. According to Lewis-Beck and Mohr (1976), the effect of coefficient relates to any pair of variables in a linear causal system, which is the combination of direct and indirect effects. That is, the coffiecient of effects of variable i on variable k is defined by:

$E_{ki} = DE_{ki} + IE_{ki}$ ----------(19)

Where, i≠k, where k refers to any endogenous variable in the causal system and i refers to any other variables.

E is the total effect

DE is the direct effect

IE is the indirect effect

According to Lewis-Beck and Mohr (1976), in equation 19, the general symbol ‘DE’ represents any causal linkage specified by a structural parameter “p” in the causal system and written so that DE_{ki} , the coefficient of direct effect of variable i on variable k, is

specified by the structural coefficient, $P_{ki,}$ which is the general coefficient of total indirect effects, is the sum of a set of one or more distinct causal chains. In the case of IE, each chain is specified by the product of a series of parameters in the structural system and takes the form $P_{nk}\, P_{ki,}$ which is the direct effect of variable i on variable k times the direct effect of k on variable n. A specific indirect effects coefficient, $IE_{ki,}$ in equation 19 represents a complete set of distinct chains.

The general procedure for deriving and computing an effects coefficient, E_{ki}, followed the below procedure:

1. Decompose the relationship of interest, ρ_{ik}, according to the basic theorem of path analysis. Lewis-Berk and Mohr (1976) note that the basic theory of path analysis defined by:

$$\rho_{ik} = \sum_j P_{kj}\rho_{ij} \text{----------(20)}$$

Where ρ_{ik} is the correlation between variables i and k, j refers to all variables in the system other than k, and P_{kj} refers to the direct path proceeding directional from variable j to variable k.

2. Computing the value of each path in the DE and IE categories.
3. Compute the effects of coefficient: $E_{ki} = DE_{ki} + IE_{ki}$.

The above lead to the transformation of equation 19 to the use of a simple analog to the basic theorem:

$$E_{ki} = \sum_j P_{kj}E_{ji} \text{ ---------- (21)}$$

Where j again refers to all variables in the system other than k. The E_{ji} are defined by equation 19. Thus, equation 21, like the basic theorem of path analysis at equation 20, may be seen as consisting, in part, of nested applications of itself. Allowing for the reversal of appropriate subscripts, equation 21 is, in fact, identical in form to the basic theorem, except that p has been replaced by E.

Graphically, the total effect model is illustrated as follows:



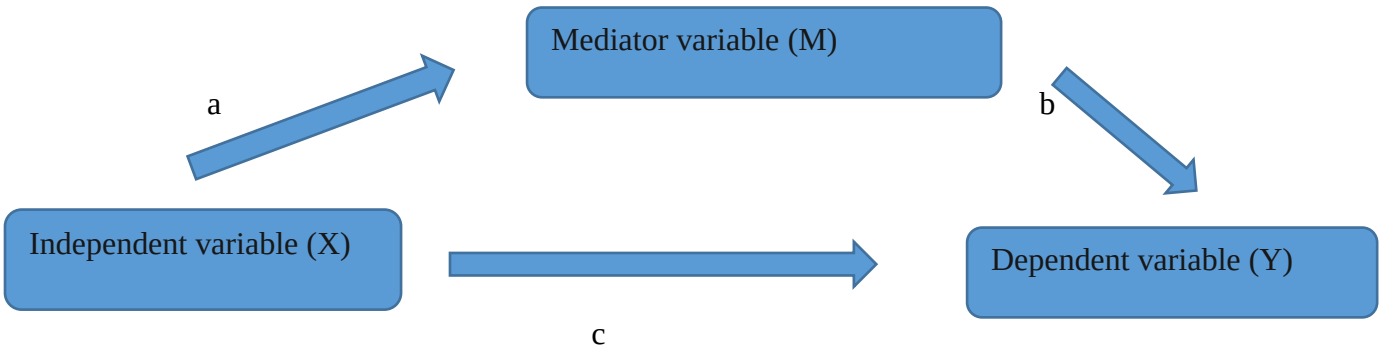
Graph 1: Total effect model

Total Effect is the effect of an independent variable on a dependent variable as shown in graph 1. It represents the cumulative effect of the relationship between variables that is, both the direct and indirect effect. The effect of the rate of interest on GDP growth was established by running a regression using Eviews.

3.4.3 Mediation model

To find the indirect effect in the Total effect model, the mediation analysis is adopted to evaluate how the independent variable had an indirect effect on dependent variable. Preacher and Hayes (2004) opine that mediation analysis is often conducted in order to indirectly identify how the independent variable affects dependent through another variable, which is called a mediator. The importance of the mediation analysis is that it explains the functional relationship between variables in addition to describing them. Mediation shows a sequence on how a variable has an effect on another and how it then affects the third variables. The variable is tested on how it affects the dependent variable, as a result of the independent variable, which is the intervening variable, is known as the mediator. It “mediates” on how the predictor, X, affect an outcome. Graphically, mediation is shown in Graph 2.

Graph 2: Mediation model



This model is applicable in this study because the study seeks to establish the indirect effect of the rate of interest rate on GPD growth with domestic investment, FDI, inflation, real exchange rate and trade openness mediating. In this study, the researcher seeks to establish how GDP growth is influenced by the rate of interest when domestic investment, FDI, inflation, real exchange rate and trade openness are mediators.

3.4.3.1 Testing mediation with regression analysis

Paths a, b and c in graph 2 shows the direct effects. The mediation happens when the independent variable (X) changes the dependent variable (Y) through a mediating variable (M), which shows the indirect effect. The indirect effect show a proportion that M contributes in the total effect. According to Baron and Kenny (1986) there are four steps used to test for mediation. The first step is to run regression analysis where X predicts Y in order to test for path c alone, secondly, run a regression to test for X, predicting M so as to test for path a, thirdly run another regression to test for M predicting Y to get the significance of path b, then lastly run a multiple regression to test for X and M predicting Y.

3.4.3.2 Statistical test of indirect effect

According to Wahidah and Ardiansari (2019), a test used to determine the effect of mediation on the intervening variable is called the Sobel Test. It is done by testing the strength of X and Y through M. To observe the reduction effect of X on Y because of

including the mediator M a Sobel test which is a t-test is used. It tests the significance of the reduction and also the statistically significance of the mediation effect. According to Preacher and Hayes (2004), the Sobel tests have three versions: The first version is the one that includes third denominator term as indicated in equation 23. The second one deducts the third denominator and it is represented by equation 24, and lastly, the one that excludes it and represented by equation 22:

z-value = $a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2)$----------(22)

z-value = $a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2 + s_a^2*s_b^2)$----------(23)

z-value = $a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2 - s_a^2*s_b^2)$----------(24)

where:

a = regression coefficient showing the relation between independent variable and mediator.
b = regression coefficient showing how the mediator and the dependent variable are related.

s_a = standard error of a.

s_b = standard error of b.

SQRT=square root

Equation 22 represents the version without the third denominator term. Equation 23 represents the other that adds the denominator term and equation 24 represents the one that subtracts the denominator term. According to Preacher and Hayes (2004), equation 22 is commonly called the Sobel test equation, equation 23 the Aroian test equation and equation 24 the Goodman test equation. Preacher and Hayes (2004) recommend the use of the Aroian version, which has also been recommended by Baron and Kenny (1986). They reasoned that the Aroian version does not make any assumption on the size of s_a and s_b, whereas the other two had challenges. The challenge with the Goodman version is that since the third term is subtracted it can cause a negative variance, and the challenge with the Sobel test is that it omits the third term. Even though Preacher and Hayes (2004) suggest that the Aroian version was better compared to the two versions, they still critic the overall use of the Sobel

test because the standard error requires an assumption of normality for the sampling distribution and that test is also appropriate for a large sample size.

As a result of the concerns raised in the use of Sobel test, Shrout and Bolger (2002) advocate for the use of Bootstrapping to test the consequence of the indirect effect. According to Efron and Tibshirani (1985), bootstrapping is mostly used where the analytic formula for standard error statistic is not known. Having analysed the two methods, this study adopted the Sobel test because it was observed that the data of most variables were normally distributed and that the standard error statistic are known, which nullifies the challenges observed on the use of the Sobel test.

A Sobel calculator for the significance of mediation is normally used with regression coefficient and standard error for both the independent variable and the mediation variable being inputs. The sobel test shows level of significance when the z-score values is less than -1.96 and where it is more than +1.96 because this is where the p-value is less than 0.05 or 5%.

3.5 Validity and reliability of research

The data used in this research was collected from trusted sources deemed to have the most relevant, reliable and valid information.

3.6 Ethical considerations

To address ethical considerations, the researcher considered the requirements and guidelines of the University to be addressed under ethical considerations. A request for a waiver to be exempted for ethical clearance was submitted to the Ethics Clearance Committee, and it was granted, refer to Annexure 1 ethics clearance/waiver number: WWBS/FI2369216/775. This is because this research uses secondary data. Therefore, it had no active participants.

The data used in this research is freely available on the internet, books or other public publications. The data was extracted from Botswana Financial Statistics, which is a document available for public consumption. It was, therefore, implied that since it is a public publication, permission for further use and analysis is authorised. However, the researcher acknowledges the citations used in this dissertation. The analyses and discussions of the findings maintained the highest level of objectivity.

CHAPTER 4: PRESENTATION OF RESULTS

4.0. Introduction

The chapter presents findings for this study. These are presented in tabular form, following their analysis using Eviews 11.

4.1. Descriptive statistics

Table 1: Descriptive statistics of the data

	EG	DI	EX	FDI	INF	RIR	TO
Mean	2.9486	30.9870	0.1354	8.8450	6.4497	4.6322	0.9519
Median	1.1843	31.2241	0.1328	8.8044	6.5000	4.2500	0.9230
Maximum	27.5111	37.3250	0.2277	33.5123	14.7000	9.4033	1.3413
Minimum	-16.1837	23.2154	0.0887	0.8692	2.2500	1.7733	0.6478
Std. Dev.	8.1858	3.2234	0.0374	5.6358	3.2059	1.9153	0.1556
Skewness	0.8074	-0.2134	0.6394	1.7560	0.7230	0.9678	0.4217
Kurtosis	4.3754	2.4740	2.6082	8.3729	2.8698	2.9624	2.7072
Jarque-Bera	11.9983	1.2236	4.7699	109.8725	5.6217	9.9945	2.1260
Probability	0.0025	0.5424	0.0921	0.0000	0.0602	0.0068	0.3454
Sum	188.7082	1983.166	8.6687	566.0827	412.7833	296.4633	60.9231
Sum Sq. Dev.	4221.454	654.6059	0.0883	2001.037	647.5042	231.1065	1.5260
Observations	64	64	64	64	64	64	64

The sample was made up of data collected from seven variables, economic growth being the dependent variable, and FDI, domestic investment, trade openness, real exchange rate,

inflation and the real interest rate being independent variables, for a period of 15 years. Each variable had a total of 64 observations. Table 1 shows a summary statistics that describes the data. On average, the dependent variable, economic growth, has a mean value of 2.95, while independent variables, domestic investment, real exchange rate, FDI, inflation, the real interest rate and trade openness, have mean values of 30.9870, 0.1354, 8.8450, 6.4497, 4.6322 and 0.9519 respectively. The lowest economic growth Botswana experienced over the period was -16.18 per cent, and it attained the highest growth rate of 27.51 per cent over the period under review.

The data for all the variables was moderately skewed, with skewness ranging between -1 and – 0.5 or between 0.5 and 1 for economic growth, the real interest rate, real exchange rate, domestic investment, inflation and trade openness, and greater than one (1) for FDI, which indicates that the data was highly skewed. The data for economic growth and FDI was found to be *leptokurtic* because their *kurtosis* values are 4.3754 and 8.3729, which is greater than three (3). Domestic investment, real exchange rate, inflation, the real interest rate and trade openness have *kurtosis* values of 2.4740, 2.6082, 2.8698, 2.9624 and 2.7072 respectively, which are less than three (3) implying that the data is *leptokurtic*. The data for trade openness, real exchange rate, inflation and domestic investment are normally distributed because their p-values are more than 5 per cent, whereas economic growth, FDI and real interest rate have a p-value of less than 5 per cent. In this case the null hypothesis is therefore rejected and the alternative hypothesis accepted, which show that the data is not normally distributed.

4.2. Correlation analysis

Table 2: Correlation analysis

	EG	DI	EX	FDI	INF	RIR	TO
EG	1.0000						
DI	-0.3571	1.0000					
EX	0.1450	-0.4380	1.0000				
FDI	0.0908	-0.4117	0.1234	1.0000			
INF	0.0676	-0.1893	0.6390	-0.0485	1.0000		
RIR	0.0786	-0.3796	0.5806	0.2762	-0.0514	1.0000	
TO	0.0070	0.3268	-0.0056	-0.2779	0.0371	0.0099	1.0000

According to Taylor (1990), correlation shows that a change of value in a variable changes the other variable in a certain path. Taylor (1990) emphasizes the usefulness of determining if a relationship exists between two variables and if it does exists how strong and significant is the association. It determines the direction and the strength in which the variables are related. According to Taylor (1990), the correlation coefficient ranges from -1 to 1, where the extreme values -1 and 1 shows perfect linear relationship, while 0 represents no relationship and values between 0 and -1 and 0 and 1 show that there is a relationship and the relationship is strong as it get close to -1 or 1. Table 2 shows a weak positive correlation between GDP growth and exchange rate, inflation, real interest rate, trade openness and FDI at 0.144984, 0.067567, 0.078569, 0.007046 and 0.090803 respectively, whereas domestic investment shows a weak negative correlation to economic growth at -0.357054. Further analysis indicate that real interest rate has a weak negative correlation with domestic investment and inflation at -0.379648, and -0.051366 respectively, whereas exchange rate has a moderate positive relation with real interest rate, and trade openness has a weak to no relationship with real interest rate.

4.3. Multicollinearity Test

Table 3: Variance inflation factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
Domestic Investment	0.1550	153.9038	1.6221
Exchange Rate	3466.8190	69.9499	4.8916
Rate of Inflation	0.3021	15.9813	3.1264
Foreign Domestic Investment	0.0408	4.5733	1.3058
Real Interest Rate	0.7972	20.4415	2.9445
Trade Openness	49.4468	47.0373	1.2060
Constant	221.9091	226.9840	NA

This model was tested for multicollinearity. According to Wang (1996), multicollinearity tests are conducted to check if the independent variables are correlated. Wang further notes that if the correlation exists, it makes it difficult to interpret the relative importance of independent variables. Thus, multicollinearity is a problem because it interrupts the independence of the independent variables. With associated independent variables, a change in one variable shifts another variable and when the correlation is strong, it is difficult change one variable without changing another. According to Daoud (2009), multicollinearity is measured using variance inflation factor (VIF). To interpret the value of VIF, the following rule is used, where VIF is equal to 1, there is no correlation, where $1 < VIF \leq 5$, the predictors are moderately correlated, and where $VIF > 5$, the predictors are highly correlated. Table 3 above indicates that there is a moderate level of multicollinearity problem because all the VIF are less than 5, but above 1. Domestic investment, FDI, and trade openness are closer to 1, indicating that they are not correlated with other variables in the model, whereas exchange rate, rate of inflation and real interest rate show moderate correlation with other variables. According to Gujarati (2003), multicollinearity makes it difficult to find the coefficient estimates with small standard error.

4.4. Unit Root Test

Data was checked for stationarity using the Unit root test. The Unit root test tests whether a time series variable is non-stationary and possesses a unit root. The null hypothesis is defined as the presence of a unit root and the alternative shows that the data is stationary. A Unit root test shows that the data is stationary since the p-value is less than 5 per cent at 0.0000. With a p-value of 0.0000, we reject the null hypotheisis that says the data has a unit root and accept the alternative that the data is stationary. A stationary data means that the statistical properties of a time series data do not change overtime.

4.5. Regression analysis

Table 4 shows a summary of regression output for domestic investment, real exchange rate, FDI, inflation and trade openness with real interest rate as the independent variable.

Table 4: Summary of regression output for domestic investment, real exchange rate, FDI, inflation, trade openness and real interest rate

Dependent variable	Independent variable	R-squared	Significance (p-value)	Coefficient estimate	Constant	Std Error	Breusch-Pagan-Godfrey Chi square
Domestic Investment	Real Interest rate	0.1441	0.0020	-0.6389	0.3395	0.1977	0.8342
Real exchange rate	Real Interest rate	0.3371	0.0000	0.0113	0.0008	0.0020	0.0546
Foreign direct investment	Real Interest rate	0.0763	0.0272	0.8127	0.0508	0.3592	0.5356
Inflation	Real Interest rate	0.0026	0.6869	-0.0860	0.0685	0.2123	0.0007
Trade Openness	Real Interest rate	0.000098	0.9381	0.0008	0.0095	0.0779	0.0180

4.5.1. Domestic investment vs real interest rate

Table 4 explains the relationship between domestic investment and real interest rate. The model has an R^2 of 0.1441, which implies that 14.41 per cent proportion of variation in domestic investment can be attributed to real interest rate. A better and more predictively model is explained by a higher R^2. The results show statistically significant relationship at 5

per cent level, (p= 0.0020) of domestic investment with real interest rate and with a regression coefficient of -0.6389 and an intercept of 0.3395. The results with an R^2 of 14.41 per cent indicate that real interest rate does not explain much the variation of domestic investment regardless of the variable significance. This shows that real interest rate, even though significant, does not account for much of the mean of domestic investment. The results also indicate that an increase of real interest rate has a negative effect on domestic investment by -0.6389, implying that for every unit fall in real interest rate, there is a 0.6389 decrease in domestic investment. The model was found to be homoscedastic with a probability chi-square value of 0.6511 against the p-value of 0.05 using the Breusch-Pagan-Godfrey test. When the probability value of chi-square is more than the p-value, this implies that the model is homoscedastic. When the model is homoscedastic, it means the error term in the relationships between the independent variable and the dependent variable is the same, which is a desired situation.

4.5.2. Exchange rate vs real interest rate

The results in table 4 show that only 33.71 per cent proportion of variation in exchange rate can be attributed to real interest rate. This implies that there are other variables attributable to the changes in real exchange rate. It is also observed that real exchange rate and real interest rate are statistically significant at 5 per cent with a p-value of 0.0000 even though the relationship implies that change in real exchange rate is not much explained by the change in interest rate. The intercept and slope of the model was found to be 0.0008 and 0.0113 respectively, which is shown by the regression coefficient estimate. The regression coefficient estimate shows a positive relationship between the two variables, implying that a unit change in real interest rate leads to an increase of the real exchange rate by 0.0113. An increase in real exchange rate means that the domestic currency will depreciate against the US dollar. The model was tested for heteroscedasticity and found to homoscedastic with a probability chi square value of 0.4743 which is more than 0.05 p-value.

4.5.3. Foreign direct investment vs real interest rate

After running a regression between FDI and real interest rate, the model was found to have an R^2 of 0.0763, which shows that 7.63 per cent proportion of variation in FDI can be

attributed to real interest rate as indicated in Table 4. The results show a statistically significant relationship at 5 per cent level, (p= 0.0272) between FDI and real interest rate, and with a regression coefficient of 0.8127. The results indicate that an increase in a unit of real interest rate led to an increase of the FDI by 0.8127. The model was found to be homoscedastic, with a probability chi-square value of 0.7261 against the p-value of 0.05.

4.5.4. Inflation vs real interest rate

Inflation and real interest rate were found to be heteroscedastic, with a probability chi-square value of 0.0007, which is less than the p-value of 0.05 as shown in Table 4. Heterescedasticity shows that when standard deviations of the predicted variable is monitored over different values of the independent variable they are not constant. In curing the heteroscedasticity, Huber white analysis was used. Even though the probability chi-value of the model remained below the p-value, the use of Huber white to remove heteroscedastic resulted in a robust standard error of regression. A robust standard error of regression meant a lower standard error of regression. This meant that the data points of the model moved closer to the regression line suggesting that the model was more stable.

According to Croux, Dhaene and Hoorelbeke (2004), regression estimator is good even when it is still dependable when the data points are different from other observations whereas its standard error is good when the regression errors are autocorrelated and/or *heteroskedastic*. However, the absence of auto correlation and heteroscedasticity causes the non-robust standard error to be more effective than the robust standard errors. Since this model was heteroscedastic, a robust standard error would be more efficient. A robust standard error of regression meant that the output and forecast are consistently accurate even with changes in the input variables or assumptions. Croux et al. (2004) note that non-robust standard errors can be a misrepresentation of robust regression estimates and that a robust standard error still perform well, despite their complexity. This means that the data points of the model moved closer to the regression line, suggesting that that there is no significant differences between the two sets of standard errors in the model. This gives confidence because the results based on homoscedasticity are more stable.

After correcting heteroscedasticity, the regression model was run on logged variables and it resulted in the model giving an R^2 of 0.0026 as shown in table 4, which suggests that at very minimal (close to zero) a change in inflation can be attributed to real interest rate. This means they are other factors responsible for the change in inflation. It was also observed that the model was not statistically significant with a p-value of 0.6869. The regression coefficient estimate was found to be -0.0860 and a constant of 0.0685. With an R^2 of 0.0026 and the results showing that the model is not statistically significant, it can be concluded that real interest rate had very minimal effect on the changes to inflation. The constant gives the value of inflation when real interest rate is equal to zero.

4.5.5. Trade openness vs real interest rate

It can be observed in table 4 that trade openness and real interest rate were also found to be heteroscedastic, with a probability chi-square value of 0.018, which is less than the p-value of 0.05. Huber white analysis was used to cure for heteroscedasticity and the resultant probability chi-value of the model remained below the p-value, but the model now had a more robust standard error of regression. After correcting for heteroscedasticity, the generated model resulted in a model with an R^2 of 0.000098, which gives a low percentage of 0.0098 of real interest rate being responsible for explaining the changes in trade openness. The model was found to have a regression coefficient of 0.0008 and statistically insignificant with a p-value of 0.9381. The constant of this model is 0.0095, which shows that when real interest rate is zero, the value of trade openness will be 0.0095.

4.5.6. Economic growth and macro-economic factors

This section analysis the regression out from economic growth and the macro-economic factors.

Table 5: Summary of regression output for economic growth with domestic investment, FDI, inflation, trade openness, real exchange rate and real interest rate.

Variable	**Coefficient**	**Significance (p-value)**
(Constant)	0.3257	0.0329
Domestic Investment	-1.1394	0.0054
Real exchange rate	22.1586	0.7081
Foreign direct investment	-0.0402	0.8428
Inflation	-0.2471	0.6548
Trade Openness	7.9737	0.2616
Real interest rate	-0.6386	0.4774
R-squared	**Probability Chi square value**	**Obs R-squared**
0.1552	0.6479	4.2127

Table 5 is the output explaining the relationship between economic growth and real interest rate, domestic investment, FDI, inflation, trade openness and real exchange rate. This model was checked for heteroscedasticity, and it did not exist. The probability value of chi-square was found to be 0.6479, which is more than 5 per cent, which means the error residuals are homoscedastic.

The R^2 for the model is low, it shows that the independent variables used in the model can explain the changes in economic growth to the extent of 15.52 per cent. Real interest rate

was found to be statistically insignificant in influencing economic growth, with a p-value of 0.4774, whereas with other economic growth channels, such as domestic investment, was found to be statistically significant at 5 per cent (p=0.0054), FDI, being statistically insignificant at 5 per cent, with a p-value of 0.8428, inflation, being statistically insignificant, with a p-value of 0.6548, trade openness, being statistically insignificant , with a p-value of 0.2616, real exchange rate, being statistically insignificant, with a p-value of 0.7081. The regression coefficient estimates for domestic investment, FDI, inflation, trade openness, real exchange rate and the real interest rate were found to be -1.1394, -0.0402, -0.2471, 7.9737, 22.1586 and -0.6386 respectively, with a constant of 0.3257. These results show that real interest rate was not statistically significant in explaining changes in economic growth. With regard to other variables, only domestic investmentwas statistically significant to explain economic growth in Botswana at 5 per cent. Real exchange rate, FDI, trade openess and inflation were not statistically significant in explaining changes in economic growth in Botswana.

4.6. Effect on economic growth by other variables as a result of change in interest rate

The analysis of mediation uses the Sobel test to see the indirect effects of interest rate on economic growth. The following are the results of the Sobel test:

Table 6: The results of the sobel test

Variable effect	z-score
RIR > DI	1.9800
RIR > EX	-0.023
RIR > FDI	0.0035
RIR > INF	0.0484
RIR > TO	0.4449

From the results in table 6, it can be observed that:

i) The effect of interest rate towards economic growth with mediation of real exchange rate is statistically insignificant, with a z-score of -0.0231, which is more than the acceptable of -1.96 and less than +1.96.

ii) The effect of interest rate towards economic growth, with mediation of domestic investment, is statistically significant with a z-score of 1.9800, which is more than +1.96.

iii) The effect of interest rate towards economic growth, with mediation of FDI, is statistically insignificant with a z-score of 0.035, which is more than -1.96 and less than +1.96.

iv) The effect of interest rate towards economic growth, with mediation of inflation, is statistically insignificant with a z-score of 0.0484, which is more than -1.96 and less than +1.96.

v) The effect of interest rate towards economic growth, with mediation of trade openness, is statistically insignificant with a z-score of 0.4449, which is more than -1.96 and less than +1.96.

CHAPTER 5: DISCUSSION OF RESULTS

5.1. Introduction

This chapter is presented in two sections. The first section contributes to the overall summary of the study, and this is followed by discussion of the findings.

5.2. Discussion of results and objectives

This section presents a summary of findings per each research question.

5.2.1. The relationship between economic growth and real interest rates

Economic growth has a positive relationship with real interest rate. The regression coefficient estimates for real interest rate was found to be 0.6386. The regression coefficient estimate shows a positive relationship between real interest rate and economic growth, and this implies that a positive unit change in real interest rate led to an increase in economic growth by 0.6386. The results indicate that there are other factors, apart from real interest rate, that affect economic growth. It is also observed that the relationship between economic growth and real interest rate is statistically insignificant, with a p-value of 0.4774 at 5 per cent level of significance in Botswana. This results means than an increase in interest rate lead to an increase in economic growth. This will be applicable in cases where an increase in interest rate causes people to save more in anticipation of high returns on interest rate. The savings increases the money supply in the economy and due to increase in money supply interest rate will go down causing individuals and companies to borrow more money for investment and consumption. With an increased investment and consumption the economy will growth.

The observation that interest rate has a positive relationship with economic growth is supported by Ramlan and Suhaimi (2017) and Olaniyi (2019), who found a positive and significant relationship between economic growth and interest rate in Malaysia and Nigeria respectively. Haltmanu et al. (2020), who found a negative relationship in Romania, and the

results were found to be statistically significant. Haltmanu et al. (2020) found that the monetary policy was responsible for stimulating economic activity in the short run. They opine that the reduction in interest rate decreases the cost of borrowing and stimulates consumption. However, Tan and Tang (2016) found that interest rate did not influence economic growth in Singapore, which is not supportive of the results in this study. Tan and Tang (2016) opine that the impact of interest rate in the short term cannot show any change in economic growth.

5.2.2. The relationship between real interest rates and other macro-economic variables

This sub-section discusses how interest rate affects other macro-economic variables, domestic investment, FDI, inflation, trade openness and real exchange rate.

5.2.2.1. The relationship between real interest rates and domestic investment

In explaining the relationship between domestic investment and real interest rate, it was found that only 14.41 per cent of changes to domestic investment can be attributed to the changes in real interest rate, and this was statistically significant at 5 per cent level at a p-value of 0.0020. The relationship between the two variables was found to be negative, with a coefficient value of -0.6389. An increase in interest rate by a unit will lead to a fall in domestic investment by 0.6389 and vice versa. The results show that there are other factors, other than interest rate, that affect domestic investment, which accounts for about 85.59 per cent of changes in domestic investment.

The reason why investment is adversely related to interest rate is that if interest rates rise, the opportunity cost of investment rises, this means if interest rate increase the appetite to hold money into interest bearing account increases and in the process reducing the attractiveness to investment. In most cases investment will be postponed until interest go down. Secondly due to an increase in interest rate, companies may anticipate a fall in human consumption which will limit the firms to invest since production may be reduced.

The results of this study are supported by studies carried out by Hansen and Seshadri (2013) and Shaukat et al. (2019), which found a negative relationship between interest rate and domestic investment. The results do not support Shaw's (1973) findings, which establish that there was no inverse relationship between interest rates and domestic investment.

5.2.2.2. The relationship between real interest rates and real exchange rate

The results show a moderate positive relationship between real interest rate and real exchange rate. The regression results show an R^2 of 0.3371, which indicates that only 33.71 per cent of changes of the real exchange rate are explained by the change in real interest rate, implying that there are other variables that explain changes in real exchange rate. It was also observed that there was a statistically significant relationship between real exchange rate and real interest rate at 5 per cent, with a p-value of 0.0000. The intercept and slope of the model was found to be 0.0008 and 0.0113 respectively, as shown by the regression coefficient estimate. A positive coefficient suggests that a unit increase in real interest rate will lead to an increase in exchange rate by 0.0113. An increase in real exchange rate means that the domestic currency will depreciate against the US dollar. An increase in interest rate would make interest rate high and when this happens high interest rates will offer lenders in an economy high returns relative to other economies. This will attract foreign capital and with more foreign players investing in the country the exchange rate will rise.

The results are supported by Kaminsky and Schumulkler (1998), who argue that investors can also speculate that high interest rates increase the fragility of the banking sector, and this might lead to a government bailout of the financial sector, abandoning the tight monetary policy and depreciating the exchange rate. However, Stiglitz and Furman (1998) and Sargent and Wallace (1981) found that higher interest rates cause the exchange rate to rise and lower interest rates tended to decrease exchange rates.

5.2.2.3. The relationship between real interest rates and FDI

The model shows a positive relationship between real interest rate and FDI. The model has a regression coefficient of 0.8127, indicating that an increase in real interest rate leads to an increase in FDI by 0.8127. The model was found to have an R^2 of 0.0763, which indicates that 7.63 per cent of changes in FDI can be explained by changes in the real interest rate. In any case, 7.63 per cent is quite a small number to consider the impact meaningful. However, the p-value show that the results were statistically significant at 5 per cent level, with p-value of 0.0272.

As discussed under 5.2.2.2. a rise in interest rate will cause an increase in real exchange rate. A rise of the real exchange rate will cause an increase in foreign direct investment. A strong foreign currency will make it cheaper for foreign companies to setup in a country.

This result is not supported by the literature reviewed on the relationship between interest rate and FDI. Gross and Trevino (1996) results found that high interest rate negatively affects FDI. Emmanuel et al. (2019) also found that there was a negative relationship between interest rate and FDI even though the result was not statistically significant. However, a study by Siddiqui and Aumeboonsuke (2014) found that low interest rate in Singapore and Malaysia did not attract the FDI inflow.

5.2.2.4. The relationship between real interest rates and inflation

Real interest rate has a very weak negative relationship with inflation. The regression results show an R^2 of 0.0026, which suggests that inflation is not explained by the change in real interest rate, but by other factors. It was also observed that the model was not statistically significant, with a p-value of 0.6869. It can be concluded that real interest rate was not responsible or did not affect inflation. The model has a regression coefficient of -0.0860, indicating that an increase in real interest rate led to a fall in inflation by -0.0860. Ghafari et al. (2014), Shaukat et al. (2019) and Akhtar (1983) found that increasing interest rates will reduce aggregate demand and aggregate inventory and hence inflation. The finding that there is a negative relationship between real interest rate and inflation is supportive of the

economic theory, which contends that, when interest rate increases, the demand for money (loans) decreases; thereby reducing spending which eventually leads to the fall in prices. When interest rate go down, loans become cheaper and consumers can get loans to increase their purchasing power and with an increased consumption prices will go up because goods will be in short supply hence inflation.

The results of this study show that interest rate has a negative effect on inflation, which is contrary to the findings by Ghafari et al. (2014), Shaukat et al. (2019) and Akhtar (1983).

5.2.2.5. The relationship between real interest rates and trade openness

The regression model generated an output with an R^2 of 0.000098, which shows that only 0.0098 per cent of real interest rate was responsible for explaining the changes in trade openness. This means that 99.99 per cent, which is almost 100 per cent, of other variables are responsible for explaining changes in trade openness other than interest rate. The model was also found to be statistically insignificant, with a p-value of 0.9381. There is a very weak positive relationship between real interest rate and trade openness since the model has a regression coefficient of 0.0008, indicating that an increase in real interest rate led to an increase in trade openness by 0.0008. A rise in interest rate will increase the real exchange rate which will in turn increase the exports thereby increasing the trade openness. Shaukat et al. (2019) and Stiglitz and Furman (1998) note that an increase in interest rate may negatively affect the performance of exports and imports; thereby affecting trade openness negatively. However, the findings in the case of Botswana suggests that interest rate has an insignificant effect on trade openness.

5.2.3. The relationship between economic growth and other macro-economic variables

The correlation between economic growth and exchange rate, inflation, real interest rate, trade openness and FDI was also examined and found to be weak at 0.144984, 0.067567, 0.078569, 0.007046 and 0.090803 respectively, whereas domestic investment show a weak negative correlation to economic growth, at -0.357054, as shown in Table 2.

The model has an R^2 of 0.1552, which implies that the independent variables used in the model can explain the changes in economic growth to the extent of 15.52 per cent. Domestic investmentis statistically significant at 5 per cent with p-value of 0.0054, while inflation, real exchange rate, real interest rate, FDI and trade openness are statistically insignificant with p-values of 0.6548, 0.7081, 0.4774, 0.8428 and 0.2616 respectively. The regression coefficient estimates for domestic investment, FDI, inflation, trade openness, real exchange rate and the real interest rate were found to be -1.1394, 0.0402, 0.2471, 7.9737, 22.1586 and 0.6386 respectively. These results show that domestic investment, FDI and trade openness has a statistically significant relationship with economic growth in Botswana. Real exchange rate, inflation and the real interest rate were not statistically significant in explaining changes in economic growth.

Domestic investment is statistically significant and shows a negative relationship with economic growth. The model has a regression coefficient of -1.1394, indicating that an increase in domestic investment leads to a fall in economic growth by 1.1394. This is despite studies by Shaukat et al. (2019), Jagadeesh (2015), Muyambiri and Chabaefe (2018), noting that domestic investment has a positive and significant impact on economic growth. They further emphasise on the importance of domestic investment on economic growth. Bakari (2017) focuses on the impact of domestic investment in Malaysia, and found that domestic investment and economic growth were positively related in the long term. However, the study found that such relationship does not exist in the short term. These results show that domestic investment wasone of the sources of economic growth in Malaysia.

From the studies above it is expected that an increase in investment will cause an increase in economic growth, however the study found a negative relationship. This could be attributed to the effect of changes in interest rate on investment which reduced domestic investment and subsequently affecting the growth of the economy.

FDI shows a positive relationship with economic growth, although the relationship was statistically insignificant. FDI has an important effect on the economy. An increase domestic investment increases aggregate demand and with an increased aggregate demand domestic

output rises. A rise in domestic output leads to economic growth. The model has a regression coefficient of 0.0402, indicating that an increase in real interest rate leads to an increase in FDI by 0.0402. However, previous studies have found the relationship to be statistically significant. Fornah and Yuehua (2017), Malesevic-Perovic et al. (2014), Quazi (2014) and Ali et al. (2019), investigate the correlation between FDI and economic growth, and found to have a significant positive impact.

Inflation was found to be positively associated with economic growth, with a coefficient regression of 0.2471, but statistically insignificant in Botswana. An increase in prices leads to high profits, increased production to take advantage of high prices and more employment and high wages due to increase production and high prices. All these are positive for economic growth. These results support the findings by Mbulawa (2015) who found that inflation has a positive effect on economic growth in Botswana. However, Uddin et al. (2017) found that inflation has a negative relation with economic growth in the long run in developing countries, whereas Ramlan and Suhaimi (2017) found that there is no significant relationship between inflation and economic growth in Malaysia.

Exchange rate was found to be positively associated with economic growth, with a coefficient value of 22.1586. An increase in real exchange rate means that the domestic currency will depreciate against the US dollar. This will make the domestic goods to be cheaper thereby enhancing exports. The net exports will increase due to the depreciation of the Botswana Pula against the US dollar. Because of cheaper local goods for foreigners, they would prefer to buy more local goods. Since Botswana's economy is highly dependent on the mining sector the depreciation of the Botswana Pula will boast the diamond sales and also increase foreign currency in the country. The foreign currency will help to pay for imports. An increase in exchange rate will lead to growth in an economy since the country will export more causing increase in production. that is import lead. The results are reflective of Botswana economy which is an export led economy dominated by the mineral sector. These results are supported by Kogid et al. (2012) and Vorlak et al. (2019) found a significant positive relationship between real exchange rate and economic growth in Malaysia and Cambodia respectively. However, Stracca et al. (2016), who found that real appreciation significantly reduces annual real GDP growth. Edwards and Yeyati (2005),

Eichengreen (2007) and Rapetti et al. (2012), also found that keeping real exchange rate at competitive levels can be critical for economic growth. They found that undervalued or competitive currency (meaning that a fall in value of a domestic currency) resulted in an increase in economic growth.

Trade openness was also found to be negatively correlated with economic growth. The model had a negative coefficient value, implying that an increase in the unit of trade openness led to a fall in economic growth by 7.9737. It can, therefore, be concluded from the regression results that trade openness and economic growth exhibit a negative relationship. The findings in this study do not support studies by Keho (2017), Gala (2007), Barro (2003), Zahonogo (2018), Shaukat et al. (2019), Lin et al., (2014) and Kong et al. (2020), who conclude that trade openness positively affects economic growth. According to Madsen (2009), the debate on the effect of trade openness on economic growth remains controversial. Some researchers have proved that trade openness had a direct impact on trade, while some suggest that economic growth is not influenced by trade openness. Blanchard (2017) states that the impact of trade openness depends on the value of exports and imports. He opines that real export growth positively affects economic growth and real import growth negatively affects economic growth.

5.2.4. Impact of interest rates on economic growth and the impact of other variables on economic growth

Table 7: Relationship between economic growth and real interest rate with domestic investment, FDI, inflation, trade openness, real exchange rate and the real interest rate

	RIR		EG	
	Relationship	Significance	Relationship	Significance
DI	-ve	Significant	-ve	Significant
FDI	+ve	Significant	-ve	Insignificant
TO	+ve	Insignificant	-ve	Insignificant
ER	+ve	Significant	+ve	Insignificant
INF	-ve	Insignificant	+ve	Insignificant

Real interest rate has a significant and positive effect on FDI and exchange rate, whilst on domestic investment, it was negative and also significant. However, the real interest rate was found to have insignificant relationship with trade openness and inflation. The relationship between trade openness and inflation was found to be positive and negative respectively.

Domestic investment is the only economic growth channel that had a significant relationship with economic growth, and it was negative for domestic investment. The relationship between domestic investment and real interest rates was also negative and significant.

The other economic growth channels, inflation, FDI, trade openness and real exchange rate have insignificant relationships with economic growth, with FDI and trade openness having a negative relationship with economic growth and exchange rate and inflation having a positive relationship.

However, Shaukat et al. (2019) found varied inverse relation of real interest rate with economic growth through domestic investment, FDI, trade openness, exchange rate and inflation. They found that interest rate is determined by external causes in economies moving away from central planned economies to free market economies, where real interest rate, through other variables may be harmful and also restricts the economy to achieve sustainable growth.

5.2.5. The relationship between economic growth and other macro-economic variables as a result of change in interest rate

This sub-section discusses the impact of interest rate on economic growth, with the macro-economic variables providing the mediation role.

5.2.5.1. The impact of interest rate on economic growth, with mediation of domestic investment

From this study's analysis, domestic investment was found to have a negative and significant relationship with economic growth. The relationship of domestic investment with real interest rates was also negative and significant. Therefore, the impact of interest rate on economic growth, with domestic investment mediating, was also found to be significant as a result of the significance of interest rate on domestic investment and domestic investment on economic growth.

5.2.5.2. The effect of interest rate on economic growth, with mediation of real exchange rate

The results show that real exchange rate cannot mediate the effect of interest rate towards Economic growth. In analysing the relationship between interest rate and exchange rate, a positive and significant effect was established, and a positive and insignificant relationship was also established between exchange rate and economic growth. It can, therefore, be concluded that the effect of interest rate on exchange rate did not significantly affect economic growth.

5.2.5.3. The effect of interest rate on economic growth, with mediation of FDI

FDI show a positive relationship with economic growth and the relationship was statistically significant. Interest rate also has a positive and significant relationship with FDI. It is evident that the effect of interest rate on FDI has a significant effect on economic growth. The effect of interest rate on economic growth, with FDI mediating was found to be statistically insignificant.

5.2.5.4. The effect of interest rate on economic growth, with mediation of inflation

The relationship between interest rate and inflation was found to be insignificant, and that of inflation and economic growth. Inflation was also found to be insignificant in mediating the effect of interest rate on economic growth.

5.2.5.5. The effect of interest rate on economic growth, with mediation of Trade openness

The relationship between interest rate and trade openness were found to be insignificant. Trade openness and economic growth was also found to be insignificant. The effect of interest rate towards economic growth with trade openness mediating was also found to be insignificant.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter provides conclusions and recommendations.

6.2. Summary of the study

Economic growth variables are important in explaining the economic development of any country. Therefore, this study presents some insights to understand how these variables affect economic growth, using Botswana as a case study. The objectives of this study were to examine the relationship between economic growth and interest rates, interest rates and other economic growth channels. It sought to answer the following research questions:

i. What is the relationship between interest rates and economic growth in Botswana?

ii. What is the relationship between interest rates and domestic investment, FDI, inflation, real effective exchange rate, and trade openness?

iii. What is the relationship between economic growth and domestic investment, FDI, inflation, real effective exchange rate, and trade openness as a result of change in interest rate?

The debate on the appropriate policy to use to take a country out of recession has mostly favoured the use of the monetary policy. In Botswana the monetary policy has traditionally been used to facilitate economic growth during recession. Interest rates have been adjusted downwards with the view to stimulate economic growth and the present article sought to deepen this discussion by incorporating the analysis of indirect effects of the interest rate on economic growth through other economic variables such as domestic investment, FDI, inflation, real effective exchange rate, and trade openness. Real interest rate shows a positive effect on economic growth through statistically insignificant. When it comes to the effect of interest rate on economic growth, the inclusion of its indirect effects seems to give a clear picture of other factors to consider in making a decision on the use of the monetary policy.

The indirect impact of interest rate is shown through domestic investment. However, when it comes real exchange rate, FDI, inflation and trade openness the impact suggest that it is insignificant.

6.3. Conclusions

Several tests were conducted to ascertain the direct and indirect effects of interest rates on economic growth in Botswana. The Augmented Dicky-Fuller test was used to establish the stationarity of some of the variables and thereby show that all the variables were stationary at level. The results show that there is a positive relationship between real interest rate and economic growth. The study also shows that real interest rate influenced domestic investment to have a significant impact on economic growth while real exchange rate, FDI, inflation and trade openness do not have a mediating effect on interest rate and economic growth. Therefore, the main conclusion that can be drawn is that interest rates have a direct positive impact on the performance of Botswana economy.

6.4. Recommendations

This study contributes to the understanding of how different macro-economic variables affect economic growth. Its findings suggest that there are other areas for future research. The recommendations are as follows:

a) To stimulate domestic investment, interest rates can be used. However, these findings are not the last words regarding the impact of macro-economic variables on economic growth in Botswana, rather these may serve as a guide in conducting more comprehensive studies in this area. Therefore, further studies on this phenomenon are highly encouraged with inclusion of savings as a variable as Botswana's Gross Savings Rate accounted for 23.6 per cent of individual income as at March 2020 (Statistics Botswana, 2020).

b) Since Botswana is a natural resource-rich country, its growth is largely dominated by the mining sector. This, therefore, suggests that there is a need to study how this affects economic growth.

c) It is, therefore, critical for policy makers, when making policy decisions on the monetary policy, to bear in mind the influence of interest rate on other macro-economic factors, and how these subsequently affect economic growth.

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