

The Relationship between Interest Rates and Inflation in Ghana and Their Impact on Economic Growth for the Period 2006-2019

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Abstract High interest rates and high inflation rates have been the bane of many developing countries especially in Sub Saharan Africa. The researcher sought to determine the relationship between these two variables and their resultant effect on the economic growth of Ghana over last fourteen years. Changes in interest rates within the period were compared with changes in inflation rates. These figures were used to determine the coefficient of correlation between these variables. The changes in these two variables were also compared with the changes in the economic growth rate within the period to ascertain any relationship between them. The research showed that interest rates and inflation rates in Ghana were positively correlated and they had strong impact on the economic growth of Ghana within the period under review. The researcher, however, observed that the coefficient of correlation between interest rates and inflation rates from 2006-2015 was stronger than from 2016-2019.

Keywords: growth rates, interest rates, inflation rates, coefficient of correlation

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1. Introduction

Economies in Sub Saharan Africa have over the years been bedeviled with inflation and high interest rates and their attendant consequences on the economies. Ghana has had its share of these problems. Currently, statistics indicate that Africa has some of the highest interest rates in the world according to a study in 2015 by Investmentfrontier.com. This study shows that three of the six countries with the world's highest interest rates are in Sub Saharan Africa. The three are Malawi, Gambia and Ghana. Interest rates in Sub Saharan Africa are commonly above 20%. Generally, over the past ten years, interest rates in Ghana have ranged between 22% and 37% and inflation between 8.8% and 19.3%. Single-digit inflation was recorded for the first time in ten years between 2011 and 2013. Nonetheless, this feat could not be sustained.

The state has been applying monetary policies to curb inflation for many years but this is yet to yield the needed result. Interest rates in Ghana are not business friendly; they have resulted in businesses operating at high costs and rendering Ghanaian products uncompetitive on the international market. This has resulted in the influx of imported goods which are consequently cheaper than the

locally produced ones, thus, worsening the country's balance of payment position. The country is already import-dependent and the few goods that could be produced locally, taking advantage of the availability of cheap raw materials, have been abandoned due to the high cost of capital. Inflation on the other hand, although not always bad as in [1], has had negative effect on the economy.

Since these two economic indicators i.e. inflation and interest rates are key determinants of the performance of a good economy, when a relationship between these two determinants are established, it can lead to reducing their adverse effects on economic growth and improving the standard of living of the people as in [1], thus economic growth is the major cause of changes in living standards. It states that with growth each generation can expect, on the average, to be substantially better off than all preceding generations. It further states that the horrors of the early industrial revolution are no longer with us to a great extent because economic growth has removed the necessity of 14-hour days worked in extremely harsh conditions.

The researcher, therefore, seeks to establish the relationship between inflation and interest rates in Ghana and identify their impact on the nation's economic growth in order to make recommendations on how to tackle these variables to enhance economic performance.

2. Empirical Review

2.1. Interest Rates

As in [2], interest rates help the economy allocate saving among alternative uses. For savers, the interest rate is a reward for abstaining from consumption and waiting to consume at some future time. The higher the interest rate the greater the incentive to save. For borrowers, the interest rate is the cost of borrowing funds to invest or buy consumption goods. Thus, if the desire to borrow exceeds the willingness to save sufficient funds, the interest rate tends to rise. Ghana is a growing economy with lots of investment opportunities to explore; this makes the tendency to borrow for investment and consumption higher than the tendency to save, hence higher interest rates persist. It is the rate a bank or other lender charges to borrow its money, or the rate a bank pays its savers for keeping money in an account as in [3].

During a financial law seminar for judges in Accra on how banks calculate interest rates the following were noted as in [4]: Interest is the price paid by a borrower for the use of money that is borrowed from a lender. It is expressed as a percentage of the amount borrowed; hence the term interest rate. Interest rate is the amount of interest expressed as a percentage of the amount borrowed. As interest rates are lowered, more people are able to borrow more money. The result is that consumers have more money to spend, causing the economy to grow and inflation to increase. The opposite holds true for rising interest rates as in [5].

2.1.1. Determinants of Interest Rates

As in [6], the determinants of interest rate are as follows: Real Risk-Free Rate; this assumes no risk or uncertainty, simply reflecting differences in timing: the preference to spend now/pay back later versus lend now/collect later. Expected Inflation; the market expects aggregate prices to rise, and the currency's purchasing power is reduced by a rate known as the inflation rate. Inflation makes real dollars less valuable in the future and is factored into determining the nominal interest rate (from the economics material: $\text{nominal rate} = \text{real rate} + \text{inflation rate}$). Default-Risk Premium; what is the chance that the borrower won't make payments on time, or will be unable to pay what is owed? This component will be high or low depending on the creditworthiness of the person or entity involved. Liquidity Premium; some investments are highly liquid, meaning they are easily exchanged for cash (U.S. Treasury debt, for example). Other securities are less liquid, and there may be a certain loss expected if it's an issue that trades infrequently. Holding other factors equal, a less liquid security must compensate the holder by offering a higher interest rate. Maturity Premium; all else being equal, a bond obligation will be more sensitive to interest rate fluctuations the longer to maturity it is.

2.1.2. The Determination of Short-Term Interest Rates

Short term interest rates are determined by the following: Monetary policy instruments; the standard mode; differing policy objective; transmission mechanisms; globalisation and the exchange rate.

2.1.3. The Determination of Long-term Interest Rates

As in [7], the determination of long-term interest rates are as follows: Short-term Rates and Inflationary

Expectations; real expectations: evidence from index-linked bonds; international markets and exchange rates; public sector borrowing. It also states that with the growth of "big government" over the last century, the level and financing of public expenditure has become an increasingly important influence on long-term interest rates. In many economies the available traded bonds have been overwhelmingly "sovereign debt" — that is, borrowing by governments to fund budget deficits. In such economies, fiscal policy has, therefore, been as important an interest rate determinant as monetary policy. Where governments decide to fund budget deficits by borrowing, they must issue new debt: i.e. increase the supply of bonds. This may depress bond prices: i.e. increase interest rates.

The extent to which this occurs depends substantially on the existing total level of government debt. When this is already high, there is not only the problem of funding new expenditure, but also the continuous need to re-fund existing debt as it reaches maturity. Because high overall levels of debt increase the risks of default, higher levels of interest have to be offered in compensation — the "risk premium". Finally, the need to pay high levels of interest can increase budget deficits even further. Rising real interest rates will also affect the private sector of the economy, as borrowing for investment becomes more expensive. If the level of savings does not increase to fund new public debt, there will be a "crowding out" of private investment. It is always open to governments to reduce budget deficits by raising taxes. Rising deficits therefore create an expectation of future tax increases, adding a risk premium to interest rates paid on private and corporate borrowing.

A government can also, however, decide to "monetise" its deficits: that is, to increase the money supply sufficiently to cover the new expenditure. This creates the necessary liquidity to fund new borrowing; but it is also inflationary, and will have an immediate effect on long-term interest rates. These will rise to compensate for the expected fall in the value of the currency. As already noted, the initial effect on public finances will be apparently benign: as a result of the "inflation tax", the real total of debt will fall. It will be the first step, however, on the downward spiral of falling credit ratings, higher interest rates and shorter maturities, at the end of which lies default.

2.1.4. Long-term Rates, Demand and Growth

The economic forces which determine long-term interest rates are therefore highly complex. Is it nevertheless true despite uncertainties about the transmission mechanisms that movements in long-term rates will have a predictable effect on the real economy? As in [7], it is again noted that the classical economic model, asserts that rising interest rates will cause the cost of capital to rise, and hence cause investment to fall. This, in turn, will cause a fall in aggregate demand and output. Similarly, a fall in long-term rates should result in increased investment, demand and output. Empirical research does, in general, confirm the theory.

A study carried out by Thomas Meyer of Goldman Sachs (1999) as in [7], has shown that a steeper yield curve does depress credit demand, leading to a reduction in GDP growth of around 0.75% for every 1% rise in rates after a time lag of a few quarters. However, it does not automatically follow that a fall in long-term rates will have a similarly positive effect on growth. Recent experience in Japan also shows that even if long term rates are low - they have fluctuated between 1 and 2 % during 1998 and 1999 — the boost to the real economy has been minimal. Much also depends on the structure of an economy, and the components of demand. Interest rate changes feed through at varying speeds to different sectors, with different effects on asset prices. The effect on inventories is more immediate than on capital projects. There can be strong regional variations, reflecting the structure of regional economies.

2.1.5. The Cost of Capital

As in [8] the cost of capital includes 3 elements: The risk-free rate of return; this is the return which would be required from an investment, if it were completely free from risk. For example Government treasury bills. The premium for business risk; this is an increase in the required rate of return due to the existence of uncertainty about the future and about a firm's business prospects. Business risks will be higher for some firms than for others. The premium for financial risk; this relates to the danger of high debt levels (high gearing). Because different companies are in different types of business (varying business risk) and have different capital structures (varying financial risk) the cost of capital applied to one company may differ radically from the cost of capital of another.

2.1.6. Budget Deficit Financing

As in [9], among the factors that affect interest rates is Budget Deficit financing. It states that when the federal government enacts fiscal policies that result in more expenditures than tax revenue, the budget deficit is increased. A higher federal government deficit increases the quantity of loanable funds demanded at any prevailing interest rate, causing an outward shift in the demand schedule. Assuming no offsetting increase in the supply schedule, interest rates will rise. Given a certain amount of loanable funds supplied to the market (through savings), excessive government demand for these funds tends to "crowd out" the private demand (by consumers and corporations) for funds. The federal government may be willing to pay whatever is necessary to borrow these funds, but the private sector may not. This impact is known as the crowding-out effect.

2.2. Inflation

As in [2], inflation is a sustained upward movement in the aggregate price level that is shared by most products. It is a sustained increase in the general price level of goods and services in an economy over a period resulting in a loss of value of currency. When the price level rises, each unit of currency buys fewer goods and services. As in [10], inflation and interest rates are linked, and frequently referenced in macroeconomics. Inflation refers

to the rate at which prices for goods and services rises. In the United States, interest rates are determined by the Federal Reserve (sometimes called "the Fed"). In general, as interest rates are lowered, more people are able to borrow more money. The result is that consumers have more money to spend, causing the economy to grow and inflation to increase. The opposite holds true for rising interest rates.

As in [11], Sub Saharan Africa has some of the highest interest rates in the world according to a study in 2015 by Investmentfrontier.com. Three of the six countries with the world's highest interest rates are in Sub Saharan Africa. The three are Malawi, Gambia and Ghana. Interest rates in Sub Saharan Africa are commonly above 20% a year for borrowers, and the spread between lending and borrowing rates is also extremely high (8%-10%) compared with spreads in other regions of the world. As in [11] again, the banks cite a high-risk environment and high inflation as well as financial volatility as explanations for the situation. Efforts to cut commercial lending rates in order to encourage start-up businesses and to foster growth for small and medium scale enterprises (SMEs) have not typically been successful in the past.

Interest rates in Ghana have predominantly been used as the Central Bank's monetary policy tool to control inflation, therefore, the commercial banks ride on the back of the central bank to maintain high lending rates and very low deposit rates to make high profits. The banking sector in Ghana is currently the most profitable sector with profits before tax ranging from 10% (UT Bank) to 88% (Bank of Baroda) in 2013 and an average net interest margin of 16.5%. As in [12], a discussion on the Impact of inflation on economic growth: a case study of Tanzania concluded that inflation has a negative impact on economic growth. It is envisaged that my findings would seek to confirm or refute his result in relation to Ghana.

2.3. Growth Rates

As in [13], economic growth has two meanings: Firstly, and most commonly, growth is defined as an increase in the output that an economy produces over a period, the minimum being two consecutive quarters. The second meaning of economic growth is an increase in what an economy can produce if it is using all its scarce resources. An increase in an economy's productive potential can be shown by an outward shift in the economy's production possibility frontier (PPF). As in [14], growth rates matter because an economy that grows too slowly fails to raise living standards. In Africa and Asia, very little economic growth has occurred in the past 50 years, so many people remain in severe poverty. As in [15], higher GDP growth rate nations do tend to experience lower inflation compared to countries with lower GDP growth rates. As in [16], it is often natural to measure how quickly something is changing by looking at its growth rate.

He asserts that the growth rate expresses the change in a variable relative to its initial value. Expressed mathematically, it is the difference (change over time) divided by the starting value. This article also seeks to measure how the economic growth of Ghana over the survey period has changed over time in relation to changes in inflation and interest rates. In an earlier research, as in

[17] the researchers tried to establish the relationship between the growth in corporate earnings and economic growth of a nation. According to them without friction, growth rate in corporate profits should be closely related to growth rate in the economy. They asserted that, however, in the presence of frictions, such as different corporate tax rates across jurisdictions, this relation may be altered or eliminated altogether. For example, during 2013, US corporations earned \$2.1 trillion dollars in pre-tax profits resulting in 6% increase from the previous year. In contrast, the US economy grew by only 2% in the same period. They further noted that for nearly a quarter of a century, corporation profits in the US have grown faster than Gross Domestic Product (GDP).

As in [18], the major factors influencing economic growth are as follows:

2.3.1. Productivity Increases

Productivity refers to how much GDP the work force generates. The higher the productivity in a country, the more wealth its people create. Productivity is the principal measure of productive creativeness, the gauge of a person's contribution to the growth of the economy. Productivity to a large extent determines an individual's income.

2.3.2. Population Growth

Population matters. The greater the population, the bigger the economy becomes. People produce goods and services, earning wages and in turn generating demand for even more goods and services. If GDP growth doesn't keep up with the population growth, GDP per capita declines, because every citizen generates less economic value and the country becomes relatively poorer. That is why it is important that GDP growth outstrips population growth.

2.3.3. Better Educated and Healthier Workforce

Well-educated and healthier employees have higher productivity. Education and health require government subsidies and a climate in which the private sector is encouraged to educate and treat the country's citizens.

2.3.4. Ease of Doing Business

The ease of doing business is determined by the opportunities an individual has to start a new enterprise, and includes variables such as regulation, access to seed capital, the size of the market for the firm's products, and taxes. This helps in economic growth. As in [19], the following are some of the important factors that affect economic growth of a country:

2.3.5. Human Resource

The quality and quantity of available human resource can directly affect the growth of an economy. The quality of human resource is dependent on its skills, creative abilities, training, and education. If the human resource of a country is well skilled and trained then the output would also be of high quality. On the other hand, a shortage of skilled labor hampers the growth of an economy, whereas surplus of labor is of lesser significance to economic growth. Therefore, the human resources of a country

should be adequate in number with required skills and abilities, so that economic growth can be achieved.

2.3.6. Natural Resources

Countries having plenty of natural resources enjoy good growth than countries with small amount of natural resources. The efficient utilization or exploitation of natural resources depends on the skills and abilities of human resource, technology used and availability of funds. A country having skilled and educated workforce with rich natural resources takes the economy on the growth path. The best examples of such economies are developed countries, such as United States, United Kingdom, Germany, and France. However, there are countries that have few natural resources, but high per capita income, such as Saudi Arabia, therefore, their economic growth is very high. Similarly, Japan has a small geographical area and few natural resources, but achieves high growth rate due to its efficient human resource and advanced technology.

2.3.7. Capital Formation

Involves land, building, machinery, power, transportation, and medium of communication. Producing and acquiring all these manmade products is termed as capital formation. Capital formation increases the availability of capital per worker, which further increases capital/labor ratio. Consequently, the productivity of labor increases, which ultimately results in the increase in output and growth of the economy.

2.3.8. Technological Development

Technological development helps in increasing productivity with the limited amount of resources. Countries that have worked in the field of technological development grow rapidly as compared to countries that have less focus on technological development. The selection of right technology also plays a role for the growth of an economy. On the contrary, an inappropriate technology results in high cost of production.

2.3.9. Social and Political Factors

These play a crucial role in economic growth of a country. Social factors involve customs, traditions, values and beliefs, which contribute to the growth of an economy to a considerable extent. For example, a society with conventional beliefs and superstitions resists the adoption of modern ways of living. In such a case, achieving becomes difficult. Apart from this, political factors, such as participation of government in formulating and implementing various policies, have a major part in economic growth.

2.4. Limitations of the Research

The study is limited to Ghana, the home country of the researcher. Since economic conditions in the sub-Saharan region are similar, it is suggested that future researchers should conduct research on the relationship between interest rates and inflation in the sub-region and their impact on economic growth in the sub-region. This will enable governments in the sub-region manage their

economies better to enhance total economic progress of sub Saharan Africa and make it economically independent; and offer their citizens better living standards.

3. Methodology

3.1. Data for the Research

Data for the research was obtained mainly from secondary sources such as data from the Ghana Statistical Service, the Central Bank of Ghana, and other journals. The researcher considered the average inflation rates, average interest rates of commercial banks in Ghana and the average growth rates for the period 2006 to 2019. The research design for the project was quantitative method and comprised of tables depicting the inflation rates, interest rates and the growth rates of Ghana within the survey period.

3.1.1. Dependent Variable

The economic growth rate over the period was considered the dependent variable.

3.1.2. Independent Variables

The inflation rates and interest rates over the survey period were considered the independent variables. Changes in inflation rates were compared to changes in interest rates to establish the relationship between these two variables. The researcher then deduced how the relationship between these two variables impacted the change in the growth rate in the economy. The researcher also did a correlation analysis by computing the coefficient of correlation between changes in inflation rates and changes in the interest rates. This enabled the researcher to deduce whether relationship between changes in Ghana's inflation rates and interest rates was positive or negative.

4. Results and Analysis

From [Table 1](#), in 2006 the interest rate was 23%, inflation rate was 11.7% and the growth rate was 5.5%. In 2007 the interest rate was 22%, inflation rate was 10.7% and growth rate was 7%. In 2008, the interest rate was 24%, inflation rate was 16.5% and growth rate was 6.5%. In 2009, the interest rate was 32.5%, the inflation rate was 19.3% and growth rate was 5%. In 2010, the interest rate was 32%, the inflation rate was 10.8% and the growth rate was 9%. In 2011, the interest rate was 27%, inflation rate was 8.7% and growth rate was 11%. In 2012, the interest rate was 25.5%, inflation rate was 8.8% and the growth rate was 8.0%. In 2013, the interest rate was 26%, inflation rate was 9% and growth rate was 5.5%. In 2014, the interest rate was 32%, inflation rate was 16.2% and the growth rate was 4.5%.

In 2015, the interest rate was 37%, the inflation rate was 17.8% and growth rate was 4.2%. In terms of percentages, in 2007, the percentage change in interest rate was (4.3), the percent change in inflation rate was (8.5)

and the percentage change in growth rate was 27.3. In 2008, the percentage change in interest rate was 9.1, the percentage in inflation rate was 54.2 and the percentage change in growth rate was (7.1). In 2009, the percentage change in interest rate was 35.4, the percentage change in inflation rate was 17 and the percentage change in growth rate was (23.0). In 2010, the percentage change in interest rate was (1.5), the percentage change in interest rate was (44.0) and the percentage change in growth rate was 80.

In 2011, the percentage change in interest rate was (15.6), the percentage change in inflation rate was (19.4) and the percentage change in growth rate was 22.2. In 2012, the percentage change in interest rate was (5.6), the percentage change in inflation rate was 1.1 and the percentage change in growth rate was 27.3. In 2013, the percentage change in interest rate was 1.9. The percentage change in inflation rate was 2.3 and the percentage change in growth rate was (31.25). In 2014, the percentage change in interest rate was 23.1, the percentage change in inflation rate was 80 and the percentage change in growth rate was (18.2). In 2015, the percentage change in interest rate was 15.6, the percentage change in inflation rate was 10.0 and the percentage change in growth rate was (6.7).

[Table 1](#) shows that when inflation dropped in 2007 by 8.5% the interest rates also dropped by 4.3% resulting in a positive change in growth rate by 27.3%. In 2008, inflation increased by 54.2% and interest rates also increased by 9.1; the growth rate fell by 7.1%. In 2009, inflation rate increased by 17% and interest rate also increased by 35.4%; the growth rate declined by 23.0%. In 2010, inflation rate declined by 44% and interest rate also declined by 1.5% and the growth rate increased by 80%.

In 2011, the inflation rate dropped by 19.4% and the interest rates also dropped by 15.6% the growth rate increased by 22.2%. In 2012, the inflation rate increased by 1.1% but the interest rate declined by 5.6%; there was an increase in the growth rate of 27.3%. In 2013, inflation rate increased by 2.3% and the interest rate also increased by 1.9%; the growth rate for that year declined by 31.25%. In 2014, inflation rate increased by 80% and the interest rate increased by 23.1%; the growth rate declined by 18.2%. In 2015, inflation rate increased by 10% and the interest rate also increased by 15.6%; the growth rate declined by 6.7%. It can be inferred from this 10-year survey that, in any year that inflation rate increased, the interest rates also increased except in 2012 when the inflation rate increased marginally by 1.1% but the interest rate declined by 5.6%.

However, in any year that the inflation rate declined, interest rate also declined. It can also be inferred that interest rate as a monetary policy tool was used as a check on inflation rate in Ghana within the 10-year survey. This confirms the result in [\[6\]](#) that monetary policy instrument is one of the determinants of short term interest rates. It can further be deduced that a drop in inflation rate coupled with a drop in interest rate resulted in increase in the growth rate; whereas an increase in inflation rate coupled with an increase in the interest rate resulted in a decline in the growth rates. This also confirms the finding as in [\[7\]](#) that a rise in interest rates results in a reduction in GDP growth after a time lag of a few quarters.

In Table 2, the mean of the inflation rates for the period was 13%, the variance of the inflation rates was 14.91 and the standard deviation of the inflation rates was 3.86. The mean of the interest rate for the period was 28%, the variance of the interest rates was 22.16 and the standard deviation of the interest rates was 4.71. The standard deviations for both variables therefore showed that the data distributions were normal. The coefficient of correlation between Ghana's inflation rates and its interest rates between 2006 and 2015 as per the above analysis was 0.58. This showed that there was positive relationship between these two variables. In other words, an increase in inflation rate was followed by an increase in interest rate and a decrease in inflation rate was followed by a decrease in interest rate.

In Table 3 and Table 4, the researcher differently determined the correlation between interest rates and inflation rates for the period 2016 to 2019 and observed that the correlation coefficient between these two variables over that period was 0.05. This implied that these two variables were positively correlated but not strongly correlated within that period compared to the period 2006 to 2015. This further showed that although

increase in inflation rates in (2016-2019) resulted in increase in interest rates and decrease in inflation rates resulted in decrease in interest rates during that period, change in inflation rates did not match changes in interest rates. For example when inflation rate dropped by 29.11% in 2017 interest rate fell by only 2.91%, similarly when inflation rate dropped by 36.86% in 2018 interest rate fell by only 4.45%.

This situation depicted in the analysis for the period 2016-2019 is disincentive to investments. This is because, although investors may benefit from relatively lower inflation to do business within that period they will not benefit from accompanying interest rate which also ought to be low to enhance borrowing, pricing of their products and economic growth because cost of capital remained high thereby adversely affecting business. This is evident in 2018 when inflation rate dropped by 36.86% while interest rate fell by only 4.45% resulting in fall in economic growth by 23.1% instead of increase in economic growth as was the trend in 2006-2015.

For conducive business environment to prevail, policy makers must ensure that a drastic fall in inflation rates should reflect in corresponding fall in interest rates.

Table 1. Data Showing Interest Rates and the Inflation Rates of Ghana from 2006 To 2015

YEAR	Interest Rates	% Change in interest rates	Inflation Rates	% Change in inflation rates	Growth Rates	Change in growth Rates
2006	23		11.7		5.5	
2007	22	(4.3)	10.7	(8.5)	7.0	27.3
2008	24	9.1	16.5	54.2	6.5	(7.1)
2009	32.5	35.4	19.3	17.0	5.0	(23.0)
2010	32	(1.5)	10.8	(44.0)	9.0	80.0
2011	27	(15.6)	8.7	(19.4)	11.0	22.2
2012	25.5	(5.6)	8.8	1.1	8.0	27.3
2013	26	1.9	9.0	2.3	5.5	(31.25)
2014	32	23.1	16.2	80	4.5	(18.2)
2015	37	15.6	17.8	10.0	4.2	(6.7)

Data survey -2017.

Table 2. Correlation Analysis of the Results

Inflation rates (x_i)	Interest rates (y_i)	$U_i =$ $X_i - 13$	$V_i =$ $Y_i - 28$	$u_i v_i$	U_i^2	V_i^2
11.7	23	-1.3	-5	6.5	1.7	25
10.7	22	-2.3	-6	13.8	5.3	36
16.5	24	3.5	-4	-14	12.3	16
19.3	32.5	6.3	4.5	28.4	39.7	20.3
10.8	32	-2.2	4	-8.8	4.8	16
8.7	27	-4.3	-1	4.3	18.5	1
8.8	25.5	-4.2	-2.5	10.5	17.6	6.3
9.0	26	-4.0	-2	8.0	16	4
16.2	32	3.2	4	12.8	10.2	16
17.8	37	4.8	9	43.2	23.0	81
TOTALS		-0.5	1	104.7	149.1	221.6

$$u = \frac{-0.5}{10} = -0.05, v = \frac{1}{10} = 0.1$$

$$\sum u_i v_i - 10uv = 104.7 + 0.05 = 104.75$$

$$\sum U_i^2 - 10u^2 = 149.1 - 0.025 = 149.075$$

$$\sum V^2 - 10v^2 = 221.6 - 0.1 = 221.5$$

$$r = \frac{104.75}{\sqrt{(149.075 \times 221.5)}} = \frac{104.75}{181.71}$$

$$r = 0.58$$

Coefficient of correlation was 0.58 for the period 2006 to 2015.

Standard (Std.) Deviation of the Inflation Rates:

$$\sqrt{\frac{149.1}{10}} = \sqrt{14.91} = 3.86$$

Variance of the inflation rates = 14.91

Mean \pm Std. Deviation = 13 + 3.86; 13 - 3.86
= 16.86; 9.14

Mean \pm 2 x Std. Deviation = 13 + 7.72; 13 - 7.72
20.72; 5.28

60% of the inflation rates for the period fall within the Mean \pm Std. Deviation range.

100% of the inflation rates for the period fall within the Mean \pm 2x Std. Deviation range. This implies that the standard deviation for the data distribution is low. The data distribution is therefore normal.

Standard Deviation of the Interest Rates:

$$\sqrt{\frac{221.6}{10}} = \sqrt{22.16} = 4.71$$

Variance of the interest rates = 22.16

Mean \pm Std. Deviation = 28 + 4.71; 28 - 4.71
= 32.71; 23.29

Mean \pm 2x Std. Deviation = 28 + 9.42; 28 - 9.42
= 37.42; 18.58

80% of the interest rates for the period fall within the Mean \pm Std. Deviation range.

100% of the inflation rates for the period fall within the Mean \pm 2x Std. Deviation range. This implies that the standard deviation for the data distribution is low. The data distribution is therefore normal.

$$u = -\frac{0.01}{4} = -0.0025, v = -\frac{0.01}{4} = -0.0025$$

$$\sum u_i v_i - 10uv = 19.71 - 0.0001 = 19.71$$

$$\sum U_i^2 - 10u^2 = 4,634.89 - 0.0001 = 4,634.89$$

$$\sum V^2 - 10v^2 = 38.69 - 0.0001 = 38.69$$

$$r = \frac{19.71}{\sqrt{(4,634.89 \times 38.69)}} = \frac{19.71}{423.47}$$

$$r = 0.05$$

Coefficient of correlation was 0.05 for the period 2016 to 2019.

5. Conclusion

The result of the research showed that inflation rates in Ghana were closely linked to interest rates. They were positively related. This implied that increase in inflation rates led to increase in interest rates and vice versa. It showed that the central bank used interest rate as a monetary policy tool to control inflation; therefore, as long as inflation rates rose it was difficult for interest rates to decline. It was also evident that the spread between lending rates and deposit rates was very high. This was partly as a result of the banks in Sub Saharan Africa exploiting the central banks' monetary policy to their benefit as indicated in [11] that 'spread between lending and borrowing rates was extremely high (8%-10%) compared with spreads in other regions of the world'; also as evidenced by the fact that the banks' average net interest margin in Ghana in 2013 was 16.5%.

The research also showed that increase in inflation rates followed by increase in interest rates led to decline in the growth rates. This result is similar to the findings in [12]; his research on the topic, Impact of Inflation on Economic Growth: A Case Study of Tanzania, showed that inflation had a negative impact on economic growth. It also confirms a study carried out as in [7] that 'rise in interest rate does depress credit demand, leading to a reduction in GDP growth'.

6. Recommendations

It is recommended that in order for interest rates in Ghana to be low and business friendly, the government should tackle inflation holistically. Thus, the state should use both fiscal and monetary policies to reduce inflation and not monetary policies alone, as in [7] "with the growth of 'big government' over the last century, the level and financing of public expenditure has become an increasingly important influence on long-term interest rates. In many economies the available traded bonds have been overwhelmingly 'sovereign debt' — that is, borrowing by governments to fund budget deficits. In such economies, fiscal policy has therefore been as important an interest rate determinant as monetary policy."

Since the research showed that increase in inflation and increase in interest rates led to decline in growth rates which usually adversely affected standard of living, the state, by effectively applying measures that reduce

Table 3. Data Showing Interest Rates and the Inflation Rates of Ghana from 2016 To 2019

YEAR	Interest Rates	% Change in interest rates	Inflation Rates	% Change in inflation rates	Growth Rates	% Change in growth rates
2016	31.26	-15.51	17.45	-1.97	3.45	-17.85
2017	30.35	-2.91	12.37	-29.11	8.14	135.94
2018	29.00	-4.45	7.81	-36.86	6.26	-23.1
2019	28.00	-3.45	7.18	-8.07	6.5	3.83

Table 4. Correlation Analysis of the Results (2016-2019)

Inflation rates (x _i)	Interest rates (y _i)	U _i = X _i - 11.20	V _i = Y _i - 29.65	u _i v _i	U _i ²	V _i ²
17.45	31.26	6.25	1.61	10.06	39.06	2.59
12.37	30.35	1.17	0.7	0.82	1.37	0.49
7.81	29.00	-3.39	-0.65	2.2	11.49	0.42
7.18	28.00	-4.02	-1.65	6.63	16.16	2.72
TOTAL		0.01	0.01	19.71	68.08	6.22

inflation and interest rates could improve the living standard of its people and also mitigate its unemployment status. Since the central bank indirectly made the commercial banks raise lending rates when inflation rates increased, the central bank should as well monitor the commercial banks to ensure that when inflation rates fall, all things being equal, the commercial banks should reduce their lending rates appreciably to foster economic growth.

Government borrowings to finance budget deficits is one of the causes of increases in interest rates in Ghana; the state should, therefore, endeavour to reduce its budget deficits, which within the survey period ranged between 6% and 13% to the barest minimum and its borrowings in order that interest rates will be low and impact positively on the economy as in [9], “given a certain amount of loanable funds supplied to the market (through savings), excessive government demand for these funds tends to ‘crowd out’ the private demand (by consumers and corporations) for funds. The federal government may be willing to pay whatever is necessary to borrow these funds, but the private sector may not”.

Governments, especially in the developing economies like Ghana should set a ceiling on government borrowing to finance budget deficits. This should be a national agenda void of politics so that all succeeding governments will be guided by it in order to enhance economic growth of their countries. As evidenced in the analysis of 2016-2019, policy makers should ensure that a drastic fall in inflation rates should reflect in corresponding fall in interest rates in order to enhance business growth.

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