

Statistical Modelling of Nigeria Inflation Rate From 1990 to 2020: A Pandemic for Economic Development

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Annotation:

In this research work, we examine the impact of inflation/exchange rate on Nigeria's economic growth. With data obtained from the National Bureau of Statistics from 1990 to 2020, using SPSS version 23 for the analysis. Utilizing the Multiple Linear Regression method, it suggested a model which is fitted as $YGDP = \beta_0 + \beta_1 INFL + \beta_2 EXR + U$. Where YGDP is the real gross domestic product and U is the stochastic variable. From the results, it shows that since the F-statistic (10.268) is greater than the F critical value (0.000). we reject the null hypothesis and conclude that both inflation and exchange rates have a negative impact on economic growth. That is, high inflation/exchange rate are inimical or a pandemic to output growth. The research work also pointed out some causes of inflation including; increase in wages, monopolistic market, disruption of productive factors by civil war, removal of oil subsidy etc. These findings are essential for monetary policy formulation as they provide a guide for the policymakers to choose an optimal target for inflation, which is consistent with the long-term sustainable economic growth goals of the country.

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Introduction

Inflation is a persistent increase in the general level of prices (Billi, & Khan, 2008). It is sometimes described as a state where too much money is chasing too few goods. When there is inflation, the currency loses purchasing power. The purchasing power of a given amount of naira will be smaller over time when there is inflation in the economy. For instance, assuming that N1000.00 can purchase 8 shirts in the current period if the price of shirts doubles in the next period, the same N1000.00 can afford 5 shirts. However, some literature suggested that inflation can be generated from three major sources. Firstly, through the ability of labor unions to use market power to demand wage increases which are more than productivity gains to appropriate part of the profits accruable to entrepreneurs usually known as distributional conflict cause of inflation. Secondly, by developments in the product markets because of the existence of monopolistic market structures, firms may wield the market power that allows them to practice markup pricing. Lastly, inflation may occur as a result of some form of exogenous or endogenous shocks that may be driven by either exchange rate depreciation or an upward spike in the price of a commodity like cooking gas, crude oil etc. (Bhatia, 1960). In either case, shocks may adversely affect costs of production which firms can pass on to domestic prices. This depends though on the pricing power of firms, the elasticity's of the demand curves of consumer durables and nondurables and on how persistent inflation is in the economy.

As seen earlier, inflation is a situation when too much money is chasing too few goods and services in an economy. Hence, an imbalance exists between the GDP and the total money supply (Bruno, & Easterly, 1995). Inflation is neither new in the economics of Nigeria nor the world at large. Variations in magnitude or rates have been observed to be in existence. In Nigeria, the rate of inflation was about 10% between 1969 and 1970. Prices rose by about 14% immediately after the civil war, then fell to 30% in 1972, and rose again by about 16% in 1974 and reached a rate of about 34% increase in 1975. Inflation was the greatest task to government policymakers in the 1970s.

In the world, between 1799 – 1801, prices rose by more than 50%. Also, between 1937 – 1941, during the second world war, the price level was recorded to be almost double what it was before.

Then between May 1542 and mid-1551, the world recorded an inflationary rate of 16% per annum, 23% during the war with France and almost 30% during the first war in 1914 – 1918. Thus, is about the highest rate attained in world history (Faria, & Carneiro, 2001). It is now clear that inflation persists both in the developed and developing countries, with the difference in magnitude or rate. The rates in developing countries making compatible with the present situation, as the above-noted rates were attained during the eighteenth century and the early part of the nineteenth century (1799 – 1807), and the early-mid parts of the twentieth century (1939 – 1951).

In the case of Nigeria, the highest rate was attained in the late twentieth century (1969 – 1975).

We all know that inflation simply refers to a continuous rise in the price of commodities.

According to web stars seventh new collegiate dictionary, inflation is defined as an “increase in the volume of money and credit relative to available goods resulting in a substantial and continuity rise in the general price level. This definition pulls out the fact that inflation cannot occur unless there is an increase in the volume of money and credit which brings about a continued rise in the general price level of goods and services, which is not being matched by the proportionate quantity of goods and services in the economy.

Inflation became rampant in Nigeria after the Nigerian civil war, though it might have been in existence bough before then. Immediately after the Nigeria civil war, prices took an upward turn from their previous levels. This was due mainly to the shortage of goods and services caused by the disruption of productive factors by the civil war.

Furthermore, another important cause factor is the review of salaries and wages. This review stated with Adebo Award of 1970, which was followed by the Udoji and Williams awards of 1974, and also 45%

increase in salaries implemented by Gen. Babangida in 1991 and also the most recent one that is the new minimum wage by Gen. A. Abubakar and president Obasanjo in 1999 and 2000 respectively. All these revises intensify the inflationary pressure.

Also, the high prices of imported goods arise from an increase in foreign prices and instability of the international exchange rate. Surcharge from port congestion, storage facilities, marketing arrangement plus the distribution network, the impact of second-tier foreign exchange market and the removal of oil subsidy is all inflationary factors in the Nigeria economy. The most current inflationary element in the Nigerian economy today is the removal of oil subsidies. Such the removal, there has been an increase in the price of oil which had led to a price increment of most items, as an increase in transportation fare, food items in the market etc. are living examples now.

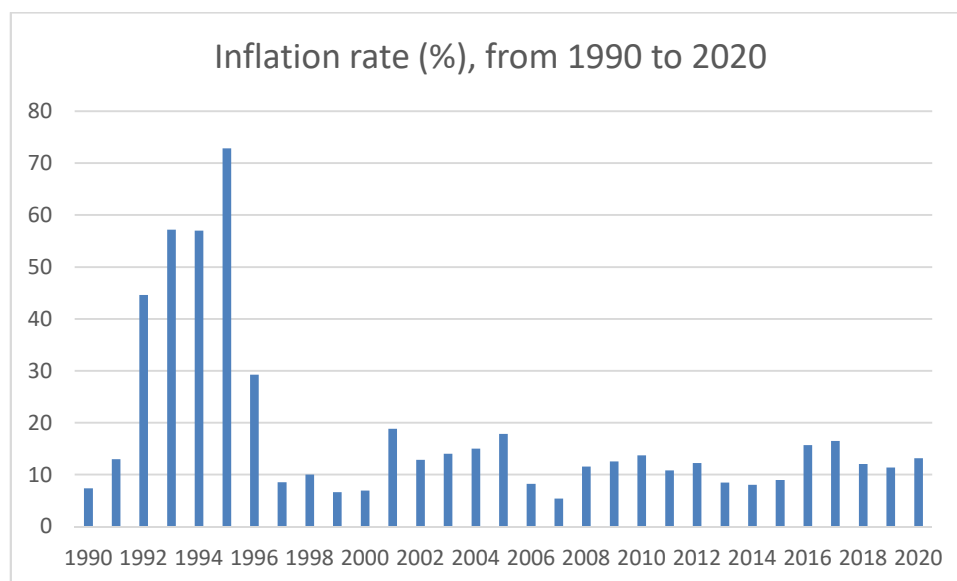
It is worthy to note at this juncture that all these issues accrued accelerated increases in the aggregate demand not being matched by an appropriate expansion in domestic output and the input of goods and services. Additionally, if inflation were to affect everyone in exactly the same way and degree, it would have no importance whatsoever; its social significance arises from the fact that it always does affect the people differently. Its effect on Mr. A. Differs from its effect on Mr. B. depending on personality, income and family background (Mubarik, 2005). The word inflation rings a bell in the market economics of the world. It is a problem that threatens all economics because of its undesirable effects. The problem of inflation surely is not a new phenomenon. It has been a major problem of the country over the years. Inflation is a household word in much market-oriented economics. Although, several people, producers, consumers, professionals, non-professional, trade unionists, workers and the likes, talk frequently about inflation particularly if the affection has assumed a habitual character yet only selected a few mechanisms and consequences of inflation (Omoke, 2010). There is a high-level consensus among many economists, central bankers, policymakers and practitioners that one of the fundamental objectives of macroeconomic policies in both developed and developing economies is to sustain high economic growth together with low, one-digit inflation (meaning that inflation is very low). This is because a high level of inflation disrupts the smooth functioning of a market economy (Sala-i-Martin, 1997).

However, at the individual level, inflation exerts a heavy fall on those with fixed income, inflation relatively favours debtors at the expense of creditors, at the firm level, the effect of inflation is called the “menu cost” Dmziger (1988) and Guerreso (2004) because it affects output when firms have to incur costs as they adjust to the new price level. That is, changing their price list for customers.

It is pertinent that much less agreement exists about the precise relationship between inflation and economic performance, and the mechanism by which inflation affects economic activity at an aggregate or high level. This has generated a significant debate both theoretically and empirically. A Series of studies have found no conclusive empirical evidence for either a positive or a negative association between inflation and economic growth, notable among these studies includes Bhatia, 1960, and Johansen (1967), for a positive association.

Several researchers found a negative correlation between economic growth and inflation. Among these studies are De Gregorio (1993), Fishers (1993) and Malla (1997) etc. That is, at lower rates of inflation, the relationship is positive or not significant, but at a higher rate, inflation has a significantly negative effect on growth. In terms of non-linearity, explaining why views on the inflation growth relationship have changed dramatically over the past thirty years is not difficult. Figure 1 shows the rate of inflation in Nigeria from 1990 to 2020.

Figure 1: Shows inflation rate trend in the Nigeria Economy from 1990 to 2020.



Source: Authors computation. Data from National Bureau of Statistic, 2020.

Figure 1 shows that in 20 out of the 30 years of observation of this measure, the Nigerian economy experienced double-digit inflation with the highest figure recorded at about 72.84% in 1995 (Sarel, 1996).

This study seeks to evaluate the impact of inflation/exchange rates on Nigeria's economic development and to ascertain the causes of inflation on the Nigerian populace via depicting some possible way-out to curb the inflation rate in Nigeria.

Aim and objectives

This work aims to evaluate the impact of inflation/exchange rates on economic growth.

The objectives are;

- (1) To build a statistical model that could be used to check the growth of inflation/exchange rates in Nigeria.
- (2) To ascertain the causes, effects and some ways of curbing inflation in Nigeria.

Significance of the Study

The significance of this study is as follows:

- It would supply an empirical effect of the inflation rate on Nigeria's economic growth.
- It would provide policy recommendations to strategy makers on ways to control the inflation rate in Nigeria.

Causes of inflation

There have been fluctuations in Nigeria's inflation rate for decades rising as high as 72.84 in 1995 to as low as 7.36 in 1990. Since then it has been rising and falling until early April 2018 when it was reported at its lowest at 12.09 percent. Although the figures suggest that the inflation rate has reduced compared to previous years, Nigerians still struggle to make ends meet as the prices of goods and services haven't really changed as evidence of a decrease in the inflation rate. Despite the above causes as discussed earlier, below are the ten most common feasible causes of inflation in Nigeria.

(1) Civil Unrest: Nigeria has been struggling against insurgency since the beginning of the democratic era in 1999. This unrest has made food production reduce drastically, particularly in the North East where most

cases of killings and destruction of properties have been recorded. The North East is a major food producer particularly Taraba State where cereals, yam and other food produce are cultivated. With the killings of farmers on their farms and destruction of crops by cattle of Fulani herdsmen, food production has decreased significantly. As a result, the cost of food items has risen in accordance with the law of demand and supply which states that when there is high demand and low supply, the price goes up. Therefore, insecurity is a major cause of inflation in Nigeria.

(2) Government Economic Policies: The policies of the federal government through the Central Bank of Nigeria (CBN) have contributed immensely to worsening inflation in Nigeria. For instance, the printing of notes for spending by the government injects so much money into the system thus raising inflation naturally by making sellers of goods and services raise their prices because of the money in circulation. It is the function of the CBN to control inflation in the economy but it has failed in this duty majorly because it answers more to the demands of the reigning government than to the health of Nigeria's economy.

(3) Devaluation of the Naira: Devaluation of the Naira may have a few advantages such as an increase in export, reduced trade deficit and others but a major disadvantage is that it leads to inflation due to lower purchasing power. It also causes an increase in the cost of importation with a consequent rise in the prices of imported goods. We see in Nigeria today money you could use to buy a bag of rice three years ago cannot buy half a bag now as result of Naira devaluation. This is therefore a major cause of inflation in Nigeria today.

4. Increased Wages: Workers place demands on employers for higher wages as a result of the biting effects of prices in the market. However increasing wages will only make it worse because higher wages will increase spending power and so flood the market with money, which further increases inflation. In other words, higher wages equal higher purchasing power which equals higher inflation.

5. The price of Fuel: Fuel used for vehicles that transport goods determine the prices of most items. Therefore, an increase in the price of fuel leads to an increase in the prices of goods. This is the situation today since the pump price for petrol is 165 Naira as opposed to 97 Naira three years ago. Petrol is also scarce so black marketers further increase the price, particularly in rural areas where food items have to be transported to cities. Inflation in food prices, therefore, is inevitable.

6. Reduction in Productivity: Apart from the decline in food production by farmers due to insecurity, the decline in production of finished goods may also cause inflation. This is a major problem in Nigeria because of the epileptic power supply which may increase the cost of production. If industries reduce production due to any of these factors then supply decreases and prices will go up.

7. Higher Taxes: There has been a recent increase in taxation in Nigeria, especially on imported goods. This discourages the importation of goods and it discourages investors who may want to establish businesses in the country. This causes scarcity of goods and so leads to an increase in prices, thereby causing inflation. Taxes must be reduced to encourage investors to produce goods to increase supply so that inflation can be reduced in the market.

8. Expectation of Inflation: Sometimes no obvious reasons cause inflation but the fear of inflation itself. When workers perceive inflation, the demand increased wages. If this demand is granted, the market gets so much money which in turn leads to the inflation they were trying to avoid.

9. Pre-election and Campaign Spending: As is the custom in Nigeria, as elections draw near, politicians spend so much money to get voters to vote for them since they have not done anything for those voters to deserve their votes. This brings so much money into the economy and therefore causes inflation because traders will increase their prices as they see money in circulation. We are about to start experiencing this as 2023 draws near.

10. Poverty: Prices of goods and services may rise not because of any of the above-mentioned reasons but because the sellers are trying to make ends meet. The profits from sales are not enough to cater for their families so they raise their prices. This is quite common in Nigeria as life has become really difficult for most traders these days and not just for them, but every citizen. Those who render services such as transportation also raise their prices due to this same reason.

Effects of inflation

The effects of inflation have been felt badly by Nigerians who use social media to speak out on the rising food inflation which is affecting the purchasing power of Nigerians. Food has become so expensive that Nigerians now buy raw food in much smaller quantities. Food has become so expensive that people now buy pieces of yams because they can't afford a full tuber. This is happening currently in Nigeria. A societal pandemic.

Nigeria's inflation rate continues to uptick rapidly. Over the trailing 20 months, the year-on-year inflation rate has increased from 11.02% in August 2019 to 18.17% in March 2021. Notably, the March 2021 inflation rate of 18.17% is at the highest since February 2017. Popular food items such as Garri, Maize, Rice, Vegetable Oil, Beans are showing significant YoY price increases of more than 20%.

This excessive spike in food is worrisome, especially if you consider that food-related items comprise 57% of the household expenditure incurred by Nigerians. In other words, Nigerian households allocate N57 out of every N100 spent, to food-related items. This means a 22.95% increase in food prices will result in Nigerians now being expected to spend over N70 out of every N100 on food-related items. Notably, these food price increases are occurring at a faster pace than incomes are increasing. Why should you be concerned about inflation? Given that price increases for goods and services continue to outpace income, the question arises about options that exist for Nigerians to mitigate and address the problem of inflation.

Notably, persistently high inflation in an economy creates concerns across the stakeholder spectrum such as Businesses - investment uncertainty resulting in capital expenditure constraints, Governments - unemployment concerns due to low business investments, Consumers - the erosion of purchasing power concerns, Investors - real returns concerns to protect and grow wealth. For consumers, the concerns about high inflation relate to how to avoid its devastating effects in eroding the purchasing power of individuals. For investors, it is keenness on ensuring that investments are optimally allocated to continually earn real returns to protect existing wealth and grow wealth if possible. What actions can be taken? Protect your purchasing power from being eroded

From a consumption perspective, purchasing power loss/erosion simply means that the number of goods and services a consumer can buy for a fixed amount continues to decline over time. Declining purchasing power affects the standard of living of individuals and forces them to cut back on items.

For instance, if you previously could buy a cup of rice for N100 and 20% inflation results in a cup of rice being sold for N120, it simply means you can only afford less than a cup of rice with the same N100 (which in this example, would be 5/6th of a cup) (<https://xtremenews.com.ng/how-to-survive-nigerias-galloping-inflation-rate/>)

Ways to curb the inflation rate

Monetary policy: Higher interest rates reduce demand in the economy, leading to lower economic growth and lower inflation.

Control of money supply: Monetarists argue there is a close link between the money supply and inflation, therefore controlling the money supply can control inflation.

Supply-side policies: policies to increase the competitiveness and efficiency of the economy, putting downward pressure on long-term costs.

Fiscal policy: a higher rate of income tax could reduce spending, demand and inflationary pressures.

Wage controls: trying to control wages could, in theory, help to reduce inflationary pressures. However, apart from the 1970s, it has been rarely used.

This study seeks to ascertain the impact of inflation on Nigeria's economic development or growth and access the causes of inflation, the effects on the Nigerian populace and outline some possible measures to curb the inflation rate in Nigeria (Masha, 2000).

METHOD

The method considered in this research is a multiple linear regression model where the error terms are normally distributed and the response outcomes are discrete [Michael, et al., (2005)].

The Model

Consider the multiple linear regression models relating a random response GDP to a set of predictor variables INFL, EXR is an equation of the form

$$YGDP = \beta_0 + \beta_1 INFL + \beta_2 EXR + U. \text{ Where } YGDP = 0, 1, 2, \quad (1)$$

Where the outcome YGDP is the inflation trend called gross domestic product, taking on values from 0, 1, 2. And β_1, β_2 , and β_0 are the regression (inflation) constants denoting the slope (the change in GDP rate concerning a unit increase in inflation, and exchange rate), and the intercept (the GDP value as inflation and exchange rates tends to zero). And U is the variations in inflation and exchange rates.

At origin, the expected response $E(YGDP)$ has a special meaning. Since $E(U) = 0$. Equation (1) becomes;

$$E(YGDP) = \beta_0 + \beta_1 INFL + \beta_2 EXR \quad (2)$$

GDP = Gross Domestic Product

INFL = Inflation rate and

EXR = Exchange rate

RESULTS AND DISCUSSIONS

Data

The data for this research work is obtained from the National Bureau of Statistics

(Inflation Rate (<https://www.macrotrends.net/countries/NGA/nigeria/inflation-rate-cpi>)). From 1990 to 2020. To analyze the result of multiple growth model building and parameter estimate.

Table 1a, b: Shows the regression output model summary and ANOVA difference of the inflation and exchange rate results at 95% and 99% Confidence intervals.

Table 1a Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657 ^a	.432	.390	6.87600

a. Predictors: (Constant), EXR, INFL

The table shows the correlation coefficient ($R = 0.657 = 66\%$), as a measure of strength of correlation. $R\text{-square} = R^2 = 0.432 = 43\%$, meaning that inflation and exchange rates explain or exact 43% effects on the Nigerian economic growth.

In table 1b, since the F-statistic (10.268) is greater than the F critical value (0.000), we reject the null hypothesis and conclude that there is a significant difference between inflation rate and the exchange rate which implies that both inflation and exchange rates are pandemic to economic growth in Nigeria.

Table 1b ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	970.956	2	485.478	10.268	.000 ^b
Residual	1276.544	27	47.279		
Total	2247.500	29			

a. Dependent Variable: GDP

b. Predictors: (Constant), EXR, INFL

Table 2: The coefficients output summary difference between Gross Domestic Product, Inflation rate and Exchange in Nigeria.**Table 2 Coefficients^a**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	9.360	1.938		4.830	.000
INFL	.179	.078	.343	2.278	.031
EXR	.353	.112	.476	3.160	.004

a. Dependent Variable: GDP

Table 2 shows β – values the regression coefficients of two predictors – 0.179 and 0.353. Both are statistically significant with p – values of 0.031, and 0.004. this shows that both β – values are significantly greater than zero, and the corresponding predictors (inflation and exchange rates) are independent determinants of the hardship to the Nigerian populace. Based on the positive sign of regression coefficient of 9.360 and t-statistical of 4.830. we reject the null hypothesis and agree with the alternative hypothesis that there is long run relationship between inflation, exchange rate and economic growth in Nigeria. This means that the regime of high inflation counteracts economic growth in the country.

Figure 1 & 2 shows the growth trend of inflation rates and exchange rates in Nigeria.

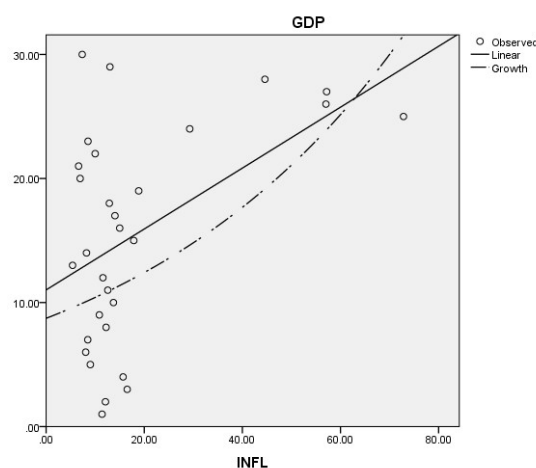
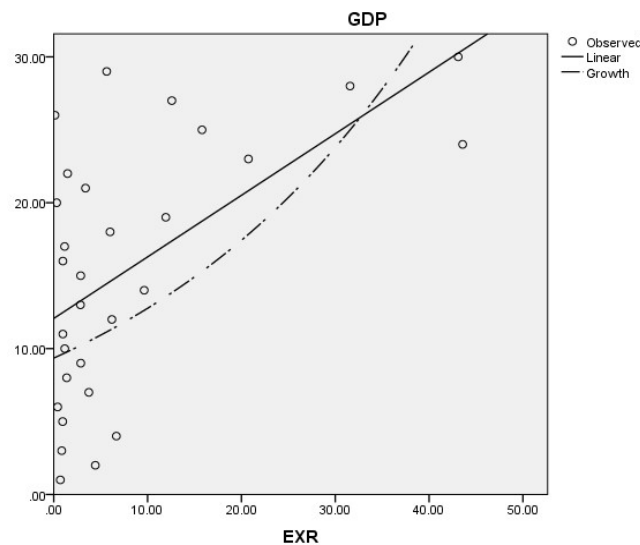
Figure 1.

Figure 2.



The two graphs above harness a positive correlation denoting an increase in inflation rate and exchange rates in Nigeria. A growth that needed immediate government intervention to curb the rates of inflation and exchange rates to ease the lives of the Nigerian populace.

Model fitting

Considering our β – values in table 2. And using our model in equation (1) above, that is,

$$YGDP = \beta_0 + \beta_1 INFL + \beta_2 EXR + U$$

Substituting values obtain in table 2, we therefore specify our model as;

$$YGDP = 9.360 + 0.179INFL + 0.353EXR + U,$$

this implies

$$\text{Gross Domestic Product} = 9.360 + 0.179 (\text{inflation}) + 0.353 (\text{exchange rate}) + U.$$

Figure 3. A sequence plot of GDP, INFL, and EXR. In Nigeria from 1990 to 2020.

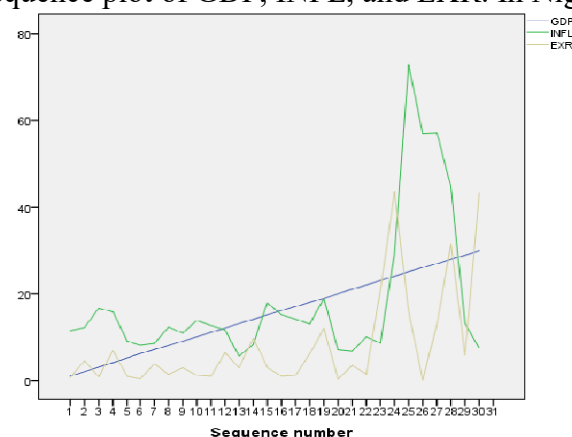


Figure 3 shows that despite government policies in Nigeria to better the wellbeing of its citizens, there is still a persistent variational increase in inflation/ exchange rates from 1990 to 2020. This is due to corruption and poor implementations of government policies.

Conclusion

It is pertinent that enormous conclusions are being generated among many economists, central banks, policymakers and practitioners that one of the fundamental objectives of the microeconomic policy is to sustain high economic growth together with a low inflation rate. That is, at low rates of inflation and exchange rate the relationship between inflation/exchange rates and economic growth is positive or not significant, but at higher rates, inflation and exchange rates have a significant negative effect on economic growth. Using a multiple linear regression model, the research shows that inflation and exchange rates have a positive impact on economic growth (Figures 1 & 2). That is, high inflation/exchange rates are inimical or a pandemic to output growth.

Recommendations

From the findings of this study, the following recommendations were made:

1. There is an urgent need for effective monitoring of the inflation rate to allow for acceleration of economic growth. This is necessary for its positive effects on economic growth.
2. This study also recommends that the monetary policies aimed at exchange rate be strengthened through effective supervision and regulatory framework of the financial system by the monetary authorities. Hence, continuous monetary policies that will active the desire for macro-economic stability increases private sector credits and investments to boost economic growth in Nigeria.
3. Finally, there is a need for further management of interest rate in Nigeria, because the more interest rate management, the more the level of economic growth in Nigeria.

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