

Impact of Inflation on Gross Domestic Product Growth in Ghana

Justine G. Kankpeyeng, Ishaque Mahama and Marzuk Abubakar

gkankpeyeng@gmail.com, imahama@uds.dugh abubakarmarzuk4@gmail.com

+233547668778

+233244459631

+233541742119

Department of Economics, Faculty of Social Science and Arts, S. D. Dombo University
of Business and Integrated Development Studies, P.O Box WA64, Ghana.

Corresponding author: Justine G. Kankpeyeng, Email: gkankpeyeng@gmail.com

DOI//<http://dx.doi.org/10.4314/gjds.v18i2.6>

ABSTRACT

This paper examines the impact of inflation and other macroeconomic variables such as physical capital, government expenditure, and money supply on GDP growth in Ghana. The study obtained data from the World Development Indicators for the period 1986-2018 and employed vector autoregressive (VAR) models for the analysis. The results showed that general inflation, low inflation rates, physical capital, and money supply have positive, statistically, significant, effect on GDP growth, while, government expenditure and high inflation have negative, statistically significant, effect on GDP growth for the period studied. The study concludes that GDP grows positively at a general level of inflation and low rates of inflation but grows negatively at a high rate of inflation in Ghana. The study, therefore, recommends that government should implement monetary and fiscal policies that will help keep inflation rates low and redirect her spending to the productive sectors in the country to enhance GDP growth.

Keywords: Inflation, GDP, Vector Auto-Regressive, Ghana, Unit root, macroeconomic variable.

INTRODUCTION

In recent times, inflation has become a major concern to both developed and developing economies. Most economies are influenced by macroeconomic indicators such as output, per capita income, capital, inflation rate, investment, interest rate, national reserve, exchange rate, and technology, among others (Anidiobu et al., 2018). The linkage between macroeconomic indicators and GDP growth has been given much concentration in the past decades and a half. The

majority of the literature has concluded on a negative relationship between some macroeconomic indicators such as inflation and GDP growth rate in Ghana at all levels (Enu et al, 2013). However, Mavikela et al., (2018) examined how inflation and economic growth are related in South Africa and Ghana and concluded on a positive effect of inflation on GDP growth in Ghana at a high inflationary level. Mbulawa (2015) also concluded on the positive effect of inflation on GDP growth in Botswana.

In theory, the total demand from consumers and the total quantity produced by producers established a direct effect of inflationary rate on GDP growth rate. Thus, as aggregate demand increases, there will be pressure on the existing goods and services leading to an increase in general prices as well. This encourages producers to produce more to maximize profit, hence increase output and a rise in GDP growth. In the view of Ahiakpor and Akapare (2012), capital investment, labor force, money supply, and government expenditure, have a direct impact on GDP. However, interest rates and inflation have an indirect effect on GDP in Ghana.

Stabilizing prices and sustaining GDP growth in an economy at the same time is a main macroeconomic policy aim for developing countries in the world today (Idalu, 2015). The performance of an economy is dependent on the stability of macroeconomic indicators, like its money supply, rate of inflation and exchange rate, etc. When these variables are stable, they favor and sustain business growth. So, policymakers always desire to make them stable. In addition, when these variables remain favorable; investors are encouraged since these macroeconomic elements will not threaten their investment profit, (Arhin, et al, 2017).

Inflation is an economic canker in the history of the Ghanaian economy. From Ghana Statistical Service (GSS, 2018) report, the yearly percentage real GDP growth rate at constant market prices based on local currency for 2010 was 7.9% and closed 2018 at 6.3%. While the consumer price index (CPI) of the country as of 2010 was 8.6%, it ended 2018 at 9.4%. So, over the years, the country has danced to the music of inflationary fluctuations; the situation has not changed in present times as she continues to fight with the rapid depreciation of her currency. The problem of how to decrease inflation and stop the depreciation of the Ghana cedi (GHS) has been central among policymakers since the 1980s (Agbenorhevi, 2016).

In the view of Piana (2002) inflation occurs when the money supply is higher as compared to the number of goods and services an economy produced. So, two broad schools emerged to explain the pattern of price development; the

monetarists and structuralists. The monetarists say that inflation is caused mainly by excess aggregate demand. They emphasized demand-pull inflation, which is a monetary problem, as they explained using Fisher's Equation of Exchange ($MV = PQ$). They argued that output (Q) and velocity (V) are constant in the short term, so, as money supply (M) increases, prices must also increase. This showed a positive relation between inflation and money supply. The structuralists believe that market power is one of the causes of inflation but it is not the only factor. Some of the causes of inflation in Ghana are deficit financing, high population growth, investment in capital projects, an increase in wages, and salaries of workers among others (Alagidede et al., 2014). Low prices are rewarding as it increases the purchasing power of money for businesses and consumers in an economy to make long-run plans (Idalu 2015). Again, Idalu, (2015) said, low inflation is associated with lower real and nominal interest rates, which decreases borrowing cost and this encourages "households" to increase their demand for durable goods and investment. Economic growth is then achieved through mass production and a rise in productivity (Idalu, 2015). When inflation is low, it is good to boost output, (Hossain, et al, 2012). Whereas high inflation leads to low, demand for labor, and this decreases production and in turn low economic growth (Leijonhufvud, 1977). The growth of an economy is sensitive to every nation, and factors of production such as physical capital, labor, and land, including technological advancement, human capital (knowledge and skills of workers), and social capital as added by new growth theory are the main factors of growth (Oteng, et al., 2016).

From the review of some previous studies, it is seen that there have been some conflicting empirical results about the impact of inflation on the GDP growth rate in Ghana, as different conclusions have been reached with no clear identification of the relationship between inflation and GDP growth (Frimpong & Oteng-Abayie, 2010). For instance, studies by Mavikela, et al. (2018) concludes that inflation has a positive effect on GDP growth rate and Enu, et al (2013) concludes that inflation harms the GDP growth rate. Given this, an examination of the impact of inflation, using 1986 to 2018 annual time series data, with consideration of physical capital, money supply, and government expenditure, as control variables, on GDP growth in Ghana is imperative. The study, therefore, seeks to assess the impact of inflation on GDP growth in Ghana with control for other macroeconomic variables such as physical capital, money supply, and government expenditure. The rest of the paper is structured as follows, section two deals with the relevant literature, section three is the methodology section, results and discussions are in section four while section five is the conclusion and recommendation.

REVIEW OF RELEVANT LITERATURE

Generally, inflation occurs when there is an increase in the general price level in an economy sustained for a particular period. This can cause a low value of a country's currency (Lipsey & Chrystal, 1995). Inflation rates had been seen in their ugly numbers from 1939 to 1945. In those periods, high inflation rates were always accompanied by deflation without any rise or fall in the pattern. Hence, it depicted a direct correlation between general prices and GDP (Haslag, 1997).

Fischer, in 1993, used several macroeconomic variables to determine their effect on the economic growth of 93 countries. He used consumer price inflation as one of the macroeconomic variables and the results showed a negative significant correlation between inflation and economic growth rates.

In 2005, Hodge studied the relationship between inflation and economic growth in South Africa by applying the linear regression model. The author used annual data from 1950-2002 for a medium to long-term model and quarterly data from 1970-2003 for the short-term model. Results from the study showed a significant negative relationship between inflation and GDP growth for both models. Kelikume (2018) shed light on the non-linear effects of inflation and inflation threshold for long-term growth in Africa. The author applied the dynamic panel threshold model with panel data from 41 African countries from 1960 to 2015 which included 21 resource countries and 20 non-resource countries. This was to enable the author to see if there are any differences in the empirical linkage between inflation and long-term growth. Results from the study revealed that for the full sample of African countries, the empirical evidence showed that inflation hampered economic growth if it exceeds 11.1%, below which the impact of inflation on growth remained positive though insignificant. However, for the resource-rich and non-resource-rich countries, inflation was beneficial for growth when inflation is below 12.5% and 9.4% levels for resource-rich and non-resource-rich African countries respectively. It further realized that when inflation exceeded these threshold levels it had a negative effect on the economic growth. The author then concluded that there is enough evidence of a growing-dampening effect of excessive inflation for Africa.

Frimpong & Oteng-Abayie (2010) in estimating the threshold effect of inflation in Ghana employed the threshold regression model using data from 1960 to 2008. They used variables such as gross domestic investment, terms of trade, aggregate labor force, and money supply. Results from the study found evidence of the threshold effect of inflation on the economic growth of the Ghanaian economy.

It further indicated that inflation threshold level of 11%, inflation starts to hurt the economic growth significantly and that below the 11% the effect of inflation is likely to be mild. They then conclude that the annual target rate of 6 – 9 % of inflation by the Bank of Ghana and the Government was in the right direction.

In 2012, Ahiakpor and Akapare looked at how inflation and GDP growth relate in the Ghanaian economy for the period 1986Q1 to 2012Q4. They employed a co-integration and error correction model. Their results showed that capital investment, government expenditure, labor force, and money supply have a positive impact on Gross Domestic Product (GDP). However, inflation and interest rate have a decreasing impact on economic growth in Ghana.

Enu, et al, (2013) applied correlation analysis, a simple linear regression model, and employed a scatter plot, using ordinary least squares in exploring how GDP and inflation relate in Ghana, from 1980 to 2012. They concluded that the relationship between output growth and general prices is linear and negatively related in Ghana. For Mavikela, et, al, (2018) inflation has been directly linked with growth at high prices in Ghana from 2001 to 2016 by the use of quarterly empirical data. Their study aimed at investigating the relationship between inflation and economic growth for South Africa and Ghana. They applied the quantile regression method and recommended that inflation targeting frameworks should be adopted by central banks in both countries.

In the view of Arhin et al, (2017) unstable reward of capital influences output in Ghana for the period 1988 to 2014. Their study indicated that there is a negative relationship between interest rate and economic growth in Ghana. They applied the ordinary least squares multiple regression techniques in the form of a log-log model. Their study concluded that the Bank of Ghana should formulate other monetary policies, rules, and regulations in the financial sector to significantly increase aggregate savings to reduce interest for sustainable and increase economic growth of Ghana.

According to Anidiobu, et al, (2018) inflation had a positive and non-significant effect on economic growth. They researched the analysis of inflation and its effect on economic growth in Nigeria, covering the period of 1986 to 2015, Ex-post research design, was employed in their study, with Augmented Dickey-Fuller (ADF), descriptive statistics, and ordinary least square. Real gross domestic product was used as a dependent variable while, inflation rate, interest rate, and exchange rate as independent variables. Agyapong, et al, (2016) tried to come

out with macroeconomic variables responsible for positive influence on Ghana's GDP by the approach of Johansen cointegration. They used 1980: Q1 to 2013: Q4, all the variables for their study indicated no unit root problem at first differential. Inflation, exchange rate, unemployment, and other macroeconomic determinants cointegrated with real output. They recommended that the government together with monetary authorities formulate and implement monetary and fiscal policies aimed at making major factors influencing the entire economy stable.

Andinuur (2013) investigated to know whether, there is a link between foreign direct investment, GDP, and inflation. Annual time-series data from 1980 – 2011 was used. In addition, models employed were cointegration as used by Pesaran, et al, (2001) including Toda & Yomomanto (1995) procedure of Granger causality. The author examined empirically, the correlation of the indicators and concluded that inflation was inversely related to GDP. The author then recommended that, for Ghana to fight against inflation and win, fiscal and monetary policies should be formulated towards addressing the real economic factors that hinder GDP growth in Ghana. Antwi, et al, (2013) studied the impact of macroeconomic factors on economic growth in Ghana. They used data spanning from 1980 to 2010, and they applied the Johansen approach to co-integration and Augmented Dickey-Fuller (ADF) test. The study found a co-integration relationship between economic growth and macroeconomic factors including inflation.

Hasanov (2011) studied how a possible threshold can influence the GDP growth of the Azerbaijani economy from 2000 to 2009. The study revealed a non-linear relationship between GDP growth and inflation in Azerbaijani economy and concluded that at 13% and above, inflation affects GDP in Azerbaijan.

In the work of Majumder (2016), inflation has a statistically significant long-run positive effect on GDP in Bangladesh. The author employed the Augmented Dickey-Fuller (ADF) test to test for a root or stationary. Granger causality and error correction model was also used to investigate the relationship between economic growth and inflation in Bangladesh from 1975 to 2013. The study used Inflation, money supply, and remittance as variables that explained economic growth of GDP in Bangladesh. Akinsola & Odhiambo (2017) examined inflation and economic growth, a review of the international literature. Their study found that inflation influences economic growth differently from country to country over time, and they relate inversely. In addition, overwhelming support is in favor of a negative relationship between inflation and GDP growth, especially in developed economies.

Keynes (1936) propounded a theory in a publication he entitled "The General Theory of Employment, Interest, and Money". To Keynes, full productivity in any given economy is possible when policy enactors make decisions to encourage investment in that economy. He said that inflation has a positive influence on GDP. He explained this relationship using aggregate demand and supply. Thus, the total demand from consumers and the total quantity produced by producers and put in the market established a direct effect of inflationary rate on GDP growth rate. So, as aggregate demand increases, there will be pressure on the existing goods and services leading to an increase in general prices as well in the short run. This encourages producers to produce more to maximize profit, hence increase output and a rise in GDP growth. When government embarks on an expansionary fiscal policy (increase expenditure and cut in tax rate), people demand increase as the policy gives them more money to spend. In the short run, the demand pressure is mounted on the existing goods and services. Hence, push the general price level to increase which results in inflation. Meaning Money supply > Economic growth rate = inflation, interest rate falls and the exchange rate and the GDP rise. This kind of inflation is normally referred to as Demand-Pull Inflation. Theory of quantity supply of money established that the money supply is the major factor that causes inflation. Therefore, a change in the amount of money supplied directly changes the level of price. Meaning, and an equation of exchange by Fishers is normally used to show how money supply causes an increase in prices. Below lies the equation; $MV = PQ$, where: M= Money supply in an economy, V= Velocity of money in circulation, Q=Volume of transactions, P=General price level. Quantity (Q) and velocity are assumed to be constant by the monetarists. So, a change in money supply (M) leads to an increase in the general price level (P), which is inflation, while GDP growth remains unchanged but a decrease in the interest rate and a rise in the exchange rate. Inflation harms capital accumulation, investment, and exports, in every economy. This reduces GDP growth in the long – run.

Neo-classical argued that the main factors that influence output growth are; capital, labor, and technology available in an economy. They established a model that consists of either technological differences or scientific innovation taking the place of investment as major variables explaining economic growth in the long-term. Also, they said, the technological difference is exogenously determined which is independent on its own from other factors like inflation. In the new growth theory, output growth is created by determinants in the supply cycle. This theory however differs from the neo-classical in the sense that, the technological difference is endogenous against the exogenous determination of technological progress

by neoclassical. Therefore, endogenous growth theory established that the GDP growth rate is influenced by the rate of return on both physical capital and human capital. Again, there is a steady marginal product of capital in the new growth theory. While Neoclassical has it that capital is declining on profit.

From the literature, it can be seen that several studies have been done on the impact of inflation on GDP growth with different conclusions reached, a clear indication that there is no clear conclusion on the effect of inflation on economic growth and that more research needs to be done in this direction. Hence this study sought to study the effect of inflation and other macroeconomic variables on GDP growth in Ghana using data from 1986 to 2018.

METHODOLOGY

The study assessed the effect of inflation on GDP in Ghana. A quantitative research design was applied to determine the effect of inflation on GDP growth using government expenditure, physical capital, and money supply as control variables. Time series data spanning from 1986 to 2018 was collected from the WDI, online database. The main variables for the study are GDP, inflation, physical capital, government expenditure, and money supply.

Model Specification

The study answers the following null hypothesis.

Ho: The performance of inflation, physical capital, government expenditure, and money supply do not affect GDP.

Ho: The level of inflation does not influence GDP growth.

Descriptive statistics were then applied to determine the performance of the variables by comparing their respective mean, standard deviation, and variance. Also, Vector Autoregressive (VAR) model as specified by Runkle (2002) and cited in Fosu (2015) was used to achieve the study's second objective. The work, therefore, used Fosu (2015) extended form of an unrestricted VAR model specified by Runkle (2002) and modified it to fit the study objective. For the choice of appropriate lags for the study, lag four is chosen from lag-order selection statistics (pre-estimation) because all the criteria point to its suitability for the VAR model. The Vector Autoregressive Models for the variables under consideration are as follows:

$$GDP_{t1} = \alpha_1 + \beta_{11}INF_{t-4} + \beta_{12}GDP_{t-4} + \beta_{13}GE_{t-4} + \beta_{14}KC_{t-4} + \beta_{15}MS_{t-4} + \delta_1HF + V_{1t} \quad (1)$$

$$GDP_{t2} = \alpha_2 + \beta_{21}INF_{t-4} + \beta_{22}GDP_{t-4} + \beta_{23}GE_{t-4} + \beta_{24}KC_{t-4} + \beta_{25}MS_{t-4} + \delta_2LF + V_{2t} \quad (2)$$

GDP_{ti} = The Gross Domestic Product variable at the time t_i . Yearly growth rates in the Gross Domestic Product are used in the analysis of this work.

INF_{t-1} = The inflation variable at time t-1. Yearly inflation rates are used for the inflation variable in the analysis of this work

K_{t-1} = The physical capital at time t-1. Yearly gross capital formation (% of GDP) rates are used for physical capital variable in the analysis of this work.

GE_{t-1} = The government expenditure at time t-1. Yearly general government expenditure (% of GDP) rates are used for government expenditure variable in the analysis of this work.

MS_{t-1} = The money supply at time t-1. Yearly broad money to total reserves ratio rates are used for money supply variable in the analysis of this work.

HC_{t-1} = The human capital at time t-1. Yearly school enrollment, primary (% gross) rates are used for human capital variable in the analysis of this work.

L_{t-1} = The labour at time t-1. Yearly labour force participation rates, total (% of total population, age 15+) are used for labour variable in the analysis of this work.

T_{t-1} = The technology at time t-1. Yearly mobile cellular subscription rates are used for technology variable in the analysis of this work.

LF = A dummy variable for a low inflation rate. It takes the value of one when inflation is from 1 to 30, both moderate and low inflation (Aminu & Anono, 2012) and zeroes otherwise.

HF = A dummy variable for the high inflation rate. It takes the value of one when inflation is from 30 to 50 (Aminu & Anono, 2012) and zeroes otherwise.

α_i = the constant term in the various equations.

β_{ii} = the parameter term for the various variables under consideration in the various equations for the first lag.

Variables justification

Physical capital is chosen because it is one of the main indicators of growth in theory. Also, inflation is included because its relation with GDP is the main focus of the study. While, money supply and government expenditure are added due to their validity in empirical literature research on GDP growth and for the fact that the state and local policy debate often revolves around them.

RESULTS AND DISCUSSION

The vector autoregressive model was used to analyze the unit root tests, descriptive statistics, and empirical effect of the study variables on economic growth.

Test of Unit Root Results

To establish the stationarity properties of the data, the unit root test was conducted on the variables under study while the Augmented Dickey-Fuller test was employed on each of the time series variables. The results are presented in Tables 1, 2, and 3.

Table 1: Augmented Dickey-Fuller test for unit root with No constant and No Trend

Variable	Test statistics	Lag differences	Coefficient of Test statistics	Test critical values		
				1%	5%	10%
GDP	z(t)	(0)	-1.080	-2.649	-1.950	-1.603
KC	z(t)	(0)	0.000	-2.649	-1.950	-1.603
INF	z(t)	(1)	-1.637*	-2.650	-1.950	-1.602
GE	z(t)	(11)	-1.610*	-2.660	-1.950	-1.600
MS	z(t)	(0)	-0.623	-2.649	-1.950	-1.603

* Indicate 10% significant level.

Source: WDI 2020

It is seen from Table 1 that, at lag differences (1) and (11) with no constant and no trend, the variables; inflation (INF) and government expenditure (GE) are free of a unit root problem. Since the coefficients of their test statistics are less than the test critical values at 10% for both INF and GE. Therefore, they are statistically significant at 10%, meaning they are stationary, and the null hypothesis of no stationarity is rejected. However, Gross domestic product (GDP) and physical capital (KC), and money supply (MS) test statistics coefficients are greater than all the significant levels. Hence, have a problem with the unit root of stationarity and is non-stationary when there is no constant and no trend in the regression.

Table 2: Augmented Dickey-Fuller test for unit root with constant and no Trend

Variable	Test statistics	Lag differences	Coefficient of Test statistics	Test critical values		
				1%	5%	10%
GDP	z(t)	(0)	-3.349**	-3.702	-2.980	-2.622
INF	z(t)	(0)	-2.907*	-3.702	-2.980	-2.622
KC	z(t)	(1)	-2.755*	-3.709	-2.983	-2.623
GE	z(t)	(0)	-3.371**	-3.702	-2.980	-2.622
MS	z(t)	(0)	-3.312**	-3.702	-2.980	-2.622

** and * indicate 1%, 5% & 10% significant levels respectively

Source: WDI, 2020

When constant was included with no trend, INF and KC became significant at 10% at the lag difference (0) and (1) respectively with GDP, MS, and GE being significant at 5%, at the lag difference (0). Hence, they have no unit root problem, implying they are all stationary. Moreover, the null hypothesis is rejected. Thus, all the variables have no unit root problem when there is a constant without trend.

Table 3: Augmented Dickey-Fuller test for unit root with Constant and Trend

Variable	Test statistics	Lag differences	Coefficient of Test statistics	Test critical values		
				1%	5%	10%
GDP	z(t)	(0)	-3.625**	-4.316	-3.572	-3.223
INF	z(t)	(0)	-3.981**	-4.316	-3.572	-3.223
KC	z(t)	(15)	.	-4.380	-3.600	-3.240
GE	z(t)	(0)	-3.504*	-4.316	-3.572	-3.223
MS	Z(t)	(0)	-3.242*	-4.316	-3.572	-3.223

** And * indicate 5% & 10% significant levels respectively

Source: WDI, 2020

Now, when constant and trend were included, GDP and INF became significant at 5%, whilst money supply and GE became significant at 10% showing no problem of unit root, meaning they are all stationary and the null hypothesis (Ho) of non-stationarity is rejected. However, physical capital is non-stationary when there is a constant and trend.

Table 4: Correlation matrix

	INF	GDP	KC	GE	MS
INF	1.000				
GDP	-0.396	1.000			
KC	-0.127	-0.317	1.000		
GE	0.158	0.068	0.225	1.000	
MS	-0.126	-0.139	0.139	0.139	1.000

Source: Computed by authors from data obtained from WDI 2020

From table 4, the correlation coefficients of all the variables are less than 0.5, hence, they are weakly correlated.

Descriptive Statistics

Table 5: Performance of GDP growth rate, Inflation rate, Physical capital rate, government expenditure, and Money supply in Ghana

Table 5: Descriptive statistics

	Old Currency			New Currency		
	Mean	Standard deviation	Variance	Mean	Standard Deviation	Variance
Inflation	25.50	12.71	161.47	13.08	3.95	15.58
GDP	4.70	0.83	0.69	6.63	3.37	11.33
KC	19.87	5.96	35.49	20.99	6.49	42.12
GE	11.22	1.74	3.04	9.69	1.86	3.47
MS	2.48	0.96	0.93	2.43	0.55	0.30

Source: Computed by authors from data obtained from WDI 2020

Table 5 displays the descriptive statistics of the variables in the study. From the table, it can be seen that there is a decline in the mean inflation rate from the old currency period to the new currency period. The mean inflation rate falls from 25.50 in the old currency period to 13.08 in the new currency period. This is an indication of the positive performance of the new currency since the mean inflationary rate is low. There is also a decrease in the volatility of inflation as the standard deviation declined from 12.71 to 3.95 for the old currency and new currency periods respectively.

It can also be seen that the mean GDP growth rate increased from 4.70 old currency period to 6.63 new currency periods. This indicates good performance in the growth rate by the new currency than the old currency. Its variation has also increased from 0.83 to 3.37 in the old and new currency periods respectively.

Additionally, the mean physical capital rate increased from 19.87 in the old currency period to 20.99 in the new currency period. This, therefore, confirmed the rise in mean GDP of the new currency, meaning the value of the GDP has been increasing over the years. Also, its variation is from 35.49 to 42.12 in the periods respectively.

Furthermore, the mean of government expenditure declined from 11.22 in the old currency to 9.69 in the new currency period. This implies that the average contribution of government expenditure to production has decreased with the new currency. Nevertheless, its volatility spread from 3.04 to 3.47 in the old and new currencies period respectively.

Finally, the mean of money supply declined from 2.48 in the old currency to 2.43 in the new currency. This implies that the average contribution of the money supply to production has decreased with the new currency. Nevertheless, its volatility spread from 0.93 to 0.30 in the old and new currencies period respectively.

Table 6: Results of Lag selection

Lag	LL	LR	P	FPE	AIC	HQIC	SBIC
0	-355.30			42567.40	24.83	24.92	25.08*
1	-323.29	64.01	0.00	27058.90	24.36	24.81	25.78
2	-301.96	42.66	0.02	41272.80	24.62	25.43	27.21
3	-256.79	90.35	0.00	16789.90	23.23	24.41	27.00
4	-199.77	114.03*	0.00	6316.71*	21.02*	22.57*	25.97

Source: Computed by authors from data obtained from WDI 2020

From table 6 above, it is clear that four of the criteria point out to lag four. Therefore, the study uses lag four for the VAR model.

Vector Autoregressive Results

This section consists of a discussion of the results obtained from running a vector autoregressive based on the model specified above. The estimates of the specified equations are presented in tables 7 and 8 and discussed.

Table 7: VAR results with high inflation dummy

GDP Growth	Coefficient	Standard Error	Z value	P>/Z/	95% C I
INF_{t-4}	0.181	0.070	2.570	0.010	0.043, 0.319
GDP_{t-4}	0.190	0.274	0.690	0.488	-0.347, 0.728
KC_{t-4}	0.559	0.181	3.090	0.002	-0.204, 0.914
GE_{t-4}	-0.725	0.241	-3.010	0.003	-1.200, -0.254
MS_{t-4}	0.358	0.458	0.780	0.434	-0.539, 1.255
HF_{t-4}	-4.457	1.608	-2.770	0.006	-7.609, -1.304
Constant	18.117	3.901	4.640	0.000	10.471, 25.762

R-square=0.888

p>chi2=0.000

Source: Computed by authors from data obtained from WDI 2020

Table 7, presents the results for the growth equation. The R^2 of 0.888 means that the independent variables in the model explained 89% of GDP growth. It also means that only 11% of the variation is explained by other variables which were not included in this study. The standard errors (S.E) show the variation of the variables.

Also, the high inflation rate dummy (HF) which carries a negative coefficient signifies the negative effect of inflation on GDP growth rate at high levels of inflation, and it is statistically significant at 1% (. This means that a 1% increase in inflation will decrease GDP growth by 4.46%. This result confirms the

results of Enu, et al, (2013), Ahiakpor & Akapare (2012), and Andinuur (2013). But contradicts the findings of Mavikela, et al, (2018).

Also, the study has established a positive statistically significant effect of the general level of inflation at the 5% level of significance (P-value= 0.010). This means that a 1% increase in the rate of inflation generally, will increase GDP growth by 0.181 keeping the other variables constant. This result is in tandem with the findings of Mavikela, et al, (2018), but contradicts that of Enu, et al, (2013), Ahiakpor & Akapare (2012), and Andinuur (2013).

The result also indicates a negative relationship between government expenditure and GDP growth. Meaning government expenditure harms GDP growth and is statistically significant at a 1% level (P-value= 0.003). This means a percentage increase in government expenditure will lead to a 0.725 decrease in GDP growth. This contradicts the findings of Ahiakpor and Akapare (2012)

The study further established a positive statistical significance of physical capital at a 1% level (P-value= 0.002). Meaning, physical capital has a positive effect on GDP growth thus, a 1% increase in the rate of physical capital will increase GDP growth by 0.559 all other things being equal. This supports the findings of Danguah (2006), Aryeetey and Fosu (2005), Oteng-Abayie et al (2006).

From the VAR with high inflation dummy analysis at lag four, it is seen that physical capital, general inflation rate, high inflation, and government expenditure affect the GDP growth rate in Ghana. Though GDP at lag four (P-value= 0.488) and money supply (P-value=0.434) have a positive effect on GDP growth, they are statistically insignificant.

Table 8: VAR results with low inflation dummy

GDP Growth	Coefficient	Standard Error	Z value	P>/Z/	95% C I
INF_{t-4}	0.102	0.036	2.790	0.005	0.030, 0.173
GDP_{t-4}	0.653	0.268	2.440	0.015	0.128, 1.178
KC_{t-4}	0.695	0.158	4.400	0.000	0.385, 1.004
GE_{t-4}	-1.056	0.221	-4.770	0.000	-1.490, -0.622
MS_{t-4}	0.835	0.466	1.970	0.073	-0.077, 1.748
LF_{t-4}	3.296	1.091	3.020	0.003	1.158, 5.433
Constant	-12.434	5.007	-2.480	0.013	-22.247, -2.620

R-square=0.924 $p > \chi^2 = 0.000$

Source: Computed by authors from data obtained from WDI 2020

Table 8 shows the results from the equation. The R^2 of 0.924 means that the independent variables in the model explained 92% of GDP growth. It also means that only 8% of the variation is explained by other variables which were not included in this study. The standard errors (S.E) show the volatility of the variables.

From table 8, the low inflation dummy (LF) carries a positive coefficient signifying a direct effect of low inflation rate on the GDP growth rate. And it is statistically significant at 1% significance level (P-value = 0.003). This means that when the inflation rate is low, a 1% increase in inflation will increase GDP growth by 3.296. Also, the general level of inflation has a positive effect on GDP growth and is statistically significant at a 1% significance level (P-value = 0.005). Meaning, 1% increase in the general rate of inflation will increase GDP growth by 0.102, and confirm the positive effect of general inflation on GDP in table 7. This result supports the findings of Mavikela, et al, (2018). However, it contradicts the findings of Enu, et al, (2013), Ahiakpor & Akapare (2012), and Andinuur (2013).

The result further shows that government expenditure is statistically significant at 1% significant level and harms GDP growth. Meaning, 1% decrease in government expenditure increase GDP by 1.056. This result points out that, at a low inflationary

rate, the government does not spend on the productive sector of the economy, hence the negative effect on GDP. Additionally, the outcome established a positive statistically significant effect of physical capital at the 1% significance level (P-value = 0.000). Meaning, physical capital has a positive effect on GDP growth thus, a 1% increase in the rate of physical capital will increase GDP growth by 0.695 all other things being equal. This supports the findings of Danguah (2006), Aryeetey and Fosu (2005), Oteng-Abayie et al (2006).

Money supply has a positive effect on GDP growth and is statistically significant at 10% significance level. Thus, a 1% increase in the supply of money at a low inflation rate will increase GDP growth by 0.835, and support the findings of Ahiakpor & Akapare (2012) and the monetarist theory of inflation.

The study further reveals that the past four years GDP growth has had a positive effect on the current GDP growth. This is statistically significant at 5% significance level. Meaning a 1% increase in the last four years' GDP growth will increase current GDP growth by 0.653.

CONCLUSION AND RECOMMENDATION

The study explored the effect of inflation on the GDP growth rate in Ghana and considered the contributions of physical capital, government expenditure, and money supply from 1986 to 2018. The study found a positive statistically significant effect of general level inflation, low rate of inflation, and physical capital on GDP, whilst government expenditure and high inflation rate have a negative statistically significant effect on GDP growth for the period studied. However, money supply does not affect GDP growth when inflation rates are high since it is statistically insignificant. Also, at a low inflationary rate, the study found a positive statistically significant effect of general inflation, physical capital, money supply, and low inflation on GDP growth. But a negative statistically significant effect of government expenditure on GDP growth. The study, therefore, recommends that government should redirect her spending in the productive sector and implement monetary and fiscal policies that will help keep inflation rates low in the country to enhance economic growth.

REFERENCES

- Agbenorhevi, A. (2016). Analysing the Effects of Macroeconomic variables on inflation in Ghana using distribution lag model. University of Ghana, <http://ugspace.ug.edu.gh>.
- Agyapong, D., Adam, A. M. & Asiamah, M. (2016). Macroeconomic behavior and Economic Growth in Ghana. *Spoudai - Journal of Economics and Business*, University of Piraeus, 66(4), 26 – 42. — —
- Ahiakpor, F., & Akapare, I. A. (2012). Short-run and Long-run inflation and Economic Growth, Nexus in Ghana. *Ghana Journal of Development Studies*, 11(2).
- Ahmed M. E. (2012). Are the FDI inflow spillover effect on Malaysia's Economic growth input Driven? *Economic modelling* 29(4), 1498-1504-2012.
- Akinsola, F. A., & Odhiambo, N. M. (2017). The Impact of Financial Liberalization on Economic Growth in Sub-Saharan Africa, *Cogent Economics and Finance*, 5(1)
- Alagidede, P., Coleman, S. & Adu, G. (2014). A Regional Analysis of Inflation Dynamics in Ghana: Persistence, Causes and Policy Implications, *London School of Economics and Political Science*.
- Aminu, U., & Anono, Z. A. (2012). Effect of Inflation on the Growth and Development of the Nigerian Economy (An Empirical Analysis). *International Journal of Business and Social Science*, 3(10).
- Andinuur, J. (2013). Inflation, Foreign Direct Investment, and Economic growth in Ghana. University of Ghana, <http://ugspace.ug.edu.gh>.
- Anidiobu, G. A., Okolie, P.I.P., & Oleka, D.C. (2018). Analysis of inflation and its effects Economic growth in Ghana. *IOSR Journal of Economics and Finance*, 9, 28-36.
- Antwi S., Mills A. E. F. E., & Zhao X. (2013). Impact of Macroeconomic factors on Economic Growth in Ghana: A co-integration analysis. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 3(1), 35-45.

- Arhin, E., Adetor, W., Lartey, F.O., Allotey, P.A., Borkloe F.B., Amponsa, A.M.P.Q, Fiadzoe, M, Baako, V.E.A, Fradjo, A.K & Basit, A.A, (2017). The effect of interest rate fluctuation On the economic growth of Ghana. Kwame Nkrumah University of Science and Technology, <https://www.researchgate.net/publication/315715526>.
- Aryeetey, E., & Fosu, A.K. (2005), "Economic Growth in Ghana: 1960-2000," AERC. Growth Project Workshop, Cambridge
- Carone G., Denis C., Mc Morrow K. Mourre G. & Roger W. (2006). Long-term labour Productivity and GDP projections for EU25 member state: a production function Framework. SSRN 930421, 2006
- Danquah, M. (2006), "Sources of Growth in Ghana," Abstract Retrieved April 14, 2011, from <http://unpan1.un.org/intradocgroups/public/document/IDEP/UNPAN023359pdf>
- Enu, P., Atta-Obeng, P., & Hagan, E. (2013). The relationship between GDP growths rates And Inflationary Rate in Ghana: An Elementary Statistical Approach. Academic International Research, 4(5).
- Fischer, M. (1993). The Role of Macroeconomic Factors in Growth, National Bureau of Economic Research, (NBER), working paper, 4565.
- Fosu, N.K, (2015). Inflation targeting: The Ghanaian Experience. University of Ghana, <http://ugspace.ug.edu.gh>.
- Frimpong, J. M., & Oteng-Abayie, E. F. (2008) 'Bivariate Causality Analysis between FDI Inflows And Economic Growth in Ghana', International Research Journal of Finance and Economics, Issue 15.
- Frimpong, J. M., & Oteng-Abayie, E. F. (2010). When is Inflation harmful? Estimating Threshold Effect for Ghana. American Journal of Economics and Business Administration, 2 (3), 232-239.
- Hasanov, F. (2011). Relationship between Economic Growth in Azerbaijani Economy: Is there any threshold effect? Asian Journal of Business and Management Sciences,1(1),1-11

- Haslag, H. J. (1997). Output, Growth, Welfare, and Inflation. A survey. <https://www.researchgate.net/publication/5029951>
- Hodge, D. (2005) Inflation and Growth in South Africa, Cambridge Journal of Economics, 30, 163-180.
- Hossain, E., Ghosh, B. C., & Islam, K. (2012). Inflation and Economic Growth in Bangladesh. Educational Research Multimedia and Publications.
- Idalu, R. E. (2015). Impact of Inflation on Economic Growth: A case study of Nigeria (1970-2013). Eastern Mediterranean University Press.
- Kelikume, K. (2018). An Estimation of Inflation Threshold for Africa, International Journal of Mangement, Economic and Social Science, Jersey City, N.J., 7(4), 283-300.
- Keynes, J. M. (1936). The General Theory of Employment Interest and Money, London, Macmillan
- Leijonhufvud, A. (1977). Costs and consequences of inflation. Palgrave Macmillan, London.
- Lipsey, R. G., & Chrystal, K. A. (1995). An Introduction to Positive Economics, Oxford University Press
- Majumder, S. C. (2016). Inflation and its impact on Economic Growth of Bangladesh. America Journal of Marketing Research, 2(1).
- Mavikela, N., Mhaka S., & Phiri A. (2018). The inflation – growth relationship in SSA Inflation targeting countries. MPRA Paper No.82141, October
- Mbulawa, S. (2015). Effect of macroeconomic variables on economic growth in Botswana. Journal of Economics and Sustainable Development, 6(4), 68-78.
- Oteng E., David B. & Emmanuel K.A. (2016). The effect of real Exchange rate on Economic Growth in Ghana. International Journal of current Research. 8(12), 4444 - 4445.
- Pesarn, M.H, Shin,Y., & Smith,R.J. (2001). Bounds testing approaches to the analysis of Level relationships. Journal of Applied Econometrics, 16, 289-326.
- Piana, V. (2002). Basic Economics for International Students Book 1 Microeconomics. USA Managerial Economics, 4th edition

Samuel A., Ebenezer F. E. A. M. & Xicang Z. (2013). Impact of macroeconomic factors on Academic Economic growth in Ghana. A Co-integration Analysis. *International Journal of Research in Accounting, Finance and Management sciences*, 3(1), 35-45.

Shim, J. K. & Siegel, J. G. (1995). *Dictionary of Economics*. USA: John Wiley & Sons, Inc.

Toda, H. Y. & Yamamoto, T. (1995). Statistical inference in vector auto-regressions with Possibly integrated processes. *Journal of Econometrics*, 66, 225-250.

Word Development Indicators (16/12/2020)