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FACTORS INFLUENCING INFLATION: THE ROLE OF THE EXCHANGE RATE REGIME USING MULTIPLE REGRESSION ANALYSIS

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Abstract: **Stability of exchange rate is very important in inflation management. A stable rate is expected to reduce inflation pressure, restricting money supply growth and inducing higher money demand and reduced velocity of money. To explore the factors influencing inflators and the role of the exchange rate regimes as well as the interest rate and growth rate and four (4) other factors for 52 African countries was examined. Data was gathered from dataset from the World Bank, Yahoo Finance and IMF from a period of 2008 to 2015 using Stata.For this purpose, Regression analysis, specifically multiple regression model was used to estimate the influence of the factors. The results suggested that increment in economic growth will increase inflation which is rather unfortunate. In addition, we also examine and discuss causal relationships between the remaining variables.**

Keywords: **inflation, interest rate, exchange rate, export rate, import rate, government budget, trade, growth rate (gdp).**

1. INTRODUCTION

Most less developed countries, especially in African faces numerous interrelated economic problems such as currency weakening related to the currencies of the western industrialized countries, high inflation, and low growth. Whilst most less developed countries have fixed exchange rate with periodic devaluation to International Monetary Fund loans, few less develop countries like Ghana and Nigeria are adopting structural adjustment policies shifted to flexible exchange rate with continuous currency depreciation. This paper seeks to access the relationship between inflation and growth and other factors that influences inflation and the role of the exchange regime. This paper will conducts empirical investigation using the Ordinary Least Square under Multiple Regression model.

The evolution of exchange rate regimes in sub-Saharan Africa exhibits significant transitions that have recently been characterized by a move away from independent floats. During the mid-1990s to the mid-2000s, exchange rate regimes tended to be "bipolar"—that is, sub-Saharan African countries were moving to either a peg or to a float, thereby "hollowing out" the group of intermediate exchange rate regimes. During 1995–2008, about 45 and 35 percent of the countries [1] were classified as pegs or floats, respectively, with intermediates accounting for about 20 percent.

The choice of exchange rate regime, particularly in developing and emerging economies, has been assessed frequently. In the early 1990s, several economies that were in transition from controlled to market economies, including those in Asia, In addition, scepticism about the credibility of intermediate exchange rate regime led to widely accepted 'bipolar view' or 'corner solution', i.e., a country should either adopt hard pegs (monetary union or currency boards) or free floats. But, hard peg solution became out of favour with the collapse of Argentina's currency board resulting in Argentinean crisis of 2002[7]. Accordingly, majority of the emerging and developing countries have gone for more flexible exchange rate regimes. However, this regime shift has not witnessed a pure float. Rather, adopted a 'constrained floating' since monetary authorities in these countries may be affected by a 'fear of float'. [8] Observe that official or de jure exchange

rate regime as reported by countries' monetary authorities may be different from the actual or de facto exchange rate regime based on the actual behaviour of the exchange rates. Most of the countries announcing a floating regime have an underlying 'fear of floating' and hence, may intervene regularly on the foreign exchange market resulting in a de facto fixed regime. This preference for exchange rate stability is, particularly, prevalent in developing and emerging economies for which sharp appreciation or depreciation of the currencies is more harmful as they do not have the institutional requirements for undertaking effective monetary policy under purely floating exchange rates.

Given the de facto stability of India's exchange rate regime, this paper tries to examine the hypothesis that whether a stable exchange rate regime leads to lower inflation. While a few earlier studies such as [3] have examined the consequences of real exchange rate targeting for inflation in terms of exchange rate `pass through' into domestic inflation, studies such as [3] and [6] have dealt with the implication of India's de facto pegged regime for monetary policy independence

2. LITERATURE REVIEW

In "Revisiting the Relationship between Inflation and Growth, A Note on the Role of Exchange Rate Regimes" by [2], stated that for both industrialized and developing countries a key policy objective is to sustain high economic growth alongside low inflation, the nature of the relationship between inflation and growth should be known. Traditionally, the consensus view was that inflation lagged changes in growth, with theory postulating a positive relationship between the two whereby as growth increased, so did inflation (a prediction also postulated by the standard aggregate supply — aggregate demand framework).

However, in the 1970s[9], the emergence of stagflation, the simultaneous presence of low or negative output growth and high inflation, highlighted the inadequacy of the widely held view, and the validity of the positive relationship between inflation and growth began to be questioned. In the 1990s, several theoretical models emerged predicting a negative relationship [4]; [5]; However, in the 1970s[9], the emergence of stagflation, the simultaneous presence of low or negative output growth and high inflation, highlighted the inadequacy of the widely held view, and the validity of the positive relationship between inflation and growth began to be questioned. In the 1990s, several theoretical models emerged predicting a negative relationship

[2] Used data for 125 industrialized and developing countries over the period 1980-2004, and exploited recent developments in the classification of exchange rate regimes that allows to compare the costs of inflation on economic growth under fixed, intermediate and flexible rates according to both de jure and de facto classification schemes. And they used Balassa-Samuelson model. In their conclusion, costs are higher for those developing countries that have a floating currency vis-à-vis those with a fixed or intermediate exchange rate regime arrangement. Based exclusively on the moderating role of the exchange rate regime with respect to the costs of inflation for economic growth, fixed or intermediate exchange rate arrangements should be the preferred policy option for developing countries.

[10] in their paper investigated the relationship between exchange rate and inflation Targeting regime. Using a multivariate GARCH model under BEKK specification. They investigate if exchange rate affect the performance of inflation target and compared between Asian and European economies. The comparison is made in terms of changes in economic structure and the disinflation cost. The results show significant correlation between exchange rate movements and inflation and growth movements in both sub-periods. Inflation Target also has significant impacts on the movements of inflation, growth and exchange rate. Inflation target leads to higher volatility in exchange rate movement in majority economies

In[11], examined causal relationships between inflation rate, output growth rate, inflation uncertainty, and output uncertainty for ten Central and Eastern European transition countries. For this purpose, they estimated a bivariate GARCH model that includes output growth and inflation rates for each country. Their results suggest that inflation rate induces uncertainty about both inflation rate and output growth rate, which is detrimental to real economic activity. At the same time, they also found that output growth rate reduces macroeconomic uncertainty in some countries. Addition they also examine the causal relationships between the other variables.

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2.1 EXCHANGE RATE REGIMES:

African countries have been on the downside of economic problems with fluctuation in inflation, exchange rate, interest rate and growth. This sturdy seek to establish the factors that influence inflation with relation to growth, inflation, interest rate, exchange rate. Drawing from recent advances in the classification of exchange rate regimes.

Countries like China can have the luxury to switch from fixed exchange rate regime to manage floating one. China's exchange rate regime reform in July 2005[6], which switches from a fixed exchange rate regime to a managed floating one, brought forward structural changes to asset return dynamics. The results suggest that the exchange rate regime switch exerted the most significant impact on house and land returns at the national level, in terms of both returns and their volatilities.

Less develop countries do not have the luxury to switch exchange rate regimes at any time it would wish to. Less developed countries continuous to have fixed exchange rate with periodic devaluation to obtain International Monetary Fund (IMF) loans, a few less developed countries like Ghana and Nigeria adopting structural adjustment policies have shifted to flexible exchange rate regimes with continuous currency depreciation. Since 1983 continuous Cedi weakening, high price, inflation and interest rate and wage rigidities imposed by the government have existed in an environment of tight and fiscal monetary policies in Ghana.

3. MEHODOLOGY

Data from 52 African countries was examine for this study using STATA to examine the relationships between the variables. Data was gathered from dataset from the World Bank, Yahoo Finance and IMF from a period of 2008 to 2015.

Multiple regression has become increasingly popular in both basic and applied research journals [13] It has been noted in the research that multiple regression (MR) is currently a major form of data analysis [14]Multiple regression examines the relationship between a single outcome measure and several predictor or independent variables [14]. The correct use of the multiple regression model requires that several critical assumptions be satisfied in order to apply the model and establish validity [15].

Data from 52 African countries was examine for this study using STATA to examine the relationships between the variables.

Variables examined included inflation (Inf), Gdp (growth rate), trade (Td), interest rate (It), government budget (Gb), export rate (Et) and import rate (Ir).

The variable of the model is inflation(Inf)=*f*(Economic Growth (Gdp)+trade(Td)+Interest Rate(It)+Export Rate(Et)+Government Budget(Gb)+Import Rate(Ir)).

The mathematical equation of the model for the model;

With single regression model involving Gdp and inflation we the mathematical model below

• $Inf = \beta_0 + \beta_1 Gdp + \mu$

With this model Target inflation which is represented by Inf is the dependent variable, β_0 is the constant of the model and β_1 stands for Unemployment (Ump) on Inflation target when all other independent variable are held constant .The other variable in the multiple regression model $\beta_2\ \beta_3\ \beta_4\ \beta_5\ \beta_6$ a partial regression with coefficients of *Gdp, Td, It, Et, Gb, Ir* Which has either positive or negative effect on inf. The error term is the μ.

Multiple regression with other variables gives the mathematical model below.

• $Inf = \beta_0 + \beta_1 Gdp + \beta_2 Td + \beta_3 It + \beta_4 Et + \beta_5 Gb + \beta_6 Ir + \mu$

Hypothesis

H_0: $\beta_1 = 0$

H_1: $\beta_1 \neq 0$

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4. DATA ANAYSIS

This table gives the description of all the variable used the regression. With 52 observations and 8 variables.

```
Contains data
  obs:            52
 vars:             8
 size:         2,600
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
countries       str24   %24s
inflationrate   float   %8.0g                 inflation rate
gdp             int     %8.0g                 Gdp
trade           float   %8.0g                 trade
interestrate    float   %8.0g                 interest rate
govbudget       float   %8.0g                 gov.budget
exportrate      float   %8.0g                 export rate
importrate      float   %8.0g                 import rate
-------------------------------------------------------------------------------
```

Source: STATA

Figure 1

4.1 THE DATA SUMMARY:

This shows the summary of the data, the number of observation, the mean ,the standard deviation, minimum and maximum of the all the variables. The mean of the gdp may seem very big because it is not percentage but in monetary value of millions.

Variable	Obs	Mean	Std. Dev.	Min	Max
countries	0				
inflationr~e	52	.0525135	.0637758	-.021	.282
gdp	52	44.69231	95.28585	0	523
trade	51	16.37647	15.31959	.57	61.64
interestrate	52	.0764077	.0526339	.0154	.25
govbudget	52	-.03125	.0399617	-.103	.121
exportrate	52	20.56154	21.86469	0	88
importrate	52	13.60462	13.47068	.8	63.8

Source: STATA

Figure 2

4.2 SIMPLE LINEAR REGRESSION MODEL:

The model seeks to establish the relationship between inflation and Gdp, below is the mathematical model.

$$Inf = \beta_0 + \beta_1 Gdp + \mu$$

$$Inf = 0.048015 + 0.0000936 Gdp$$

The above model and figure below indicates that an increment in gdp by 0.0000936 will lead to 0.0000936 increment of inf. And also the T Test table below shows that we fail to reject H_0 in favour of H_1 at 5% significant level.

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```
regress inflationrate gdp

      Source |       SS       df       MS              Number of obs =      52
-------------+------------------------------           F(  1,    50) =    1.16
       Model |  .00469125      1  .00469125             Prob > F      =  0.2873
    Residual |  .202743435    50  .004054869            R-squared     =  0.0226
-------------+------------------------------           Adj R-squared =  0.0031
       Total |  .207434685    51  .004067347            Root MSE      =  .06368

------------------------------------------------------------------------------
nflationr~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
        gdp |   .0001007   .0000936     1.08   0.287    -.0000873    .0002886
      _cons |    .048015   .0097708     4.91   0.000     .0283897    .0676403
------------------------------------------------------------------------------
```

Source: STATA

Figure 3

T TEST TABLE:

Table 1: T Test

T- Value	df	C.V	Sig. Level	Result	Meaning
1.08	50	2.021	5%	t value < C.V	We fail to reject H_0 in favour of H_1 at 5% significant level

Source: STATA

4.3 MULTIPLE REGRESSION MODEL:

The model seeks to establish the relationship between inflation and Gdp and other additional variables, below is the mathematical model.

$Inf = \beta_0 + \beta_1 Gdp + \beta_2 Td + \beta_3 It + \beta_4 Et + \beta_5 Gb + \beta_6 Ir + \mu$

Inf = 0.0210794+ 0.000738Gdp – 0.001037Td + 0.4820995It + 0.000256Et –

0.1522167Gb - 0.0001165Ir + μ

The signs of the coefficient of *Gdp, It,* and Et makes *Inf* goes up but *Td,Gb* and *Ir* makes come down. And also the F Test Statistics table 2 below shows that we reject H_0 in favour H_1 at 5% significant level.

From figure 5 below, the exact regression model that can be developed is thus, Inf = 0.0210794+ 0.000738Gdp – 0.001037Td + 0.4820995It + 0.000256Et – 0.1522167Gb - 0.0001165Ir + µ. The model is thus interpreted as follows: The constant value of 0.0210794 is the intercept which represent total output of inflation rate. On the other hand the coefficients of β_1 (i.e.*Gdp*) 0.000738 implies how much or the magnitude by which Inf would change (in this case would increase) per unit change in $\beta_1 Gdp, \beta_3 It, \beta_4 Et$. This of course shows that there is a positive relationship between *Gdp,It* and *Et* given the data for the period under consideration. This means that $\beta_1 Gdp, \beta_3 It, \beta_4 Et$ behave or move in the same direction. As inflation rate increases $\beta_1 Gdp, \beta_3 It, \beta_4 Et$ also increase. $\beta_1 Gdp, \beta_3 It, \beta_4 Et$ Move together because, during the period, especially the demand pull inflation, could lead to increase in demand for goods and services, this could lead to increase in productivity and for that matter increasing the Inf lation rate consequently. Also, the coefficient of β_2 *Td* - 0.001037, $\beta_5 Gb$ *Td* - 0.1522167, $\beta_6 Ir$ - 0.0001165 imply how much inflation rate would change (would decrease) by if there is a unit increase in the $\beta_1 Gdp, \beta_3 It, \beta_4 Et$. It further indicates a negative or inverse relationship between inflation rate andβ_2 β_5 β_6.

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```
. regress inflationrate gdp trade interestrate govbudget exportrate importrate

      Source |       SS       df       MS              Number of obs =      51
-------------+------------------------------           F(  6,    44) =    2.89
       Model |  .058299615     6  .009716602            Prob > F      =  0.0183
    Residual |  .147849135    44  .003360208            R-squared     =  0.2828
-------------+------------------------------           Adj R-squared =  0.1850
       Total |  .20614875     50  .004122975            Root MSE      =  .05797

------------------------------------------------------------------------------
inflationr~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         gdp |   .0000738   .0000888     0.83   0.410    -.0001051    .0002527
       trade |  -.0010637   .0005461    -1.95   0.058    -.0021643    .0000369
interestrate |   .4820995    .157984     3.05   0.004     .1637037    .8004954
   govbudget |  -.1522167   .2239573    -0.68   0.500    -.6035729    .2991395
  exportrate |    .000256   .0004023     0.64   0.528    -.0005547    .0010668
  importrate |  -.0001165   .0006703    -0.17   0.863    -.0014674    .0012345
       _cons |   .0210794   .0246141     0.86   0.396    -.0285271    .0706858
------------------------------------------------------------------------------
```

Source STATA

Figure 4

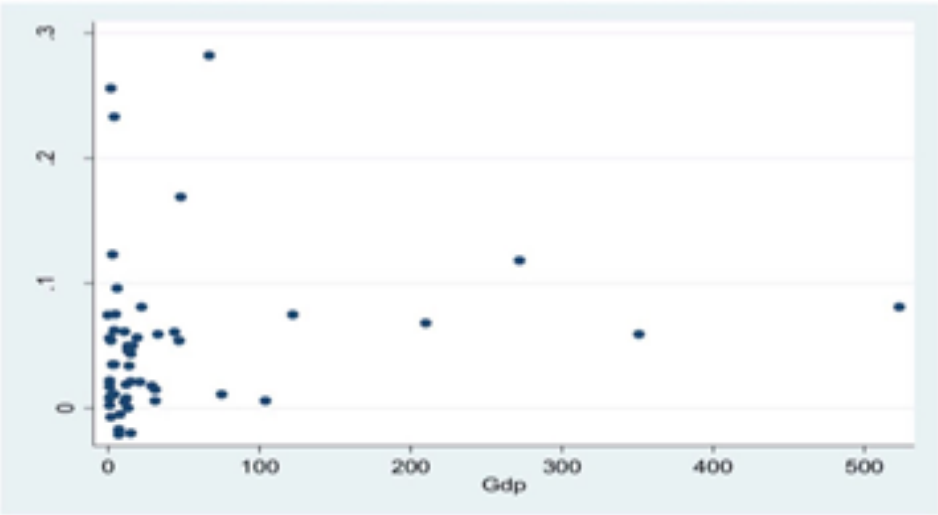
F STATISTICS TABLE:

Table 2: F Statistics

F- Value	df	C.V	Significant Level	Result	Meaning
2.89	44	2.34	5%	F Value > C.V	We reject the null at 5% significant level

Source: STATA

Two – way scatter graph



Source: STATA

Figure 5

5. CONLUSION

It can be concluded from the findings that there exit a strong positive relationship between Gdp, may conclude that as African economy. An increase in GDP performance impact infinitesimally on inflation and this does not supports the stable economy theory.

The results suggested that increment in economic growth will increase inflation which is rather unfortunate. In addition, causal relationships between the remaining variables were as expected A higher interest rate leads to high inflation and this can ease government effort in Africa to enhance its GDP growth. The inflexibility of some African states to switch between exchange rate regimes is also hindering growth of the continent because periodic devaluation to obtain International Monetary Fund (IMF) loans.

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