

## MACROECONOMIC DETERMINANTS OF INFLATION IN GHANA FROM 1990 – 2009

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### ABSTRACT

*The study attempts to identify the macroeconomic factors responsible for inflation in Ghana for the period 1990 to 2009. For this purpose, the time series model is selected based on various diagnostic, evaluation and selection criteria. It can be concluded that the model has sufficient predictive powers and the findings are well in line with those of other studies. The research findings would show that real output and money supply are the strongest forces exerting pressure on the price level to move up the exchange rate depreciation and implementation of ERP helped reduce the level of inflation in Ghana giving evidence that the ERP achieved its basic objective of reducing inflationary trend in Ghana.*

**Keywords: Ghana, Inflation Trends, and Economic Growth.**

### 1.0 INTRODUCTION

Inflation is one of the multifaceted challenges that the Ghanaian economy have been encountering for a very long time in spite of the numerous economic policies that have been formulated to neutralize its existence. It is indeed imperative to research for effective and efficient measure to curb inflation in order to sustain development and increase economic growth. The economic history of Ghana has been marked by conscious and intensive efforts by government to speed up economic development. Indeed the years have witnessed some remarkable results in some sectors, particularly, education, hydro-power, transportation and industrialization. Regrettably these realizations have been achieved with the associated consequences of growing financial instability, dwindling external reserves, increasing disequilibrium in the balance of payment and inflation.

The period (1957–1972) is classified as the first episode of inflationary situation in Ghana, which was marked by active involvement of the state in economic activity of the country. Almost all the industrial set-up and the infrastructure base of the country were financed by the state. (Ghana Statistical services, various CPI Newsletters).The gradual but increasing inflation rate became serious during the period (1973- 1982), which is the second episode of inflation in Ghana. This period was marked by several military interventions. Within this period, the various military leaders who came into power pursued expansionary economic management, which led to huge

Balance of payment deficits. The deficits that resulted were financed through expansionary monetary policy, which resulted in increases in money supply and the subsequent effects on the economy through high general price levels. By 1983, inflation had reached a “sky-rocketing” level of 123 %. (Ghana Statistical Service’s annual report; 1984 issue).

The control of inflation is central to good monetary policy. The concern with inflation emanates not only from the need to maintain overall macroeconomic stability, but also from the fact that inflation hits the poor particularly hard as they do not possess effective inflation hedges. Price stability is a good thing in itself, as inflation injects noise into the price system, makes long-term financial planning more complex.

In the short-to medium term, high inflation and persistent inflation undermines public confidence in the economy and in the management of economic policy generally, with potentially adverse effects on risk-taking, investment, and other productive activities that are sensitive to the public's assessments of the prospects for future economic stability. In the long term, low inflation promotes growth, efficiency, and stability, which supports maximum sustainable economic growth.

Evidently inflation in Ghana is caused by both fiscal and non-monetary factors. In the past, Ghana's balance of payment position has been in severe difficulties due to inappropriate trade, fiscal and monetary policies. Excessive money supply is the single most pervasive cause of inflation in Ghana. For instance between 1996 and 1997 inflation was at 25% and 8% respectively, but this was short lived as it shot to 40.5% in December 2000, reflecting fiscal mismanagement. Bemanke et al, (2005).

A non-monetary source of inflation is attributable to poor performance of the agricultural sector between 1995 and 1999. Ghana's agricultural sector grew by 44 percent but dropped again to 1.1 percent in the year 2000. This resulted in high food prices in the country. Food prices alone account for over half of the average household expenditure in Ghana. The other dimension to inflationary trends is that inflation is international.

This is because Ghana like the rest of the world is always affected by crude oil hikes, which affects the state of the economy. This has been a major cause of civil strife which belies every military overthrow in the country. For example high inflation rate of 100% in 1979 moderating to 54% led to the removal of the then government from office in a military putsch in 1981.

The then government imposed fiscal and monetary discipline to curb it, but spending unwisely during the 2000 election year shot inflation from 8 percent to 30 percent between 1998 and 2000. The new government succeeded in curbing inflation down but again shot up during the 2008 election year from 12.81 percent in January 2008 to 18.4 percent in July 2008. Currently, inflation is still unstable and has assumed a downward decreasing trend from 14.78 percent in January to 14.23 percent in February; it further decreased from 14.23 percent in February to 13.32 percent in March, 2010. Inflation has further dropped from 13.32 percent in March to an unprecedented value of 11.66 percent in April, representing a drop of 1.7 percent. Recently the inflation rate for July 2010 is 9.46 percent.

During the past three decades, dramatic changes in the inflationary environment have stimulated wealth of studies on the relative accuracy of alternative models of inflation forecasts. Moreover, there has been much work on examining and evaluating different methodologies in forecasting inflation. One approach is associated with the work of (Fama and Gibbons 1997).

A number of research conducted have brought to light a wide range of factors explaining inflationary pressure. Economists contend that there is no single theory capable of explaining every inflationary situation in an economy because; source of inflation will depend on a number of factors including the extent of development of a country, the nature of its labour unions, market structure and the likes. Therefore what might appear a reasonable paradigm for a situation may be unsuitable for another. Government expenditure and revenue is raised by inflation. It causes an upward adjustment in government's budget, especially index-linked ones while it simultaneously increases government revenue. Budgetary imbalances have become entrenched and have been the primary cause of resurgence of macroeconomic instability. For example, according to (CEPA,2001) the non observance of poverty reduction and growth facility (PRGF) conditionality's agreed with the international monetary fund (IMF), worsened the state of the economy in 1999 and 2000 fiscal year, as there was total delayance in aid disbursement to the country. Bank of Ghana in an attempt to meet its monetary targets often resulted to bouncing of government cheques. The consequential borrowing by government led to a sharp build up of the banking sector as private sector operatives turned to the banking system for an ace on account of looked up working capital, in spite of enormous interest rates.

The main purpose of the study was to identify the causes of inflation in Ghana for the period 1990-2009. Specifically, the study sought to establish the statistical relationship and the impact of the ER key macroeconomic variables that causes inflation in Ghana in the long run.

This will help in determining the best policy package that the government can adopt to achieve the single digit inflation level.

In line with the aforementioned purposes, the study seeks to test the following hypotheses;

H<sub>0</sub>; anticipated prices has no significant relationship with inflation.

H<sub>1</sub>; anticipated prices has a significant relationship with inflation.

H<sub>0</sub>; output level has no significant impact on inflation.

H<sub>2</sub>; output level has significant impact on inflation.

H<sub>0</sub>; money supply has no significant impact on inflation

H<sub>3</sub>; money supply has a significant impact on inflation

H<sub>0</sub>; there is no significant relationship between exchange rate and inflation.

H<sub>4</sub>; there is significant relationship between exchange rate and inflation.

## 2.0 LITERATURE REVIEW

### 2.1 The Monetarists Theory

Milton Friedman (1968) in explaining the phenomenon of inflation says that inflation is caused by too much money chasing too few goods. Friedman has asserted that 'inflation is always and everywhere a monetary phenomenon'. The monetarists approach is based on the quantity theory of money, which relates a unique price level inflation as, always, and everywhere, a monetary phenomenon which originates from an increase in money supply.

The quantity theory is given by:

$$M_V = P_Y$$

Where M = nominal quantity of money supplied,

P = the price level,

V = the velocity of circulation of money,

Y = volume of total real output.

The assumptions on which this approach is based are as follows;

1. The velocity of money V is constant, denoted by V
2. In the long run, the growth of real income is determined by real factors, although monetary factors may have a short run impact on the level of real income. This implies a constant Y denoted by Y
3. Lastly supply of money can be controlled independently of the demand for money. Rewriting

The quantity theory taking the above assumptions into consideration gives;

$$M_V = P_Y$$

If the above identity holds then;  $M = P$

Which means the rate of change in the identities in the equation gives;

$$M+0=P+0.$$

From this any change in 'M' is wholly reflected in 'P' which causes inflation. This falls under demand-pull inflation. Monetarists believe that changes in price levels reflect fluctuating volumes of money available, usually defined as currency demand deposits. They argued that to create stable prices, the money supply should increase at a stable rate commensurate with the economy's real output capacity.

### 2.2 The Structuralizes Theory

The structuralists argue that by the very nature of their economies, the less developed countries are prone to inflation. The reason assigned to this argument is that there exist structural rigidities or bottlenecks namely; economic, institutional and socio-political factors in these countries, which in one way or the other impede expansion of output.

This theory views inflation from the supply side of the economy and identifies some mechanisms that trigger inflation as low inelastic supply of food items and agricultural products owing to bottlenecks in the agricultural sector and foreign exchange shortages.

### 2.3 The Keynesian Theory

The Keynesian inflation theory contends that in the presence of pressure from organized institutional forces of trade unions for increased wages, prices rise in excess of any rise in production in the absence of excess demand

in the market. The employers decide to transfer the increased wages into prices. This culminates into wage-price spiral, which triggers inflation. The above also belongs to the cost-push school of thought.

Another variant of Keynesian theory of inflation, which takes cognizance of level of unemployment as a determinant of inflation contends that price level in the short-run depends not only on the flow of money but also on the level of unemployment. The theoretical basis of this theory is that if the sum of private consumption (c), private investment (I), government expenditure (G) as well as foreign sector (N), that is, expenditure exceeds the full employment output, an inflationary gap results which causes price to rise. Thus inflation depends on excess demand relative to output.

#### **2.4 Inflation and Exchange Rate**

Reflecting a depreciating exchange rate and demand pressures as well as increased international oil prices and adjustments in utility and petroleum product prices, the inflation rate (end of period) accelerated from 10.9% in 2006 to 12.8%, 18.4% and 20.7% in 2007, 2008 and mid-2009 respectively. However, with slower growth, tighter fiscal and monetary policy, and modest currency appreciation since July 2009, inflation declined from 20.7% in June 2009 to 9.5% in June 2010. The challenge to keeping inflation low surrounds oil price volatility, increases in electricity tariff and the implementation of the single pay spine. The BOG has since the beginning of 2010, cumulatively reduced the Monetary Policy Rate (MPR) by 450 basis point (the latest being a 150 basis point cut in July 2010) bringing the MPR to 13.5%.

The exchange rate depreciated by about 50% against the dollar between 2008 and the first half of 2009 as a result of Ghana's macroeconomic imbalances and declining foreign exchange inflows. However, by mid-2009 there were signs of stabilization in the exchange rate. Much of the exchange rate adjustment was however, offset by Ghana's high inflation rate and the appreciation of the dollar. Consequently, the real effective exchange rate by mid-2009 was just about 8% more depreciated than in 2007.

Following Governments adoption of a multi-year fiscal stabilization plan in 2009, fiscal deficit which widened consistently between 2005 and 2008 narrowed in 2009 and, on a cash basis, ended the year at 9.7% compared to a target of 9.4%. However, this was achieved partly by the deferment of revenue transfers to statutory fund (2.4% of GDP) and by incurring new arrears to domestic suppliers (1.8% of GDP). These arrears have impacted the banking sector and brought projects to a standstill. Consequently, on a commitment basis, including arrears, fiscal deficit which stood at 20.1% in 2008 narrowed to 14% in 2009.

#### **2.5 Inflation and money supply**

Bawumia and Abradu (2003) indicated that the empirical evidence of a broad monetary growth in Ghana between the period of 1983 and 1999 is suggestive, as theory will predict that a slower money supply growth reduces inflation and the rate of depreciation of the cedi. They then considered the monetary growth trends between the periods of 1983 and 1999 and indicated that broad monetary growth peaked at 62.5 percent in 1985. Thereafter, the pursuit of a tight monetary policy resulted in broad money growth reducing inflation to 20.6 percent by 1990. Over the period of 1983 to 1991 inflation declined from a peak of 122.8 percent in 1983 to 10.2 percent by 1991, whilst monetary growth was 26 percent in 1991. Exchange rate over this period also declined from 93 percent in 1983 to 11.54 percent by 1991.

According to the Ghana macroeconomic preview, (CEPA, 2001), indicated that the difficulties encountered in the divestiture program deepened the deficit in government budget as net foreign financing declined from 26 percent of GDP in 1998 to 0.9 of GDP in 1995. Net domestic finance also rose from 5 percent of GDP in 1998 to 7 percent of GDP in 1999 and sharply to 10.3 percent. Considering the long-run inflation when the money stock in the economy increases by 1%, the inflation rate will also increase by 15.72% which clearly confirm the monetarist argument. This result reflects the fact that the monetary authorities exogenously determine money supply in Ghana. Besides due to the lack of independence of the central bank (Bank of Ghana), money supply and the policies that govern it are based on the discretion of the government in power but not on rules

### **2.6 EMPIRICAL LITERATURE REVIEW**

#### **2.6.1 The Ghanaian experience**

Inflation in Ghana has also been researched extensively from both demand or monetary side and supply or real factors side. Available research findings to heavily filter toward demand pressures as demand cause of

inflationary situation. Researches on Ghana's inflation are Lawson (1966), Ahmad (1970), Ewusi (1977), Steel, F., (1979), Oti Boateng (1979), Kwakye (1981), Chhibber and Shafik (1990), Sowa and Kwakye (1993).

Lawson (1966) noted that the major contributory factor to the inflationary process was deficit incurred on government accounts and which were financed through borrowing from the domestic banking system. This assertion confirms the monetarist hypothesis. She also stated that inflation was further strengthened by the shortage of essential consumer goods and restrictions of imports which have abort as a result of structural rigidities in the country. The findings of a study carried out by Ahmad (1970) for the period 1960 to 1965 confirmed Lawson's study over the same period. Ahmad (1970) also noted that excessive monetary expansion arising from government borrowing from the banking system to finance budget deficits generated strong inflationary pressures in the country.

Kwakyes' work also established that deficiency in local food production is a contributing factor to the general inflation pressures. This also can confirm further results of various studies on Ghana's inflation as well as the structuralist paradigm that food supply constraint plays a major role in price inflation in LDCs. He blamed this on increasing demand on agricultural production resulting from growth in population and urbanization. Growth in productivity was undermined by bottlenecks in that sector and therefore could not match the population growth and urbanization in terms of food demand. This excess demand for food then influenced comprehensive price increases.

Empirical evidences on Ghana's economy indicate that money supply has played a very significant role in price movements in the country. For instance, conclusions from the works of Lawson, Ahmed, Ewusi and Kwakye attributed the Ghanaian inflation predominantly to excessive monetary expansion which resulted from government borrowing from the banking system to finance budget deficits. According to the bank of Ghana (BOG), the financial support from the BOG to the central government in its expansionary fiscal policies occasioned money supply to rise on the average at 40% per annum.

This is believed to have been the main cause of high rate of inflation which averaged 50% per annum during the period. Even under the ERP (1983-1989), money supply grew by approximately the same average (Bank of Ghana, 1996). The annual data on money supply was exclusively obtained from IMF's IFS.

Growth in nominal GDP was used as a proxy for real output represented by (Y) in our model. In Ghana, output is determined by the expenditure approach and the government has traditionally been a major consumer of non-productive items. It goes without saying, therefore, that a rise in output would mostly induce inflation in Ghana. For instance, large spending on central government protocol services, travelling abroad, conducting elections and bye-elections and national security do not increase the supply of physical goods in the economy. These will result in an increase in aggregate demand over aggregate supply, and hence, inflation in the local economy. Data on output on annual basis was obtained from various issues of IFS published by the IMF.

Domestic supplies could not suffice the ever-increasing demand of producers and consumers for input such as raw materials and final goods (consumables) respectively. This resulted in an increase in demand for the importation of these commodities and subsequently, the role of exchange rate in the determination of inflation in Ghana. Exchange rate, in this context, is defined as the value of the domestic currency (the cedi) in terms of the US dollar.

The theoretical basis for the inclusion of the variables was justified under the cost push theory of inflation, specifically under the structuralists' school of thought. As mentioned earlier, the inclusion of the variables emanates from the pattern of demand for customer goods and production base for the Ghanaian economy. Many of the industries that were established during Ghana's industrialization drive in the 1960s are 'last industries', that is, industries that have high import backward linkages.

These industries have high import content in their production mix. The raw material was approximately to be 28% in the 1970s. From the foregoing it is obvious that fluctuations in the exchange rate will most likely be reflected in cost of domestic production which invariably translates into inflationary pressures.

The Ghanaian economy seemed to have operated under a controlled price system. This is so because it was a period when most prices, exchange rates and interest rates were fixed by the government. Hence, the fixed exchange rate did not allow wide swings in the exchange rate to affect price formation. With the introduction of the ERP, price controls were removed, interest rates were liberalized and exchange rates were allowed to be determined by the market forces of demand and supply.

The elements in the price equation are money, output, the exchange rate, foreign prices and other cost factors. The money depends on monetization of the fiscal deficit. The parallel market also depends on the demand for foreign exchange and the transactions demand for foreign exchange. The real value of output is also a function of the real exchange rate. The study revealed that monetary expansion was instrumental in determining the pace of inflation. The expansion of money supply was largely fuelled by net foreign asset inflows and low financial intermediation.

Sowa and Kwakye (1993) felt there were other factors that could more explain the inflationary situation in Ghana other than just monetary elements as the results of some of the researchers earlier have shown in our earlier discussion. Sowa and Kwakye argued that those researchers arrived at the conclusion because they captured real factors as monetary factors making them lose the ability to isolate the real side. Upon this premises Sowa and Kwakye set up another model specifying all the possible causes of inflation in the Ghanaian economy and econometrically analyzed them. Sources identified are growth in money and output, the rate of exchange and anticipated price. When regressed they found out that most of the factors are individually significant, with supply constraint emerging as the strongest while unlike the findings of Chhibber and Shafik (1990), exchange rate devaluation also seemed significant. The difference they explain could be attributed to the additional period they added to their data since their data went beyond 1988. In the light of the above discussion, this research seeks to identify the causes of Ghana's inflation and also from demand and supply side. Our focus really is to establish the statistical relationship between inflation and the impact of the Economic Recovery Program (ERP), not only on real exchange rate as Chhibber and Shafik(1990) did, but on the key macroeconomic variables that cause inflation in Ghana, a scope broader than that of the earlier works done.

## 2.8 Conclusion

The main aim of this study is to establish the macroeconomic determinants of inflation in Ghana. It is clear that the growth rate of real GDP and the growth of money supply are the main determinants of inflation in Ghana-both in the short-run and the long-run, with money supply being the key determinant. The coefficient for money supply from the estimated long-run inflation function confirms the Monetarists theory of inflation in the long-run.

Base on the estimated result, the independence of the central bank is very important if policy makers want to reduce the effects of money supply on inflation. The independence of the Bank of Ghana will help check discretionary monetary practices such as financing of government debt by the central bank via printing of currency. Besides, the success of the current inflation policy known as inflation targeting practiced by countries like United Kingdom and Sweden which places great importance on the independence of the central bank re-enforces my point made with regards to the independence of the Bank

## 3.0 METHODOLOGY

### 3.1 THE MODEL

From our discussion in chapter two, the arguments put forward as causes of inflation can be summarized as monetary factors, real factors and anticipated prices. Using these factors, we specify the general model in equation (1) below:

$$I = f(M_t, Y_t, E_t, P^e_t) \text{ Where,}$$

I = Inflation measured as the average growth in consumer price index (CPI) as reported by IMF in the IFS.

M = Money supply which is define as the sum of currency outside deposit money, banks and demand deposits plus quasi-money.

E = Exchange rate, defined as annual average of official exchange rates based on monthly averages(local currency units to the US dollars), because, is the rate determined by national authorities or the rate determined in the legally sanctioned exchange market.

Y = Growth in GDP

$P^e$  = Price expectations computed from CPI as reported in IFS by the IMF  
 $t$  = Time period denoting the 't<sup>th</sup>' year and  $f$  = Functional notation

From the foregoing, therefore, the specific long-run equation for estimation is:

$$I_t = a_0 + a_1 M_t + a_2 Y_t + a_3 E_t + a_4 D_t + a_5 P^e_t + \mu_t$$

Where all variables used are as defined in (1) above whilst  $D$  ( $D=0$  before ERP; that is pre- 1990:

$D = 1$  during and after ERP; that is, post 1990, represents a dummy variable. 'a' is a constant and the ' $\mu$ ' in the model is the error or the stochastic disturbance term, which will address the influence of other factors of inflation, which have not been mentioned in the model.

Based on the literature review and information on the Ghanaian economy, we expect that, after the estimation, the coefficients of the explanatory variables  $a_1, a_2, a_3, a_5 > 0$ ; which implies that these explanatory variables have positive influence on the dependent variable (I). Thus, an increase in money supply (M) or real output (Y) or real exchange rate (E) is expected to generate inflationary pressure. Also it is expected that a high rate of inflation for a previous period may be fed into negotiations and thus result in an inflationary spiral.

Conversely, we predict that the coefficient of  $a_4 < 0$ ; indicating that the regressed (D) and the dependent variable (I) are negatively related. This is so since one of the main objectives of the implementation of the ERP is to scale down the inflation rate in the Ghanaian economy.

### 3.3 VARIABLES DESCRIPTION

Money supply (M) as used in the model is defined as the sum of currency outside deposit money banks and demand deposits other than those of the central government plus quasi-money within the Ghanaian economy. Quasi-money refers to time, demand, savings and foreign currency deposits. The role money supply plays in the determination of inflation had been discussed in the theoretical framework under the monetarist's theory of inflation. The quantity theory was used to demonstrate how money supplies a decisive role in the determination of inflation.

Meanwhile, the domestic currency has persistently been on the decline against the foreign currencies and these exchange rates devaluation have been feeding into the inflation rate. Between 1980 and 2000, the cedi-dollar rate rose from c2.75/\$1 to c7,143 (IMF). This suggests that the period has experience about 99.96% cumulative cedi depreciation. The data on exchange rate (E) is annual and obtained from the IMF's IFS.

The expectations play in the determination of inflation was explained under the expectations theory of inflation. According to Kwakye (1993), anticipated price is an important determinant of the overall inflation in the Ghanaian economy. Expectations as explained earlier could be adaptive or rational. For the purpose of this study, we used the adaptive form of expectations computed from CPI as reported by the IMF in the IFS in our estimated model.

### 3.4 THE ESTIMATED TECHNIQUE

In order to obtain best linear unbiased estimators for the population parameters from the sample chosen, the Ordinary Least Squares (OLS) was used in the estimation of the coefficients of the explanatory variables in the model. The OLS enabled us to determine the individual as well as the collective statistical significance of the explanatory variables on the dependent variable (I).

The t-ratio or t-statistic was used to test for the significance of each of the independent variables on the dependent variable (I).

The f-statistic was used to test the collective statistical significance of the explanatory variables on the dependent variable (I).

The  $R^2$  was used to evaluate the collective explanatory power of the explanatory variables on the dependent (I). Thus, it enables us to determine the proportion of the dependent variable that has been explained by the explanatory variables without taking into consideration the degrees of freedom.

The Durbin Watson (DW) statistic was also used to test for autocorrelation or serial correlation. The DW statistic was to determine if any error committed at say time ( $t$ ) relates to any error committed at time ( $t-1$ ).

Conventionally, if the DW-statistic is 2, then there is no problem of autocorrelation in our model. The statistical package used for the estimation is the Econometric Views (E-Views).

#### 4.0 EMPIRICAL RESULTS

##### 4.1 PRESENTATION OF RESULTS

Estimating the linear relationship between inflation (I) by Ordinary Least Squares (OLS) according to the long run model formulated in section 3.1 of chapter three, we obtain the following results shown in table 4.1.

**Table 4.1: Modeling Inflation (I) by OLS**

<b>Dependent Variable : INFLATION (I)</b>				
Regressor	Coefficient	Standard error	t-statistics	t-probability
Pe	-0.000958	0.000608	-1.57535	0.1283
D	-23.02414	6.263308	-3.676034	0.0012
Y	0.890319	0.137027	6.497407	0
M	2.97E-05	1.39E-05	2.137268	0.043
E	-442.0733	171.8233	-2.57284	0.0167
a	28.03789	10.51684	2.66	0.0135
<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistics</b>	<b>F-probability</b>	<b>DW statistics</b>
0.807175	0.840421	25.27908	0	2.222459

##### 4.2 PERFORMANCE OF THE MODEL

The assessment of the estimated model is based on the results presented in table 4.1 above. The multiple coefficient of determination, adjusted R<sup>2</sup> and the F-ratio were used to assess the performance of the estimated model. From the summary statistics of the diagnostic test in the table, R<sup>2</sup> is 0.807175. This means that our explanatory variables explain about 80 percent of the total variations in inflation in Ghana. In other words, anticipated prices (P<sup>e</sup>), captured by the dummy variable (D), real exchange rate (E), money supply (S) and output (Y) together with a constant (a) collectively explains more than 80 percent, the level of prices or inflation in Ghana for the period 1990 to 2009.

The F-statistics of 25.27908 with a probability of 0.0000 shows that the F-ratio is statistically highly significant. This implies that the R<sup>2</sup> value of 0.807175 is actually different from zero. Therefore we conclude that at 100% level of confidence, the explanatory variables are collectively statistically significant in explaining the dependent variable (I).

Thus the explanatory variables in our estimated model are not dependent on one another. In other words, the value of the estimated error term at any point in time is independent of its past values.

In general, the key assumptions underlying the OLS estimation technique hold in our estimated model. Thus, the OLS estimation is efficient and effective, and therefore, it can be inferred that there is no specification error in our estimated model and that the functional form of the model is correct.

##### 4.3 TESTS OF HYPOTHESES

The hypotheses specified in section 1.4 in chapter one is tested below at the conventional levels of significance: The alternative hypotheses as specified under 1.4 have been upheld, except in the case of H<sub>1</sub> involving anticipated price and inflation, in which case the null hypotheses is instead upheld. Anticipated price is not statistically significant in explaining inflation in Ghana. This is manifested in the low t-statistics of 1.575350 in absolute terms. Therefore, we fail to reject the null hypothesis that, 'anticipated price has no significant relationship with inflation' in Ghana in the long run.

Given the t-values of 6.497407, 2.137268, 2.572836 and 3.676034, regarding the relationship between output, money supply and real exchange rate as independent variables and inflation as dependent variable we fail to reject the alternative hypotheses  $H_2$ ,  $H_3$  and  $H_4$ . Thus, at 95% level of confidence, we conclude that output, money supply and real exchange rate are statistically significant factors explaining the macroeconomic determinants of inflation in Ghana.

Finally, since the value of the constant (28.03789) is statistically significant at 95% level of confidence, we fail to accept the null hypothesis that  $a_0 = 0$ . This means that our estimated regression line does not pass through the point of origin. The magnitude and the positive sign of the constant indicate that the intercept of the inflation will rise by 28% if all the explanatory variables change by a 0%.

#### 4.4 ANALYSES OF ESTIMATED RESULTS

Anticipated price ( $P^e$ ), the dummy variable (D) and the real exchange rate (E) have negative relationship on the dependent variable (I). This means that as ( $P^e$ ), (D) and (E) rise by 1% the inflation rate will also fall by 0.000958, 23.02414 and 442.0733 respectively. However, output (Y), money supply (M) and the constant (a) have positive impact on the dependent variable (I). The implication is that a 1% increase in output, money supply and the constant will lead to corresponding increase in the endogenous variable (I) by 0.890319, 2.97 and 28.03789. The result shows that apart from anticipated price all the regressors are individually statistically significant in explaining the dependent variable at 95% level of confidence.

This result reflects the fact that the monetary authorities exogenously determine money supply in Ghana. Besides due to the lack of independence of the central bank (Bank of Ghana), money supply and the policies that govern it are based on the discretion of the government in power but not on rules.

First, the value of the constant is statistically significant at 95% level of confidence. Thus, irrespective of what measures government put in place, there will be a certain amount of rises in the domestic price level, holding all the independent variable constant. This may be due to attributes of price mechanism, the role of the international economy with Ghana being a small open economy and natural with demographic factors. The predominate retailing and rent seeking activities as opposed to the low level of productivity in Ghana could also underline this fact. The results have confirmed a prior expectation that  $a_0$  will be positive and significant.

The negative sign borne by the anticipated price indicates that our prior expectation has been violated. The variable  $P^e$  is not statistically significant since the absolute value of the t-statistic

t-ratio of -1.57535 is less than the conventional 2.0 at 5% level of significance confirming the conclusions of Kwakye (1981) and also Haberger (1963) in the Pakistani experience. This may be explained that wrong estimation of prices is made in view of the high level of illiteracy in the LDCs.

The dummy variable has also been significant in reducing inflation in Ghana. This is because the coefficient of -23.02414 and a corresponding t-probability of 0.0012 show that there is a negative correlation between inflation and the implementation of the ERP in Ghana. This could be attributed to the policies that were implemented when the ERP was introduced. Besides, since the budget is a major factor in generating monetary pressures, great efforts were made towards improving the government budget. To this end, activities aimed at streamlining government expenditure which included downsizing the workforce of government machinery, that is, ministries, departments and agencies and divesting some of the non-performing institutions of government, were undertaken. Further government revenue was enhanced through reforms in tax administration, spreading the income tax and widening the tax base by the introduction of the consumption tax, value added tax (VAT) in December 1998 which ropes in almost all consumers of goods and services. By this result our 'a' prior expectation has been confirmed and in addition supported the works of Sowa and Kwakye (1993).

The output variable (Y) emerged as the strongest determinant among all the variables that influences inflation in Ghana, looking at its t-statistic of 6.49707 and the t-probability of 0.0000. The positive nature of its coefficient also confirms our argument that an increase in the expenditure pattern in general and of government in particular, on non-productive items will cause the general price level to move upwards. The coefficient of 0.890319 indicates that a 100% increase in output (Y) will influence inflation to rise by 89%.

The sign of coefficient of  $a_3$  confirms our prediction that money supply and inflation are positively correlated. Monetary pressures are one of the strongest forces responsible for Ghana's inflation given its t-statistic of 2.137268 and the matching probability of 0.0430. This finding is in support of the works of Chibber and Shafit (1990) and Sowa and Kwakye (1993).

Monetary expansion can be attributed primarily, to the support the government enjoys from the Bank of Ghana in implementing its fiscal policies. Clearly, the origin of this problem can be traced as far back as the law establishing the central bank and its functions after Ghana withdrew from the West African Currency Board (WACB) soon after independence in 1957. One of the main functions of the bank was to conduct independent monetary management which was previously being controlled in Britain. Ever since this law was passed, the bank has actually failed to exhibit real independence because of enormous influence that the government wields on the central bank (Bank of Ghana Annual Report, 1996). This is because under that law, the central bank was required to conduct monetary policies in consultation with government, represented by the Minister of Finance.

Furthermore, large amounts of liquidity are injected into the economy through cocoa financing. During the pre-ERP period, cocoa financing was made through issues of cocoa bills and huge overdrafts which were picked up and loaned out by the central bank as the retention account of the Ghana Cocoa Board (Cocobod) was inadequate to cover the total cost of cocoa financing. But under the ERP, the cocoa sector became self-financing as a result of implementation of policies aimed at shifting financing to the non-bank public and commercial banks, reducing Cocobod's operational expenses and large exchange rate adjustments. This action notwithstanding is believed that cocoa financing continues to add liquidity to the economy.

Real exchange rate variable (E) is negatively related to the level of prices in Ghana. The t-statistics of -2.572838 and the t-probability of 0.0167 indicate that as the real exchange rate depreciates by a 100%, inflation reduces by about 442%. A lot of reasons could possibly be assigned to this fact. Ghana is a small open economy in the world market, hence a price taker. With the depreciation of the cedi, export commodities from Ghana become cheaper as against her imports that become dearer. Even though her exports become cheaper, the Ghanaian exporter can hardly export more of her products because most of her exports are raw agro-products with a near perfect inelastic supply. Receipts from exports would not increase very significantly, since export volume is not likely to rise instantly. Imports on the other hand, would most likely increase in domestic currency. This is because most of Ghana's imports are made up of basic necessities such as crude oil, drugs and food to supplement the domestic production. When imports are brought to the domestic currency, prices are pushed upwards, exerting inflationary pressures. This confirms our 'a' prior expectation in chapter three.

## **5.0 CONCLUSION AND RECOMMENDATION**

Based on the empirical findings from our study we conclude that real exchange rate and money supply are the main macroeconomic factors responsible for inflation in Ghana. Whilst exchange rate depreciation help reduce the level of inflation, growth in real output or expenditure and money supply exert pressure on price levels to move up. Therefore all the working hypotheses except  $H_1$  are accepted; and we fail to reject the hypotheses that "anticipated price has no significant relationship with inflation". To a large extent our findings have given further support to the view that inflation in Ghana is a combination of aggregate demand and excess liquidity.

## **5.2 POLICY RECOMMENDATIONS**

### **5.2.1 Pursuance of Policies under Economic Recovery Programme (ERP)**

First and foremost, since the implementation of the Economic Recovery Programme (ERP) succeeded in controlling or minimizing inflationary pressures in Ghana, it would be most prudent for the government to identify vital policies under the programme and continue with their implementation with revitalization in order to derive the associated merits for the Ghanaian economy. For instance, in the case of the State-Owned Enterprise (SOE<sub>s</sub>) and parastatals, it is recommended that a conscious policy be pursued to divest a number of the remaining state-owned enterprises and other parastatals such as utility service providers as a means of both resource mobilization as well as expenditure reduction. This can be achieved through:

- \* Outright sale of some commercial SOEs, such as the remaining shares in the produce and buying company, national investment bank and Tema dry-docks; and
- \* Containment of the indebtedness of key parastatals such as Tema Oil Refinery (TOR) through price adjustments and reduction in subsidies leading eventually to price recovery.

This will provide sound environment for the private sector to flourish.

#### **5.4 Monetary Policy**

The new law of the central bank (Bank of Ghana Act, 2002, (Act 612), has made some inroads on the former. The independence of the central bank has been enhanced. Section 32 of the Act empowers the central bank, after consulting the Minister to use any of the instruments of control conferred upon it to counteract unusual movements in the money supply and prices in the economy. With this in view, the monetary policy committee of the Bank of Ghana be given real independence to enable maintain tight monetary policy through, for example, intensified open market operations and mopping up excess liquidity. Added to this, there should be strict adherence to the Economic Community of West African States' (ECOWAS) convergence criteria on government borrowing implemented in the new Bank of Ghana Act, which should not be more than 10% of the previous years GDP. The criteria place a cap on the borrowings of governments of countries in the West African sub-region to prepare the grounds for a uniform inflation and interest rates within the region which will lead to the implementation of the intended single West African currency.

Finally, liquidity injections should be focused on direct productive activity rather than consumption so as to discourage monetary growth in the economy.

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**LIST OF ABBREVIATIONS**

IFS	International financial statistics
IMF	International monetary fund
ERP	Economic recovery program
OLS	Ordinary least system
VAT	Value added tax
GDP	Gross domestic product
DW	Durbin Watson
E-VIEWS	Electronic Views
SOE	State Owned Enterprise
TOR	Tema Oil Refinery
WACB	West African Currency Board
ECOWAS	Economic Community of West African State
CPI	Consumer Price Index
BoG	Bank of Ghana
MPR	Monetary Policy Rate
LDC	Less Developed Country
PRGF	Poverty Reduction and Growth Facility
HIPC	Heavily Indebted Poor Country
GPRS	Ghana Poverty Reduction Strategy
I-PRSP	Interim Poverty Reduction Strategy Paper
CEPA	Centre for Policy Analysis