

UNIVERSITY OF CAPE COAST

ANTECEDENCE OF INFLATION IN GHANA

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BY

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DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature.....Date.....

Name: Mahmoud Abdul-Fatahi

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by the University of Cape Coast.

Supervisor's Signature..... Date.....

Name: Mr. Anthony Adu-Asare Idun

ABSTRACT

The study examines the antecedence of inflation, most especially the effect of money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana using annual time series data from 1990 to 2016. An Autoregressive Distributed Lag model was adopted as the estimation technique to examine the long-run and short-run dynamics among the variables used. In the long run, the regression estimates indicated that there is an insignificant positive effect between money supply growth and inflation. However, interest rate in the long run was observed to have a positive significant effect on inflation in Ghana. Real depreciation of the cedi was also seen to have a negative insignificant effect on inflation. The short run results indicated that money supply growth had a positive insignificant effect on inflation; interest rate and real depreciation of the cedi were equally observed to have a positive significant effect on inflation in Ghana. From the results obtained money supply is not an integral part in the fight against inflation in Ghana. This confirms why the Bank of Ghana has shifted for monetary targeting to inflation targeting monetary policy. Therefore, to reduce inflation in the economy, immediate measures need to be adopted by the Central Bank to strengthen the effectiveness of inflation targeting as a monetary policy. A recommendation is made that the Bank of Ghana should continue to use interest rate as the major instrument in the conduct of monetary policy in Ghana. It is also recommended that measures should be implemented to reduce the depreciation of the cedi, through the reduction of budget deficit financing and reduction in external borrowing.

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DEDICATION

To my loving and caring wife and mother for their heightened patience, support
and endurance during my absence from home.

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LIST OF ACRONYMS

ADF	Augumented Dickery Fuller
AIC	Akaike Information Criterion
ARLD	Autoregressive Distributed Lag Model
CPI	Consumer Price Index
ECT	Error Correction Term
ERP	Economic Recovery Programmed
EX	Exchange Rate
FPE	Final Prediction Error
GDP	Gross Domestic Product
GHS	Ghana Cedi's
HQ	Hannan-Quinn
IFS	International Financial Statistics
IMF	International Monetary Fund
INT	Interest Rate
Mgr	Money Growth
OLS	Ordinary List Square
PP	Phillips Perron
SIC	Swartz Information Criterion
SW-H	Sargent Wallace Hypothesis
USD	United State Dollars
VAR	Vector Auto regression
VECM	Vector Error Correction Model

CHAPTER ONE

INTRODUCTION

Ghana formally implemented inflation targeting in 2007 making it one of the first group of emerging market economies and as at the time one of the first low income countries to do so. A 5% inflation rate was set as the medium targeted by the Bank of Ghana. This objective was however affected by negative shocks which made it difficult to achieve the target. Such problems are common in the inflation reduction phase of inflation targeting countries and do not necessarily imply policy failure. It however means that there is the need for flexibility in the implementation of inflation targeting. Challenges in the implementation of inflation targeting policies are expected in the economy since it is vulnerable to shocks and has a history of high and variable inflation. Inflation rates came down significantly to as low as 10.7 percent in 2010, 8.7 percent in 2011 and 9.2 percent 2012. It has however returned to double digits, thus, 11.6, 15.4, 17.1 and 17.5 percent as at the end of 2013, 2014, 2014, 2015 and 2016 respectively.

In several instances, monetary policy authorities have reacted vigorously to short-run deviations from targets, in an attempt to maintain credibility. This had a destabilizing impact on the economy. Attempting to hit inflation targets for every year is not desirable and might not be feasible. The challenge should rather be to maintain the credibility of the ultimate target, in the face of variations in the path of inflation. This can be done by not just focusing on annual inflation targets but also being mindful of short-run trade-offs against output and employment (Ekholm, 2010).

Background to the Study

Inflation is a key macroeconomic variable that exerts important influence on macroeconomic stability and is a focal point of macroeconomic policy aimed at achieving sustainable rates of economic growth and development in many countries. Inflation is defined as a persistent increased in the general price level of goods and services in an economy over time. In an inflationary economy, it is difficult for money to act as a medium of exchange and store of value, with adverse effect on output, employment and real income. There is, however, no consensus both in theoretical and empirical literature regarding the factors that drive the inflationary process of many economies, especially in the developing world. While in the monetarist theory aggregate excess demand resulting from excess supply of money is regarded as the only cause of inflation, the structurelist theory accredits inflation to the composition of demand for products and services accompanied by inflexibilities in the productive structure (Fisher & Mayer, 1980).

One of the key culprits of money growth, especially in the developing world, is the monetization of deficits. The monetization of deficits leads to increases in the monetary base in an economy, which implies increases in the money supply, which in turn stimulate aggregate demand and expectations of higher inflation, pushing the authorities to accommodate the resulting price increases.

Friedman (1963) arguing that, high rate of inflation in any economy is due to monetary expansion, some researchers and policy makers argued that government budget deficits are also inflationary. These arguments (Sergent &

Wallace, 1981; Leeper & Walker 2012) stem from the method by which government finance their deficits. That is, either by borrowing from domestic or foreign sources or by printing money. This is because, deficits financed by monetization would directly expand the money supply while borrowing (particularly from domestic sources) tend to crowd out investment of the private sector and cut down economic growth and aggregate supply, which also has inflationary effect on the economy. Historically, high inflationary economies, especially those in the developing world, also tend to have wide fiscal deficits; suggesting a line between fiscal deficits and inflation.

The Ghanaian economy for more than centuries has experienced high and continuous inflation and a lot of policies and programs like the Economic Recovery Program (1983), the Structural Adjustment Program (1986) that was aimed at solving it proved to be futile. Sowa and Kwakye (1993), Atta-Mensah and Bawumia (2003), Ocran (2007), Adu and Marbuah (2011) among other empirical studies on the causes of inflationary process in the Ghanaian economy have arguably pointed out that, the high and persistent increases in the price of goods and services since the late 1970s has been “nurtured” by monetization of the fiscal deficits, monetary expansion, depreciation of the Ghanaian currency, cyclical food deficits among others.

After Ghana gained independence in 1957, the country encountered relative price stability as the inflation rate floated to a single digit. However, the 1970s and beginning of 1980, saw very high inflationary episode been recorded. The yearly inflation rate recorded, assuaged 100% on four occasions between July

1977 and March 1983. The 1970s in particular was characterized by an increased trend in inflation. Inflation levels remained generally high from 1972 with rates ranging between 10% in 1972 and 123% in 1983, with growth in money supply being 41% and 40% respectively in both years; while the figures for fiscal deficits in that period were 5.7% in 1972 and 2.7% in 1983. The surges in inflation during this period were (1972-1983) could be as a result of the excess growth in money supply due to the monetization of the fiscal deficits. The inflation rate then came down in 1984 to 39% while growth in money supply was 53% and a deficit-GDP ratio of 1.8%. After moderating somewhat during the latter parts of the 1980s; government expenditure goes up in 1992 which was an election year contributed massively to inflation rates surging from 10.1% in 1992 to 24.81% in 1993 and 59.9% by the end of 1995.

In recent times, the inflation rate has been of relatively low when compared with the 1970s and 1980s. In 2000s, the rate has been between 11% and 34% with 2001 and 2011 having the highest and the lowest figures of 32.9% and 8.7% respectively. During this same period fiscal deficit as a percentage of GDP was 7.7% (2001) and 4.2% (2011) while growth in money supply was 56.53% for 2001 and 34.04% for 2011.

Statement of the Problem

The significance of stable prices in achieving macroeconomic stability and providing the congenial environment for attaining sustainable growth in employment and output cannot be overemphasized. As such ensuring price stability in the form of low inflation, so as to anchor governments objectives of

attaining higher rates of employment and economic growth remains the focal point and the cornerstone of Bank of Ghana's monetary policy. For the past three decades, Ghana has succeeded in lowering inflation rates from historically high levels to a single digit, of 8.80 percent in January 2013 (Ghana statistical Service, Quarterly Statistical Bulletin). However, over the four (4) years, the country seems to appear vanquished in the battle against inflation as the general price level has steadily edged up to 13.3 percent in January, 2017. The economy is showing signs of deterioration and the stability of the macroeconomic environment is being threatened as the cedi is losing its external value against major currencies (i.e. depreciating by 6.2 percent against US dollars), with public debt to GDP ratio reaching 74 percent all in 2016 (Ghana Statistic Service report 2016). Furthermore, whereas, ardent monetary growth in recent years (i.e. dropping from 20.4 percent in 2013 to 3.6 percent in 2016), the country continues to experience increasing fiscal deficit and current account deficits (reaching 9.0 percent and 7.8 percent in 2016 respectively) with detrimental effects on the price stability, economic activities and economic growth in general. Whereas government is consolidating its fiscal stance by cutting down taxes' on some goods and reducing fuel prices and utility subsidies in order to stabilize the price level and economy as a whole, the question remains whether we can rely on fiscal prudence alone to solve the inflationary pressures in the economy.

Again, how is price level influenced by expansion in aggregate money supply? Is there causal link between money growth and inflation rate in Ghana? Does interest rate and exchange rate affect inflation in Ghana? Finding empirical

answers to these questions is what this dissertation set out to achieve. This study differs from existing studies by looking at the extent to which both fiscal and monetary policy interacts to influence the price level in Ghana.

As Ghana continues to combat inflation through the framework of inflation targeting and also attaining its objective in meeting the requirement of joining the West Africa Monetary Zone (i.e. Single-digit inflation), understanding of the forces that actually explain the antecedence of inflation cannot be overstressed.

This research therefore explores the relationship between money growth, interest rate, exchange rate and inflation in Ghana. Specifically, it aimed at finding a possible two-way relationship between money supply growth and inflation in Ghana, the effect of interest rate and exchange rate on inflation in Ghana.

Purpose of the Study

The purpose of the study is to examine the effect of Money Supply Growth, Interest Rate and Real Depreciation of the cedi on Inflation in Ghana.

Objectives of the Study

1. To determine the long and short run effect of money supply growth on inflation in Ghana
2. To investigate the long and short run impact of interest rate on inflation in Ghana.
3. To determine the long and short run effect of real depreciation of the cedi on inflation in Ghana.

Hypotheses of the Study

The study focus on the following research hypothesis:

H1: Money supply growth has significant long and short run effect on inflation in Ghana

H2: Interest rate has significant long and short run effect on inflation in Ghana

H3: Real depreciation of the cedi has significant long and short run effect on inflation in Ghana.

Significance of the Study

Making an appraisal of the research work and concluding on how worthy of importance it is to undertake this study; it is hoped that the research:

1. Will guide policy makers to take pragmatic steps in addressing inflation in Ghana
2. Will help the government of the day to know which of the Macroeconomic indicators is influencing inflation.
3. The study will explore and recommends potential areas the government and other policymakers should concentrate when addressing the issue of inflation. On the other hand, policymakers will also benefit in the sense that, the findings will provide informed suggestions on how policies can be improved.
4. The research will add to the existing literature.

Scope of the Study

The aim of the researcher is to study the effect of Money Supply, Exchange Rate, Interest Rate and Inflation in Ghana for the period 1990-2016 using time series data. There are so many macroeconomic factors which may contribute to the inflation of Ghana; therefore, limiting the research findings to only money supply, exchange rate and interest rate may not give an accurate account of the position.

Limitations of the Study

It should be noted that in the turn of economic studies, it is not possible to cover all the aspects of a particular field of enquiry in a single study. In this section, the aspects of research that were not covered are highlighted and these will identify priorities for future research.

First, this study focuses on the effects of money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana. This means that it is limited to a Ghanaian context; and therefore, it is not applicable to any other region outside Ghana. Furthermore, the effect of macroeconomic variables on inflation is not limited to only those considered in this study. The study however was limited to only money supply growth, interest rate and real depreciation of the cedi on inflation.

Organization of the Study

The study is set out in five chapters. Chapter one will be introducing the background to the study, which will include the objectives of the study, research questions, purpose, and limitations to the study. Chapter two will take an

extensive look at literature on the antecedence of inflation in Ghana. The third chapter will also take an extensive look at the methodology to be used in the research. It will give a detailed description of the data collection method. This chapter will be focusing on the type of data to be used. The chapter will also explain in detail the research design employed and the data analysis tool to be used in the study. The penultimate chapter is an analysis of the data gathered. The result of data to be collected will be presented in the form of tables, figures or graphical presentations. Each table will be captioned to explain the very important points being illustrated.

The last chapter will be discussing the research findings, conclusions drawn and recommendations made to that effect. The chapter will aim at interpreting the results by explaining one set of data with another and that of other works and making analytical discussions. Conclusions and recommendations will be deduced from the research findings. The study will state how the findings will contribute to the body of knowledge on the theme.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter shows a review of a theoretical and empirical literature on the interaction of Money Supply, Interest Rate, Exchange Rate and inflation. The chapter is classified into two main sections. The first section is devoted to the review of theoretical literature on Money Supply, Interest Rate, Exchange Rate and inflation. Depicted in this section includes classical and contemporary theories on money supply, Interest Rate, Exchange Rate and inflation. Existing empirical literature on the Inflation, Money Supply, Interest Rate and Exchange Rate is nexus in the second sub-section of the chapter.

Theoretical Review

This section is devoted to throwing light on the meaning of the four main concepts under study followed by a brief survey of theoretical literature on four main opposing views on the linkage between money growth, Interest Rate, Exchange Rate and inflation from a theoretical point. The main theories of inflation presented in this chapter are: The Monetarist's theory, the Structure list theory of inflation, the Classicalist theory of inflation and the Keynesians theory of inflation.

The Monetarist Theory of Inflation

Monetarist suggest that the factors causing inflation in an economy like Ghana are the same to those causing inflation elsewhere in the world and are primarily a matter of excessive aggregate demand. Thus, monetarists view

situations of excess aggregate demand for goods and services over and above the aggregate supply in an economy as the ultimate source of inflationary tendencies.

The monetarist's view of inflation relied on the quantity theory of money to provide an explanation of movements in the price level. The quantity theory of money posits that a change in the growth rate of money induces an equal change in the rate of price inflation (Lucas, 1980 cited in Walsh 2003). Thus from the monetarist perspective movement in the price level are solely driven by changes in the quantity of money (Mishkin, 2004).

According to Lozano (2008), given the nominal money supply being exogenously determined by the monetary authority – the price level is determined as the unique level of price that will make the purchasing power of the money supply equal to the desired level of real balances from an operational point of view, it means the central bank seeks to ensure the quantity of money agents want for their transactions. Hence given a price level, if the nominal money supply differs from the desired real balances, it will translate into changes in the price level.

Mishkin (2004), noted that in monetarist analyses money supply is seen as the sole source of shifts in the aggregate demand curve. Using aggregate demand and supply curves, the author shared that if monetary policy is accommodative such that money supply is always rising in response to increasing aggregate demands, output rises initially above the natural level but after some time the economy returns to its potential level of output. However, this occurs at the expense of permanent higher prices, which results in inflation. This is because

the resulting unemployment below the natural rate level will cause wages to rise and the aggregate supply curve to quickly fall. It will stop shifting only when it reaches the level at which the economy has returned to the natural rate level of output on the long run aggregate supply curve. At the new equilibrium, the price level will increase. As large as the money supply grows, this process will continue, and inflation will occur. That is according to the monetarist, inflation will only occur if the central bank monetizes the government debt.

The Structuralist Theory of Inflation

The structuralist school of thought stress structured rigidities as the principal cause of inflation in developing countries. Structuralism holds the view that inflation is a necessary condition for growth. They are of the view that inflation is a purely non-monetary phenomenon, it is driven by “cost push” factors, and these factors dominate the conduct of inflation regardless of what course monetary policy takes. Thus Cost-Push causes of inflation result when cost in production increases independently of aggregate demand. To them inflation is not triggered merely by the excess of demand over supply but built into an economy due to the government’s monetary policy. In the words of Sunkel (1969:6) cited in Khabo (2002). “the structuralist position on inflation is a reaction to the stabilization policies pursued by the Latin American governments on the advice of the International Monetary Fund (IMF), these policies were considered harmful rather than merely austere and growth promoting.

One important argument of the structuralist school is that the roots of inflation can be found in bottlenecks of “Inelastic Supply” in the agriculture

sector. This is emphasized by Boianovsky (2010) “according to the structuralist”, the basic factor behind chronic inflation in under- developed countries such as Brazil was that the pace of diversification of aggregate demand was much quicker than that of corresponding changes in the composition of aggregate supply that is a “particularly inelastic supply function” Latin American structuralist will grant that the money supply may increase along with the price level unlike monetarists, however, they believe that the money stock is responding to inflation rather than initiating it.

Classical Theory of Inflation

The classical theory of inflation attributes on price inflation to excessive growth in the quantity of money in circulation. For this reason, the classical theory is sometimes called the “quantity theory of money” even though it is theory of inflation and not theory of money. More specifically, the classical theory of inflation explains how the aggregate price level gets determined through the interaction between money supply and money demand.

As a matter of fact, because it traces the behavior of an important economy-wide variable-inflation-back to the most basic forces of supply and demand, the classical theory must qualify as one of the oldest “micro founded” model in all of macroeconomics. The classical theory allows us to think about inflation without any reference to interest rate, unemployment, or any of the other variables that are more frequently referred to in popular discussions inflation and its causes today. This is a big part of what makes the classical theory of inflation so useful. It recognizes that unemployment may be high or low and interest rates

may be rising or falling-it really doesn't matter. If the money supply is growing too fast, inflation results.

Keynes Cost-Push and Demand-Pull Inflation Theory

Keynesians argued that, money supply is only one of the components of aggregate demand and therefore cannot solely be responsible for increases in general price level rather it is aggregate demand that entirely influences inflationary situations in a country. Keynesians believe that, factors that influence aggregate demand in the economy (money supply inclusive) are responsible for the persistent rise in price level in an economy.

The eminent economist, John Maynard theorized a lot about inflation. He postulated that the money supply had an influence on inflation in a much more complex way than the strict monetarist suggested. Instead Keynes proposed that inflation was caused in number of different ways: By demand outstanding supply and pulling inflation higher, by inflation being built into the system, by high costs pushing inflation higher. Keynes also explained cost-push inflation by looking at the increment in commodity prices, tax level and exchange rate which may lead to inflation.

Empirical Review on Antecedence of Inflation

Nchor and Darkwah (2015), their study investigated the impact of exchange rate movement and the nominal interest rate on inflation in Ghana. It also looks at the presence of the Fisher Effect and the International Fisher Effect scenarios. It makes use of an autoregressive distributed lag model and an unrestricted error correction model. Ordinary Least Squares regression methods

were also employed to determine the presence of the Fisher Effect and International Fisher Effect. The results from the study shows that in the short-run a percentage point increase in the level of depreciation of the Ghana cedi leads to an increase in the rate of inflation by 0.20%. A percentage point increase in the level of nominal interest rates however results in a decrease in inflation by 0.98%. Inflation increases by 13.3% for every percentage point increase in the nominal interest rate in the long run. An increase in inflation on the other hand increases the nominal interest rate by 0.51%, which demonstrates the partial Fisher Effect. A 1% increase in the interest rate differential leads to a depreciation of the Ghana cedi's by approximately 1%, which indicates the full International Fisher Effect.

Ofori, Danquah, and Zhang (2017) examined the impact of money supply and inflation in Ghana by using annual data from 1967-2015. Their study was limited to the used of money supply as the independent variable on the dependent variable which is inflation. The results of their study shows a long-run positive relationship between money supply and inflation in Ghana based on an Ordinary Least Squares.

Kwakye, (2015), examines the influences of key macroeconomic variables on the exchange rate of Ghana cedi against the US Dollar. The macroeconomic variables used in the study were money supply, interest rate, and inflation of Ghana. Monthly data from May, 2000 to May, 2014 were used for the study. Using Autoregressive Distributed Lag approach to co-integration, the results shows a co-integrating relationship between the variables, by indicating a long-run equilibrium amongst Money Supply, Interest Rate and Inflation.

Johnson (2014), investigated the causal relationship between fiscal deficits, money growth and inflation, having controlled for the macroeconomic variables such as interest rate, exchange rate and real GDP in the Ghanaian economy for the period 1960-2012 and to test whether the Sargent Wallace Hypothesis holds for the Ghanaian economy. The time series properties of the underlying series were examined using the Augmented Dickery Fuller and the Philip Perron unit root tests and the result reveals that the interaction between fiscal deficit and money supply, were all stationary at the levels, while other incorporated variables in the empirical analysis- real income and the nominal exchange rate were stationary at the first difference. Using the Autoregressive Distributed Lag Model, the long and short run models were estimated, and the Granger Causality test was also employed to test for causality among the variables. The results suggested that a positive relationship between fiscal deficit and inflation in the Ghanaian economy occurs only in the short run; however, the money supply shows a consistent positive relationship with inflation, both in the short and long run. This supports the position that in the long run, inflation is mainly driven by monetary expansion. The Granger causality test supported a unidirectional causality from fiscal deficit to inflation and money supply; and bi-directional causality existing between money supply and inflation.

Asiama (2015), looked at the long-run demand for money function, determines the stability of the long-run demand for money function and determines the causal links between demand for broad money and the inflation-targeting regime for Ghana. The study uses time series data over the period 1979

to 2014. The co-integration approach by Pesaran et al. (2001) and the causality approach by Toda and Yamamoto (1995) were employed in estimating the models. The Bounds test to co-integration revealed that all the variables in the money demand function-inflation, dollar exchange rates, GDP growth, money supply growth and the inflation-targeting regime converged to long run equilibrium once there were deviations in the short run. Both the CUSUM and CUSUMSQ test showed that this long-run relationship was stable and converged to equilibrium. In the long run, while inflation and money supply were found to negatively impact demand for broad money, the dollar exchange rates and inflation were found to positively impact demand for broad money in the short run. These relationships were statistically significant at 5%.

Abdul Razak (2014), examined the responses of real GDP and inflation to monetary policy instruments shocks in Ghana using a multivariate modeling technique of the Vector Autoregressive and focusing on the reduced-form relationship between real GDP, price level, broad money supply (M2), real lending rate, real effective exchange rate and domestic credit for the period 1980-2012. The stochastic shocks of monetary policy actions and decisions on the real GDP and inflation were carried out by examining the dynamics nature of Granger Causality Test, Cholesky ordered impulse Response Functions and Forecast Error Variance Decomposition for the VAR model. The study found that the potency of monetary policy in influencing real GDP and inflation is limited, as important channels of monetary transmission are not fully functional. In particular, the lending rate channel, credit channel, and the exchange rate channel were found

weak, even though there is evidence of money supply as the only monetary policy instrument exerting significant effects on real GDP, surprisingly, the connection between money supply and inflation is less clear in the case of Ghana. There is also evidence transmission to inflation of changes in the lending rate. The study established the lack of unequivocal evidence in support of the conventional channel of monetary policy transmission mechanism. It has revealed that money supply was the most important variable in predicting real GDP in the case of Ghana during the study period.

Gyebi, and Bofo, (2013), attempts to identify the macroeconomic factors responsible for inflation in Ghana for the period 1990-2009. For this purpose, their time series model was selected based on various diagnostic, evaluation and selection criteria. They have concluded that the model has sufficient predictive powers and the findings are well in line with those of other studies. The research findings shown 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 help reduce the level of inflation in Ghana giving evidence that the ERP achieved its basic objective of reducing inflationary trend in Ghana.

Thaddeus and Nneka, (2014), their paper models long run relationship between Exchange Rate, Interest Rate and Inflation in Nigeria using autoregressive distributed lag (ARDL) co-integration analysis. The study was motivated by the desire to ensure stability in exchange rate regime through a structurally nexus of interest rate and inflation volatility and targeting. Using an

historical data spanning from (1971-2010), the paper established a significant short-run and long-run positive relationship between inflation and exchange rate. On the other hand, interest rate exhibited a negative relationship, though insignificant.

Uduakobong (2017) investigated the impact of monetary policy on the economic growth of Nigeria using annual data covering the period of 1970 to 2012. Specifically, he seeks to analyze the relationship between money supply and economic growth in Nigeria, determines the nature and direction of causality between money supply and economic growth. The researcher employs the Ordinary Least Square (OLS) techniques and the granger causality test. The result indicates a positive and insignificant relationship between money supply and economic growth. Furthermore, it indicates no causality between money supply and economic growth.

Summary and Gaps in Literature

Inflation being one of the most important macroeconomic indicators worldwide, several studies on the determinants of inflation has been conducted in various parts of the world using time series data. However, the short comings in these studies is that; the researchers have neglected West Africa as an area of study and must never attempted to establish the causal relationship. Further, there is lack of consensus on the relationship between inflation, money supply, interest rate and exchange rate. This study therefore seeks to bridge these gaps by establishing the effect of money supply, interest rate, exchange rate movement on inflation in Ghana using time series data

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter provided a critical perspective of the study setting, research approach and research design. It also examines the data collection method, data sources, models specifications and data analyses procedure. The chapter examined the quantitative research methodology chosen to achieve the research objectives. The chosen methodology, Pallant (2007), intimated that helps in deepening the understanding of the work plan, enabling comparisons with other studies while enhancing possible replication of the study in future.

Study Setting

The study was conducted in Ghana with much focus on the antecedence of inflation in Ghana. The fight against inflation has been a major challenge in the Ghanaian economy. This has aggravated in recent times, this therefore formed the bases for the study. Thus, to investigate the antecedence of inflation in Ghana.

Research Approach

The use of a quantitative research approach was considered for the study owing to the kind of data sought for to achieve the research objectives. Creswell (1994) intimated that a quantitative research is a kind of research where the researcher seeks to explain a phenomenon with the aid of numerical data which is analysed mathematically. This approach, Leedy and Ormrod (2010) is appropriate when the purpose of the study is to explain, confirm and validate, or to test theory.

A quantitative approach was deemed well suited for this study on the antecedence of inflation in Ghana given the need to explain causal relationships between money supply growth, interest rate and real depreciation of the cedi on inflation. A quantitative approach offers a number of useful benefits; these may include providing results that could be reduced to statistics, allowing for statistical comparison among entities, and offering precision, definitiveness, and standardization (Sukamolson, 2005).

This study is mainly explanatory in nature owing to the objectives that are set to be achieved. According to Saunders, Lewis and Thornhill (2009), explanatory research focuses on “studies that establish causal relationships between variables”, For instance, in analysing the effect of money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana.

Research Design

The study sought to examine the effect of money supply, interest rate and real depreciation of the cedi on inflation. Thus, an explanatory research design was best suited for the study. This design is used where there is the need to investigate the effect of one variable on another variable. Explanatory research design may offer the following advantages; it may play a vital role in terms of identifying reasons behind a range of processes and assessing the impact of changes on existing norms and processes, it may aid in replication of study if necessity arises and offer greater levels of internal validity due to systematic selection of subjects. An explanatory research design was employed for this research in order to gain a thorough understanding of how money supply growth, interest rate and real depreciation of the cedi on inflation.

Data Collection Method

Data is very relevant in every study. According to Polit and Hungler (1999) data is the information obtained in the course of an investigation or a study. The study employed secondary annual data for the period 1990 to 2016. The data was obtained given considerations to its relevance to the study's objectives and hypotheses. The purpose of this study is to assess the effect of money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana.

Sources of Data

The main source of the data used in the study was obtained from the website of the Bank of Ghana (BOG) and the World Development Indicators. The Bank of Ghana is the Central Bank of the Republic of Ghana and is responsible for producing and publishing data on a number of economic variables including the ones considered in this study. Inflation and money supply growth (Broad money) were obtained from the World Development Indicators and Real depreciation of the cedi and interest rate from the Bank of Ghana. Gross domestic product and Gross national expenditure as a percentage of GDP which served as control variables were taken from WDI.

Analytical Approach and Methods

This study employed purely quantitative analytical methods. After the data was collected, it was organised and analysed. For analysis, statistical software called E-views 9 was used. E-views supports a wide range of basic statistical analyses, encompassing everything from simple descriptive statistics to

parametric and non-parametric hypothesis tests. The results were presented in tabular form and graphs. Basic descriptive statistics such as mean to show central tendency and maximum and minimum values to show the range were computed over the entire series data as well as standard deviation for the study.

An Autoregressive Distributed Lag (ARDL) model was adopted to examine the effect of money supply growth, interest rate and real depreciation of the cedi on inflation. The general form of this model is as follows for time t , where α and μ_t are the constant and error terms respectively, β , Ω , ϕ and ω are the unknown parameters to be estimated, X_t is the independent variable, where as Y_t represents the dependent variable.

$$\Delta Y_t = \alpha + \sum_{i=1}^p \beta \Delta Y_{t-i} + \sum_{i=0}^p \Omega \Delta X_{t-i} + \phi Y_{t-1} + \omega X_{t-1} \mu_t \dots \dots \dots (1)$$

The ARDL model was adopted for the study because of the following;

It can be Applied to data with different order of integration , the approach allows the model to take sufficient number of lags to capture the data generating process in a general to-specific modeling framework, a dynamic Error Correction Model (ECM) can be derived from ARDL through a simple linear transformation and this helps integrate the short-run dynamics with the long-run equilibrium without losing long-run information, the approach avoids problems resulting from nonstationary time series data and finally, this technique is also suitable for small or finite sample size.

Estimation of Model

The study aimed at assessing the extent to which money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana. Below is the

model that has been adopted to help examine the hypotheses that were tested in the study.

$$\begin{aligned} \Delta INF_t = & \alpha + \sum_{i=1}^p \beta_1 \Delta INF_{t-1} + \sum_{i=0}^p \Omega \Delta Mgr_{t-1} + \sum_{i=0}^p \phi \Delta INT_{t-1} \\ & + \sum_{i=0}^p \delta \Delta Rdep_{t-1} + \sum_{i=0}^p \omega \Delta GDP_{t-1} + \sum_{i=0}^p \theta \Delta GNX/GDP_{t-1} \\ & + \beta_2 INF_{t-1} + \Omega_1 Mgr_{t-1} + \phi_1 INT_{t-1} + \delta_1 Rdep_{t-1} \\ & + \omega_1 GDP_{t-1} + \theta_1 GNX/GDP_{t-1} + \mu_t \dots \dots \dots (2) \end{aligned}$$

Where;

INF = Inflation

Mgr = Money supply growth (broad money)

INT = Interest rate

Rdep = Real depreciation of the cedi

GDP= Gross domestic product

GNX/GDP= Gross national expenditure as a percentage of GDP

Measurement of Variables

The four main variables specified in the model are money supply, interest rate, real effective exchange rate (use to determine the real depreciation of the cedi) and inflation. whiles money supply, interest rate and real depreciation are said to be the independent variables, Inflation is the dependent variable.

Money Supply

For the purpose of this paper, broad money definition is adopted which according to World Bank, (2013) is the sum of currency outside banks; demand deposits other than those of the central government; the time savings and foreign currency deposits of resident sectors other than the central government; bank and

travelers checks and other securities such as certificate of deposit and commercial paper.

Inflation

Consumer's price index (CPI) annual percentage was adopted as a measure of inflation in Ghana according to Patnaik, (2010), CPI is statistical time series measure of weighted average of prices of a specified set of goods and services purchased by consumers. It is a price that tracks the price of a specified basket of consumer's goods and services, providing a measure of inflation.

Interest Rate

This an amount charged expressed as a percentage of principal, by a lender to a borrower for the use of assets. Interest rate is typically noted on an annual basis, known as the annual percentage rate (APR). The monetary policy rate was used as a proxy for interest rate in the current study.

Real Depreciation of the Cedi

This is how the price of a nation's currency changes in terms of another currency. Thus, an exchange rate depreciation has two components, the domestic currency and a foreign currency, and can be quoted either directly or indirectly.

Descriptive Statistics

Descriptive statistics gives initial indication of variables that can be used in regression analysis giving several summarized statistics on a variable, example, mean, medium, standard deviation and also often the lowest and highest observation. (Johansen, 2011). If the means and medians are not much different from each other, then there is an indication that the variables are normally

distributed a fact further confirmed by Jarque-Bera test (Kiganda, 2014). According to University of Reading (2011), the standard deviation represents the amount of deviation from the mean, (the smaller the standard deviation, and the more accurate future predictions may be, because there is less variability). Skewness measures the direction and degree of asymmetry; a value of zero indicates a symmetrical distribution, a positive value indicates skewness to the right while a negative value indicates skewness to the left, value between -3 and +3 indicates typical values of sample from a normal distribution (Kiganda, 2014). While kurtosis measure the heaviness of the tails of a distribution negative kurtosis indicates too many cases in the tails of distribution, positive kurtosis indicates too few cases (Musau & Musau, 2011).

Data Presentation

The study established the determinants of inflation in Ghana. Data on the variables of inflation, money supply, interest rate and exchange rate obtained from official published documents of the Bank of Ghana, World Bank, World Development Indicators and Ghana Statistic Service was presented using tables and figures. Oso and Onen (2009) described tables and figures as useful in presenting findings because they can summarize a lot of information in small space.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter gives an in-depth discussion of the findings of the study in relation to the objectives. This is to allow valid conclusions and recommendations to be drawn in chapter five on the basis of the empirical studies, economic policy framework and theory. The chapter begins with a trend analysis of inflation series, money supply growth, interest rate and real depreciation of the cedi. This is to help determine if there exists a particular trend in these variables in the Ghanaian economy and also to identify reasons behind the existence of such a trend if any. A descriptive analysis was also conducted with regard to the variables of interest considered in the study. This was done using descriptive statistics including mean, standard deviations, minimum and maximum observations, so as to identify the major features of the variables under consideration.

A test for stationarity of variables was also carried out on each of the variables under consideration. This as a matter of fact was done to help identify the order of integration for the variables under consideration to avoid getting spurious results. The chapter proceeded to carry out the analysis of results using an ARDL model to identify the short and long run effects of money supply growth, interest rates and real depreciation of the cedi on inflation rates in Ghana.

Trend Analysis of Variables

A trend analysis of a variable provides a pictorial view of the behaviour of the variable in an economic study over a period of time. Trend analyses are very important because they bring to light, if there exists, a particular pattern of

influence in variables. Figure 1, 2, 3 and 4 therefore observed a trend analysis of inflation, money supply growth, interest rates and real depreciation of the cedi in the Ghanaian economy over the period 1990 to 2016.

Trend analysis of inflation, money supply growth, interest rate and real depreciation of the cedi

In the management and control of inflation, governments and institutions in Ghana have adopted a lot of monetary policy frameworks. The current one being practiced is the inflation targeting monetary policy. The figures below give an analysis of the trend of inflation and money supply growth, interest rate and real depreciation of the cedi which are considered as major variables in determining inflation in Ghana.

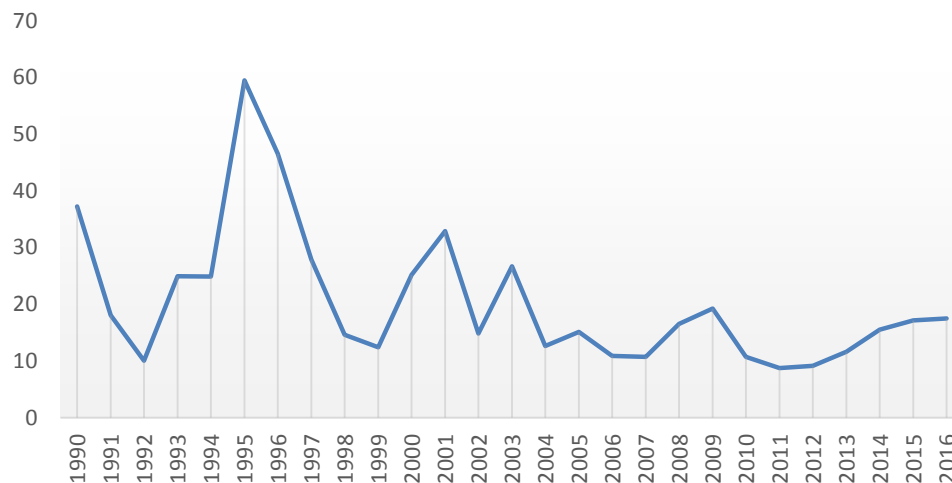


Figure 1: Trend Analysis of Inflation

Source: Graph based on annual data from WDI, 2017

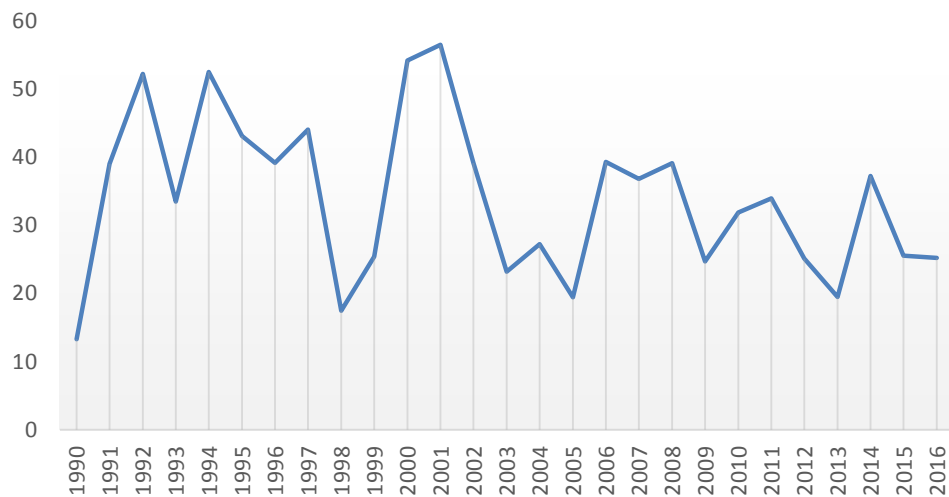


Figure 2: Trend Analysis of Money Supply Growth

Source: Graph based on annual data from WDI, 2017

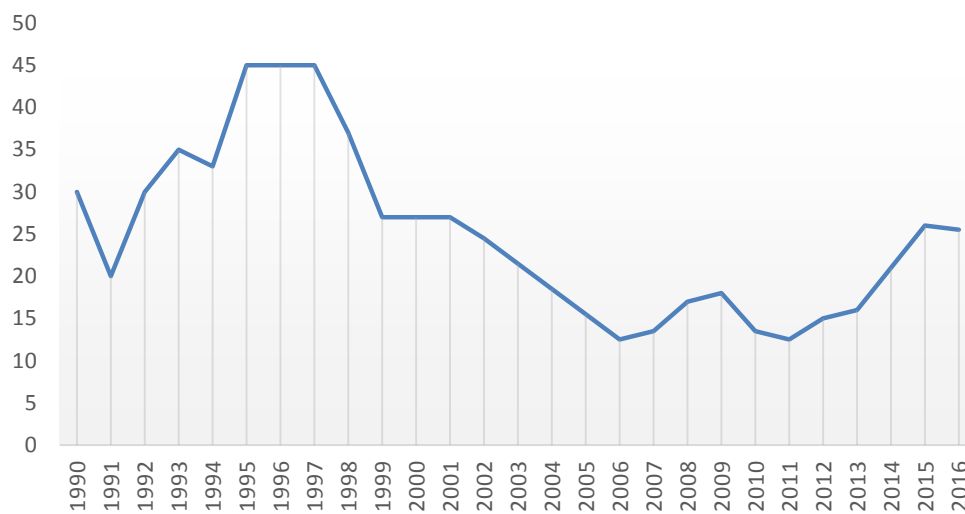


Figure 3: Trend Analysis of Monetary Policy Rate

Source: Graph based on annual data from Bank of Ghana, 2017

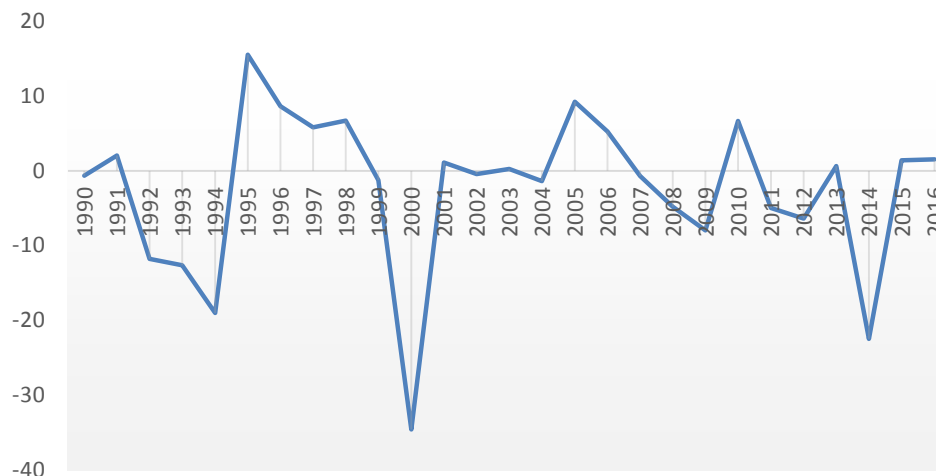


Figure 4: Trend Analysis of Real Depreciation of the Cedi

Source: Graph based on annual data from Bank of Ghana, 2017

Figures 1, 2, 3 and 4 provide a trend analysis of the variables considered in the study. Figure 1, examines the trend of inflation series for the period 1990 to 2016. From the figure, it can be seen that Ghana experienced a relatively high inflation rates in 1990, 1995 and 2001. These figures were recorded prior to the adoption of inflation targeting as a monetary policy. Examining the trend of inflation series and that of the other variables of interest, it can be seen that the graphs exhibited some similarities in trend, with money supply and interest rates showing almost the same trend as that of the inflation rates. Where with regard to money supply, the higher growth rates were recorded in 2000 and 2001 while the highest interest rates were recorded in 1995, 1996 and 1997. These trends exhibited in inflation series, money supply growth and interest rates are consistent with theory and empirical study where money supply and interest rates are deemed to have impacted positively on inflation. This is because at falling rates of inflation, money supply and interest rates were also seen to be falling and at

rising inflation rates, money supply and interest rates were seen to be on the rise. Real depreciation of the cedi was also observed to follow same trends. However, the trend analysis revealed that the cedi has been relatively strong over the period under consideration. Experiencing sight depreciation in 1995, 1996, 1997, 1998, 2005 and 2006. However, in the rest of the years, there was a relatively real appreciation in the value of the cedi. The trend analysis gives prominence to examining the relationship and effect of money supply, interest rates and real depreciation of the cedi on inflation in Ghana.

Descriptive Analysis of the Variables

The study conducted a descriptive statistics analysis of inflation, money supply growth, interest rates and real depreciation of the cedi. This is because they are the major variables of interest under the current study. The descriptive statistics include the mean, maximum, minimum and standard deviation. These statistics are illustrated extensively in Table 1. This was necessary to identify the basic features of the data and also to determine the behaviour of the data. This will help in further evaluation and analysis of the data. From Table 1, it can be seen that all the variables have positive average values (mean) with the exception of real depreciation of the cedi.

Table 1: Descriptive Statistics of the Variables

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
INF	20.41431	16.52214	59.46155	8.726837	12.11508
Mgr	34.03041	33.99495	56.5348	13.30136	11.78427
INT	24.87037	24.5	45	12.5	10.05331
Rdep	-2.369826	-0.416506	15.51543	-34.57209	10.60688

Source: Author's computations, Abdul-Fatahi (2018)

From Table 1, the results showed a summary of the descriptive statistics of the variables, where it can be seen that the average inflation was 20.41% in the period under consideration. This means that on the average inflation was 20.41%. A minimum value of 8.73% and a maximum of 59.46% were also recorded. The standard deviation of inflation was also observed to be 12.12%. This means that inflation was very variable in the period under consideration. Money supply growth was also seen to have an average of 34.03%. this means that on the average money supply increased by 34.03% over the period. A minimum value of 13.30% was recorded and a maximum of 56.53%. The standard deviation of money supply growth was also observed to be 11.78%. Also, Interest rates which are very critical in the promotion of economic activities had an average of 24.87%. This means that on the average, interest rates had increased by 24.87% over the period under consideration. A minimum value of 12.5% and a maximum of 45%, were equally recorded. Exchange rates are very critical to the survival of economies. This is because of world economic integration. The real depreciation

of the cedi over the period under consideration recorded an average of -2.37%. A minimum value of -34.57% and a maximum value of 15.52% were also recorded.

Unit Root Test

The stationarity of variables is very key in determining the usefulness and reliability of the results in the current study. Dickey and Fuller (1979) intimated that in time series analysis, there is the need to test for the presence or otherwise of unit root to avoid spurious regression of which no meaningful and reliable analysis and forecasting can be made. In the test for stationarity, different approaches have been developed and adopted for various studies.

Some of the most common ones are; Dickey-Fuller GLS, Augmented Dickey-Fuller, Phillip-Perron, Kwiatkowski- Phillip-Schmidt-Shun, Elliott-Rothenberg-Stock Point-Optimal and Ng-Perron.

The stationarity status of the data used in the current study was determined through the use of the Augmented Dickey-Fuller (ADF) and Phillips-Parron (PP) unit root tests. The various variables were subjected to the tests at intercept and trend and intercept at 1%, 5% and 10% levels of significance. The results as presented in table 2 were eminent.

Table 2: Unit root test at Levels

Level		ADF		Phillips-Perron	
Variable		Intercept	Trend and intercept	Intercept	Trend and intercept
Data period: 1990-2016					
INF	T-stat.	-3.013818	-3.290892	-3.088696	-3.290892
	P-value	0.0467**	0.0899*	0.0399**	0.0899*
Mgr	T-stat.	-4.156076	-4.148110	-4.192612	-8.005920
	P-value	0.0035***	0.0198**	0.0032***	0.0000***
INT	T-stat.	-1.357253	-1.422712	-1.422648	-1.574451
	P-value	0.5864	0.8297	0.5557	0.7753
Rdep	T-stat.	-2.001647	-2.759396	-2.029863	-2.870585
	P-value	0.2843	0.2233	0.2730	0.1873
GDP	T-stat.	-2.857062	-2.921601	-2.829902	-2.929834
	P-value	0.0643*	0.1723	0.0679*	0.1700
GNX/GDP	T-stat.	-3.135650	-2.956674	-3.135650	-2.956674
	P-value	0.0362**	0.1625	0.0362**	0.1625

Source: Author's computations, Abdul-Fatahi (2018)

From Table 2, the test for stationarity for the variables were subjected to the null hypothesis, “the variable has a unit root”. The rejection of the null hypothesis of each variable for both ADF and Phillips-Perron unit root tests were based on the MacKinnon (1996) one-side p-values. The lag length for the unit root tests was determined automatically by Swartz information criterion (SIC) criteria and Newey-West automatic bandwidth using Bartlett kernel. From the table, “*” means rejection of the null hypothesis of unit root at 10% significance level; “**” rejection of null hypothesis of unit root at 5% level of significance and “***” rejection of null hypothesis of unit root at 1% significance level.

Having established that, it can be observed from table 2 that inflation,

money supply growth, gross domestic product and gross national expenditure as a percentage of GDP were stationary at levels within the specified levels of significance. This means that there was a rejection of the null hypothesis and that these variables were stationary at levels, i.e. integrated at I(0).

The variables that were not stationary at levels were further subjected to the analysis at first difference and the results presented in Table 3.

Table 3: Unit root test at First Difference

		First difference			
		Perron	ADF		Phillips-
Variable		Intercept	Trend and intercept	Intercept	Trend and intercept
Data period: 1990-2016					
INT	T-stat.	-3.094458	-6.734523	-4.743084	-4.616833
	P-value	0.0405**	0.0002***	0.0009***	0.0059***
Rdep	T-stat.	-4.348759	-4.341862	-4.334982	-4.332873
	P-value	0.0023***	0.0107**	0.0024***	0.0109**

Source: Author's computations, Abdul-Fatahi (2018)

The examination of the variables for unit root at levels showed that interest rate and real depreciation of the cedi were not stationary; this was seen as per the results shown in Table 2. A first difference test for stationary was subsequently conducted on these variables as represented in table 3. The results revealed that these variables became stationary at first difference, at the conventional levels of significance, thus integrated at I (1).

Lag Selection Criteria

It is essential, before estimating an ARDL model, to determine the optimal lag length of the model. Table 4, reports on the optimal lag selection criteria based on the sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ), where * indicates lag order selected by the criterion.

Table 4: Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-527.9302	NA	2.77e+10	41.07156	41.36189	41.15516
1	-461.1555	97.59379*	2.82e+09*	38.70427*	40.73658*	39.28950*

Source: Abdul-Fatahi (2018)

* Indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

From Table 4 results, the optimal lag selection is 1. This was based on the lag selection criteria. These therefore informed the use of an ARDL model at lag one in the analysis.

The effect of money supply growth, interest rate and real depreciation of the cedi on inflation

The main objective of the study is to examine the effect of some economic variables on inflation in Ghana. This was paramount to examine due to the limited in scope of studies that tried to examine the issues in perspective and also the recent developments with regard to some of these variables. The study examined the long run and short run effect of money supply growth, interest rate and real depreciation of the cedi on inflation using an ARDL model. However, before the presentation of the results, a Bound test was conducted to determine if there exists any long run co-integration among the variables under consideration.

Table 5: The Results of ARDL Cointegration Test (1, 0, 0, 1, 0, 0)

Test Statistic	Value	K
F-statistic	4.100860	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.08	3
5%	2.39	3.38
2.5%	2.7	3.73
1%	3.06	4.15

Source: Author's computations, Abdul-Fatahi (2018)

Table 5 represents the results of a bound test. This was done to determine if there exists any co-integration among the variables under consideration. An appropriate lag order was selected to calculate the F-statistics for the co-integration. The lag order was selected using the Schwarz information criterion

(SC) lag selection criterion. The Schwarz information criterion (SC) was chosen because it gives a more parsimonious model. Table 5 shows the estimates for ARDL bound testing approach to cointegration. The calculated F-statistics is 4.10648 when inflation, money supply growth, interest rate, real depreciation of the cedi, gross domestic product and gross national expenditure as a percentage of GDP are included in the model. The critical bounds generated by Pesaran, Shin and Smith (2001) have been used. The F-statistic is higher than the upper critical bound of Pesaran et al. (2001) at the 2.5% level of significance. This implies that there exists cointegration among inflation, money supply growth, interest rate, real depreciation of the cedi, gross domestic product and gross national expenditure as a percentage of GDP for the period 1990 to 2016 under consideration.

The Long Run Effect of money supply growth, interest rate and real depreciation of the cedi on inflation

There is the existence of a long run relationship among the variables as reported from the cointegration test. The study then proceeded to estimate the long run Autoregressive Distributed Lag model (ARDL). And the results have been presented in table 6.

Table 6: ARDL long run estimates – Dependent variable is inflation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Mgr	0.218357	0.179147	1.218872	0.2386
INT	0.757476	0.222127	3.410108	0.0031***
Rdep	-0.013130	0.321328	-0.040862	0.9679
GDP	0.263799	0.864653	0.305092	0.7638
GNX/GDP	-0.175074	0.366962	-0.477090	0.6390
C	11.982242	44.061593	0.271943	0.7888

Table 6 presents the long run results, test statistics and P-values of the estimated ARDL model. From the long run estimates, any disequilibrium as a result of a shock in the short run can be corrected by the error correction term. Hence, the error correction term measures the speed of adjustment from disequilibrium to equilibrium. The coefficient of CointEq(-1) shows the speed of adjustment from short run to long run equilibrium and it should be statistically significant with negative sign, and from the results in table 7, this was the case. Banerjee, Dolado and Mestre (1998) noted that significant negative lagged error term sign is a way to prove that the established long run relationship was stable. The estimated coefficient of CointEq(-1) is equal to -0.88. This means that any deviation in short the run from the long run equilibrium in the inflation model is corrected by 88 per cent each year.

The ARDL estimates from Table 6 revealed that growth in money supply had a positive insignificant effect on inflation in Ghana. This means that the growth in money supply has no impact on the recorded inflation figures in the

Ghanaian economy. Thus further increases or decreases in money supply will not have any significant effect on inflation in the long run. Also, from the results, it can be seen that real depreciation of the cedi had a negative insignificant effect on inflation in Ghana. Thus, the overall strength of the cedi does not impact on inflation in the Ghanaian economy. However, interest rates in the Ghanaian economy have demonstrated to have a positive significant effect on inflation at 1% significance level. This means that an increase in interest rate will in turn increase the rate of inflation. As indicated in table 6, it can be seen that a 1% increase in interest rates in the Ghanaian economy will lead to a 0.76% increase in inflation rate. Also, gross domestic product and gross national product as a percentage of GDP which served as control variables under the current study were seen to have insignificant effect on inflation. A detailed discussion of the results is presented under the discussions section of this chapter pursuant to the objectives of the study.

Short Run Dynamic Results (inflation is Dependent Variable)

When variables are cointegrated, their dynamic relationship can be specified by an error correction representation in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short-run and long-run relationships (Engle & Granger, 1991). The existence of long run relationships among inflation and its explanatory variables necessitates the estimation of its long-run coefficients and short run dynamic parameters. The table 7 presents the short run dynamics.

Table 7: Short Run Results-Dependent Variable is inflation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)	-0.884566	0.189127	-4.677091	0.0002***
D(Mgr)	0.198052	0.121531	1.629649	0.1206
D(INT)	0.989659	0.303556	3.260213	0.0043***
D(Rdep)	0.232019	0.112781	2.057256	0.0544*
D(GDP)	0.343985	0.651828	0.527724	0.6041
D(GNX/GDP)	-0.281431	0.299271	-0.940388	0.3595
			Mean	
R-squared	0.675538		dependent var	19.76643
			S.D.	
Adjusted R-squared	0.549358		dependent var	11.86844
			Akaike info	
S.E. of regression	7.967266		criterion	7.236220
			Schwarz	
Sum squared resid	1142.592		criterion	7.623326
			Hannan-	
Log likelihood	-86.07086		Quinn criter.	7.347692
			Durbin-	
F-statistic	5.353779		Watson stat	1.874277
Prob(F-statistic)	0.001914			

Source: Author's computations, Abdul-Fatahi (2018)

Table 7 reports the short run results of the estimated Autoregressive Distributed Lag (ARDL) Model and showed that money supply growth has a positive insignificant impact on inflation in the short run. This means that there are no any short run ramifications of money supply on inflation in Ghana, and thus a percentage increase in money supply will not affect inflation. Also, from table 7, it can be seen that interest rate has a positive significant effect on inflation in the short run at 1% significance level. This means that a percentage increase in interest rate will lead to an increase in inflation by 0.99% in the short run. Real depreciation of the cedi was also seen to have a positive significant effect on inflation at 10% level of significance. This means that a unit increases in real

depreciation of the cedi will lead to a 0.23% increase in inflation. Also, gross domestic product and gross national expenditure as a percentage of GDP which served as control variables under the current study were seen to have insignificant effect on inflation in the short run. A detailed discussion of the results is presented under the discussions section of this chapter pursuant to the objectives of the study.

Discussions

This section gives a detailed discussion on the results of the study. It tries to relate the findings of the study to previous works as provided in literature and theory in order to justify the different results of the different models and provide interpretation of the results for policy formulation and implementation.

The Long Run Effect of money supply growth, interest rate and real depreciation on inflation

The level of inflation is very crucial to the growth of economies, development and improvement the living standards of the people. For this reason, most governments all over the world strive to achieve sustainable levels of inflation through the implementation of various economic policies and programs. This therefore makes it very paramount to examine the effect of money supply growth, interest rate and real depreciation of the cedi on inflation.

From Table 6 as presented in the ARDL model, it can be seen that money supply growth has a positive insignificant effect on inflation. This means that growth in money supply does not impact on inflation in the long run. These findings are consistent with Teshome (2011) where in examining the relationship

between money supply and inflation in Ethiopia, Teshome (2011), observed that money supply had no significant impact on inflation. With such an observation, Teshome (2011), rather observed that controlling or reducing money supply will negatively affect economic growth. The findings in the Ghanaian context, where the injection of money to the economy can't impact on inflation could be as a result of high velocity of money caused by growth of financial institution and economic transaction in the economy. This means that where the injection of money supply into the economy affects the velocity of money as a result of growth in financial institution and economic transactions; money supply will not have any impact on inflation. The findings of the study are therefore contrary to the view point of the quantity theory of money, where inflation in an economy is always seen as a monetary phenomenon. This therefore explains why the monetary targeting as a monetary policy was not much efficient in the fight against inflation leading to the adoption of inflation targeting as a monetary policy.

Also, the findings of the study are contrary to the findings of Wolde-Rufael (2008), where under a bound testing approach, money supply was seen to have a positive significant effect on the level of inflation in Ethiopia. Similar findings were also espoused by Kesavarajah and Amirthalingam (2012), where under the Johanson and Juseliues multivariate cointegration test, it was observed that monetary stability have impacted in price stability in Nigeria.

Interest rates were observed to have a positive significant effect on inflation in Ghana. This means that an increase in interest rate will lead to an

increase in inflation. The findings of the study are consistent with Wesso (2000). Wesso (2000) used a cointegration and error correction modelling techniques and found that interest rates are cointegrated with expected inflation for the period studied. However, the findings of the study are contrary to the findings of Likukela (2007), where interest rates were seen to have a negative significant effect on inflation.

The findings of the study are consistent with the Fisher's theory, where the level of interest rates in an economy are always deemed to be determined by the level of inflation. Meaning a high inflation rate will mean a high interest rate; establishing a positive relationship between inflation and interest rate. The findings of the study are, as a result of the fact that majority of the business community in Ghana obtain their funds use in financing their operations through borrowing. This means that any increase in the interest rate will invariably increase their cost of operations thereby necessitating cost recovery processes through price increment which leads to inflation.

In examining the effect of exchange rates on inflation in Ghana, most study used the bilateral exchange rate (GHS/USD). This for a fact may not determine the real strength of the cedi and thus the real impact on inflation and economic activities. The current study however, used the real depreciation of the Ghanaian cedi in examining the effect of exchange rate depreciation on inflation in Ghana. The results from the study indicated that real depreciation of the cedi had a negative insignificant effect on inflation in the long in Ghana. This means that a unit increase in the real depreciation of the cedi will not impact on the level

of inflation. The findings of the study are contrary to the findings of Likukela (2007), where depreciation of the South African Rand had a negative significant effect on inflation in South Africa.

Short Run Dynamic Results of the Effect of money supply growth, interest rate and real depreciation on inflation

Table 7 presents the short run dynamic results estimated under an ARDL model. From the short run estimates, any disequilibrium as a result of shocks can be corrected by the error correction term. Hence, the error correction term measures the speed of adjustment from disequilibrium to equilibrium. The coefficient of CointEq (-1) shows the speed of adjustment from short run to long run equilibrium and it should be statistically significant with negative sign, and from the results above, this was the case. Banerjee, Dolado and Mestre (1998) noted that significant negative lagged error term sign is a way to prove that the established long run relationship was stable. The estimated coefficient of CointEq (-1) is equal to -0.88. This means that any deviation in short run from the long run equilibrium in the inflation model is corrected by 88 per cent each year.

From Table 7 and as presented in the ARDL model, the short run dynamic results indicated that money supply growth had a positive insignificant effect on inflation. This means that money supply has no impact on the recorded inflation in Ghana. The short run findings are not different from the long run result where money supply had positive insignificant effect on inflation. the findings of the study are consistent with Amarasekara (2009), where it was indicated that, any contraction in money supply had no impact on inflation in Sri Lanka. The findings

of the study are however inconsistent with the findings of Commodore (2016), where money supply growth was seen to have a positive significant effect on inflation in Ghana. Also, the short run results indicated that both interest rate and real depreciation of the cedi had a positive significant effect on inflation. This means that in the short, a percentage increase in interest rate will lead to an increase in inflation and a unit increase in real depreciation of the cedi will lead to an increase in inflation. The findings of the study are consistent with Kyereboah-Coleman (2012) where depreciation in the cedi was seen to have a positive significant effect on inflation in Ghana. The short run findings are consistent with the quantity theory of money, where inflation is and always a monetary phenomenon and the purchasing power parity theory where depreciation in a currency must be compensated for by a price increment.

Diagnostics

In a quest to ascertain the validity and reliability of the results estimated in the inflation model, a number of post estimation tests were conducted. The regression for the ARDL indicated significant post estimation test results. These are presented in table 8.

Table 8: Post Estimation tests for ARDL

Test	Statistic	Conclusion
Breusch-Godfrey Serial Correlation LM Test	F-statistic=1.214179 (0.3229) Obs*R-squared 3.426095 (0.1803)	No serial correlation
ARCH Test	F-statistic= 0.066300 (0.7991) Obs*R-squared 0.071858 (0.7887)	No Heteroskedasticity
Multivariate Normality	Jarque-Bera= 0.264029 P. value= 0.876328	Residuals are normally distributed

Source: Author's Computations, Abdul-Fatahi, 2018

The model recorded as presented in table 7, R-squared of 0.675538 and adjusted R-squared of 0.549358 implying a high predictive power of the determinants. The high R-squared showed a tight fit for the model. The R-squared therefore means that about 68% of variations in the dependent variable are been explained by the independent variables. The F-statistic was also significant at 1%. This means that the independent variables jointly explained variations in the dependent variable. A Durbin-Watson statistic of 1.874277 was also recorded; this is within the acceptable range of 1.5 to 2.5.

From the results in Table 8, the Breusch-Godfrey correlation LM test result was insignificant at 10%. This is an indication of the acceptance of the null hypothesis of “no serial correlation” in the residuals. Therefore, there is no serial or autocorrelation in the residual; this was also confirmed by the Durbin-Watson statistic. The ARCH test result was also insignificant at 10%. This is also an

indication of the acceptance of the null hypothesis of “no heteroskedasticity” in the residual. Therefore, the residual was homoscedastic. The Jarque-Bera test of normality P-value was insignificant at 10%. This means an acceptance of the null hypothesis that the residual is normally distributed.

Stability Tests

Hansen (1992) observed that estimated parameters of a time series data may change over time. As a result, it is important to conduct parameter test. This is because a model misspecification may arise because of the varying nature of the parameters which has the tendency of biasing the results. Pesaran and Pesaran (1997) advised that under such circumstances, a cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests be employed to assess the parameter robustness. These tests examine the stability of the parameters in the model of the study for the period under consideration. This option plots the cumulative sum and the cumulative sum of squares together with the 5 percent critical lines. The test finds a parameter to be unstable if the cumulative sum and cumulative sum of squares goes beyond the area between the two critical lines.

Appendix A shows the plots of the CUSUM and CUSUMSQ for the estimated ARDL model. The graphs indicated the absence of any instability of the coefficients because the plots of these graphs are confined within the 5 per cent critical bounds of parameters stability suggesting that the coefficients of the estimated model are relatively stable over the study period.

Summary and Conclusions

This chapter centered on examining the money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana. This was achieved using an Autoregressive Distributed Lag (ARDL) model. The ARDL was used to explore the long and short run relationship among variables. The results disclosed and discussed the long run relationship as well as the short run estimates.

The long run estimates revealed a positive insignificant effect of money supply growth on inflation. The effect of real depreciation of the cedi on inflation in the long run was also seen to negatively insignificant. However, interest rates were also seen to have a positive significant effect on inflation in Ghana. The short run estimates reveal positive and statistically insignificant effect of money supply growth on inflation. however, interest rates and real depreciation of the cedi had a positive significant effect on inflation in the short run.

The diagnostic and parameter stability tests reveal that the model passes the test of serial correlation, residual was fairly normally distributed and that there was no heteroskedasticity. The graph of CUSUM and CUSUMSQ showed the absence of any instability of the coefficient because the plots of these graphs are confined within the 5 per cent critical bounds parameter stability suggesting that all coefficients in the estimated ARDL model are stable over the study period.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter provides a summary, conclusion and policy recommendations espoused from the study for the Ghanaian government, policymakers and analysts as well as scholars. The purpose is to elaborate on the major findings of the study and thereafter suggest policy recommendations to be considered. The chapter first provides a brief summary of the overview of the research problem, objectives, methodology and findings whereas the conclusion encapsulates the overall outcomes regarding the study in the light of the hypotheses advanced in chapter one. The chapter then concludes on the major findings of the study before advancing policy recommendations. Limitations for the study as well as direction for future studies are equally featured in the chapter.

Summary Key Findings

The relevance of inflation management in propelling economic growth has come under serious criticism in contemporary times in the Ghanaian context. This is as a result of the fact that amidst the continue increase in programmes and policies meant to control inflation, economic growth has still not lived up to expectations. This as a matter of fact has raised a lot of issues regarding the factors influencing inflation management in Ghana. The study therefore sought to examine the effect of money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana. This is in furtherance of the fact that there are only a few studies that examine the issues in context.

The main objective of this study was to examine the effect of money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana using annual time series data from 1990 to 2016. The study investigated the long run and short run effect of money supply growth, interest rate and real depreciation of the cedi on inflation amidst control variables such as gross domestic product and gross national expenditure as a percentage of GDP in Ghana. An Autoregressive Distributed Lag model was adopted as the estimation technique.

The empirical model was specified based on an extensive review of the literature on the macroeconomic variables and inflation. The variables included in the model are; inflation, money supply growth, interest rate, real depreciation of the cedi, gross domestic product and gross national expenditure as a percentage of GDP.

On the methodology, the stationarity properties of the variables were tested using the Augmented-Dickey Fuller (ADF) and Phillips-Perron test statistics. The unit roots results suggest that inflation, money supply growth, gross domestic product and gross national expenditure as a percentage of GDP were stationary at levels. However, interest rate and real depreciation of the cedi were found to be stationary after taking the first difference. The study employed an Autoregressive Distributed Lag model to examine the long-run and short-run dynamics among the variables used in the estimation. The ARDL analysis showed the presence of economically interpretable long-run and short run relationship among inflation, money supply growth, and interest rate, real depreciation of the

cedi, gross domestic product and gross national expenditure as a percentage of GDP.

In the long run, the regression estimates indicated that there is an insignificant positive effect between money supply growth and inflation. However, interest rate in the long run was observed to have a positive significant effect on inflation in Ghana. Real depreciation of the cedi was also seen to have a negative insignificant effect on inflation. The short run results indicated that money supply growth had a positive insignificant effect on inflation; interest rate and real depreciation of the cedi were equally observed to have a positive significant effect on inflation in Ghana.

Conclusions

From the results of the study, the following propositions were made. In the long run, interest rate has a positive significant effect on inflation in Ghana; however, money supply growth and real depreciation of the cedi have insignificant effect on inflation. The short run results also indicated that interest rate and real depreciation of the cedi had positive significant effect on inflation in Ghana. However, in the short run also, money supply growth also had insignificant effect on inflation.

Recommendations

The management and control of inflation is of great concern in Ghana and will continue to receive a lot of attention in economic literature. Based on the findings of this study the following recommendations can be made:

From the results obtained money supply is not an integral part in the fight against inflation in Ghana. This confirms why the Bank of Ghana has shifted from monetary targeting to inflation targeting monetary policy. Therefore, to reduce inflation in the economy, immediate measures need to be adopted by the Central Bank to strengthen the effectiveness of inflation targeting as a monetary policy. Also, interest rate had positive significant effect on inflation in both long run and short run. It is therefore recommended that Bank of Ghana should continue to use interest rate as the major instrument in the conduct of monetary policy in Ghana. Real depreciation of the cedi also had positive significant effect on inflation. It is therefore recommended that measures should be implemented to reduce the depreciation of the cedi, through the reduction of budget deficit financing and reduction in external borrowing.

Direction for Future Research

First, this study focuses on the effects of money supply growth, interest rate and real depreciation of the cedi on inflation in Ghana. This means that it is limited to a Ghanaian context; and therefore, it is not applicable to any other region outside Ghana. Therefore, further analysis can be done for different countries.

Furthermore, aside money supply growth, interest rate and real depreciation of the cedi, there are other macroeconomic variables that can impact on inflation in Ghana. Future studies can therefore consider the effect of other macroeconomic variables on inflation in Ghana.

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APPENDIX A

Plot of Cumulative Sum (CUSUM) and Cumulative Sum of Squares

Recursive Residuals (CUSUMSQ)

Figure 5: Cumulative Sum of recursive residuals (CUSUM)

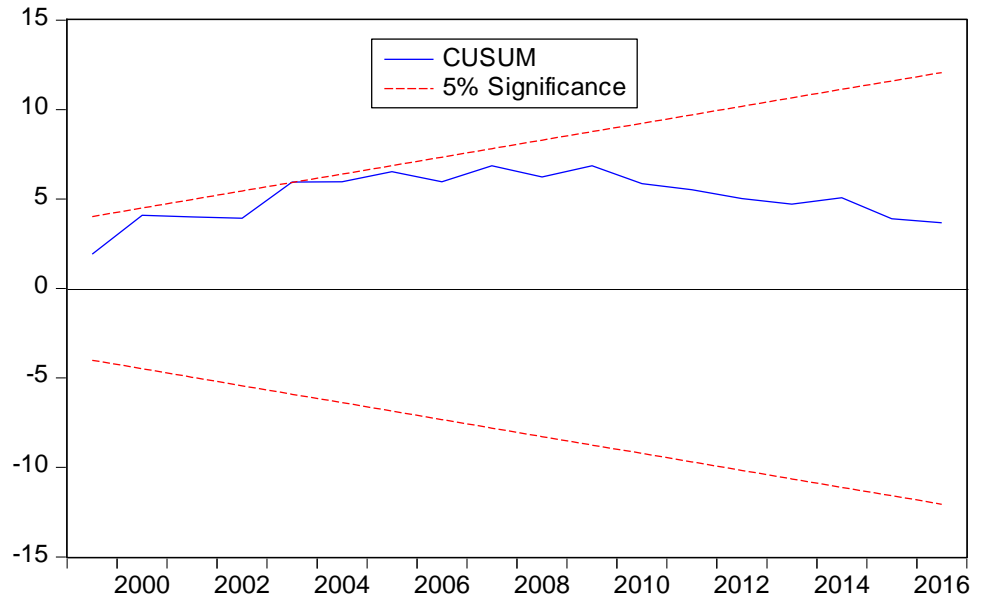


Figure 6: Cumulative Sum of Squares Recursive Residuals (CUSUMSQ)

