UNIVERSITY OF CAPE COAST

EFFECTS OF EXCHANGE RATE, INFLATION AND INTEREST RATE ON ECONOMIC GROWTH IN GHANA

FRANK YAW YEBOAH

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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

work and that no part of it has been presented for another degree in the

University or elsewhere.

Candidate's Signature…………………………… Date……………………………

Candidate's Name:……………………………………………………………….

Supervisor's Declaration

I hereby declare that the preparation and presentation of the

dissertation were supervised in accordance with guidelines on supervision of

thesis laid down by the University of Cape Coast.

Supervisor's Signature:…………………………. Date……………………………

Supervisor's Name:…………………………………………………………...

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ABSTRACT

This study therefore investigates the effect of Ghana's exchange rate, inflation, and interest rate on economic growth over the period 1980 to 2015 using quarterly time series data. It examines the extent to which exchange rate policy have been able to contribute to lowering the probability of currency and banking crises, ensuring sustainable internal and external balance, and containing inflation and interest rate. Given the political economy, more openness, the structural wage-price processes, the degree of backward and forward looking behavior in the Ghanaian economy, the paper draws out implications for macroeconomic policy. The paper employs the Johansen's co-integration analysis within the framework of Vector Autoregressive (VAR) to empirically investigate the effects of rate of exchange, inflation and interest rateon economic growth since the adoption of floating exchange rate regime in the country. The results indicated that, the past one year of inflation rate and the past two years of interest rate had negative impacts on the growth of real GDP in Ghana respectively while the past one year of exchange rate, had a positive impact on the growth of real GDP in Ghana.The Granger Causality test also indicated bi-directional causality between exchange rate and real GDP, unidirectional causality between inflation, interest rate and GDP. The study therefore clearly recommends that the government of Ghana and Bank of Ghana intensify their efforts stabilising these policy variables as they are capable of influencing the country's macroeconomic policy decisions in both short and long run.

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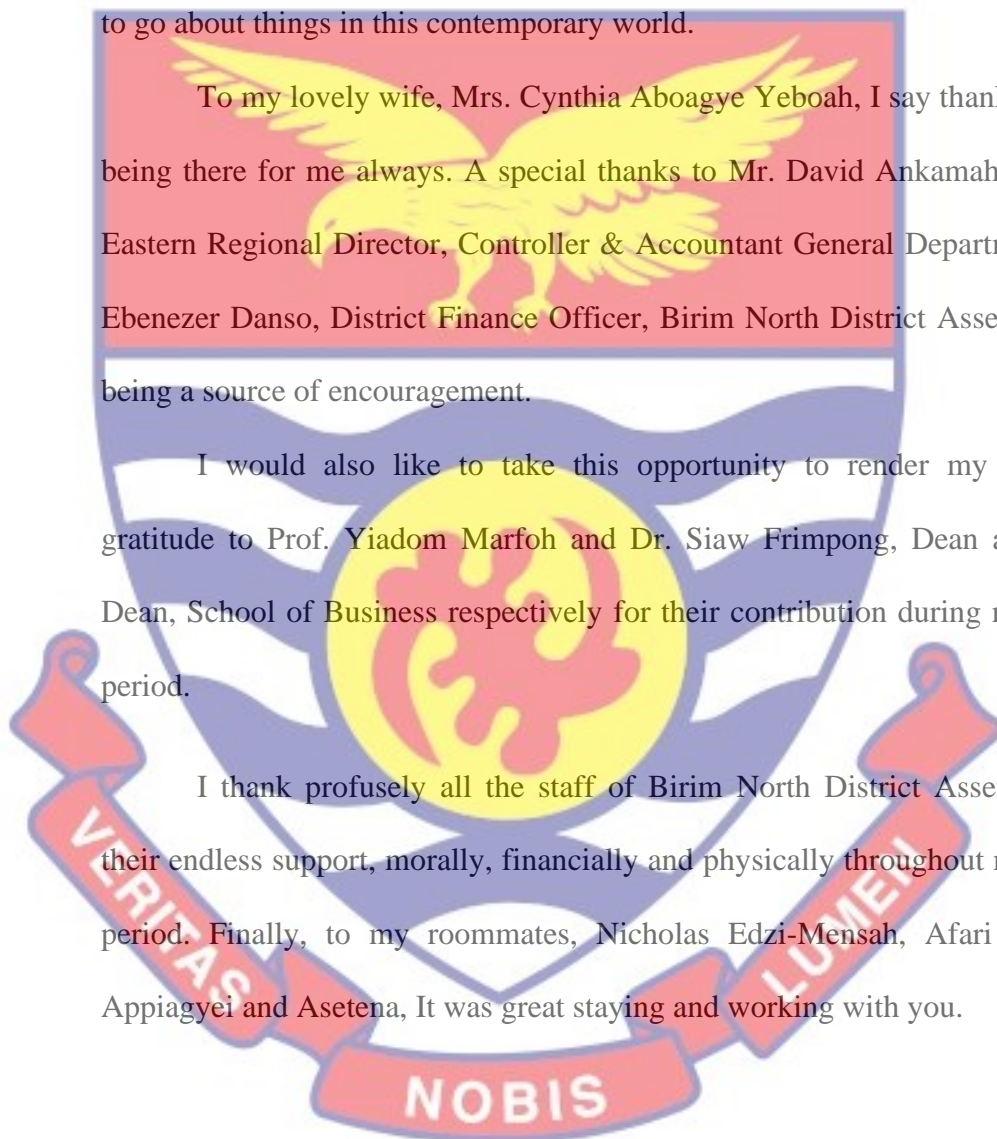
DEDICATION

This work is dedicated to my lovely children Nyamekye, Nyame Tease, Amoakoa and Nyame Ye for their understanding in the course of my study and writing of this research work.

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CHAPTER ONE

INTRODUCTION

This section presents the overview on the study which includes the background to the study, statement of problem, purpose of the study, objectives of the study, hypotheses of the study, significance of the study, scope of the study, and organization of the study.

Background to the study

Economics is a reflection of human behavior, referred to as "rational self-interest" (McConnell & Brue, 2008). Rational self-interest can be interpreted as an increase in income, rents, interest, and profit that makes a person able to meet their needs. Every individual tries to reach a standard of satisfaction by the consumption of goods or services, by allocating power, money, or time to achieve satisfaction. The problem lies in the limitedness of resources. Scarcity and availability of goods and services within a country will reflect the level of economic growth (Semuel & Nurina, 2015). High or low economic growth can be measured by calculating the gross domestic product (GDP) of the country concerned. Rodrik (2009) proves that GDP is affected by currency exchange rates (exchange rate) of a particular country. Udoka and Roland (2012) state that, interest rate is one of the determinants of economic growth. The statements made by researchers above can prove that the interest rate, inflation and the exchange rate can influence economic growth.

Most policy rate reaction functions for Central Banks in an open economy framework have output gap, inflation gap and exchange rate gap as explanatory variables. Following similar specification in literature, Granville and Mallick (2010) using monetary policy rule for an open economy tested

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empirically the reaction of the interest rate to exchange rate changes and inflation rate shocks. Estimation incorporated assumptions that the central bank has a desire to accumulate more reserves even under a negative supply shock in form of higher oil prices. They imposed sign restrictions to identify exchange rate shocks and inflation shocks to examine impulse responses functions. They found, using an error correction form and a sign restriction approach that Russian monetary authorities focused more on targeting the exchange rate rather than inflation as an instrument for monetary policy.

Achieving high sustainable economic growth with low inflation as a poverty reduction strategy is the principal objective of policy makers in both developed and developing countries (Khan &Senhadji, 2001). This is because; high growth makes it possible to raise the living standards of the impoverished in the society. Hence, it begets the opportunity for some people to be made better off in society without making others worse off (Douthwaite, 1997). In addition, low inflation and high long term growth improves the efficient allocation of resources and increases employment in the economy.

For all countries, both developed and developing, one of the fundamental objectives of macroeconomic policy is economic stability. In Ghana, monetary and fiscal policies are aimed at sustaining high growth rates in terms of Gross Domestic Product (GDP) together with low inflation by way of price stability. Ghana has been targeting a single digit average inflation rate. The monetary policy committee (MPC) of Bank of Ghana on 15th may, 2011 reduced it policy rate from 13.5% to 13% as a result of improvement in the economy. This was expected to trigger a reduction in the interest rate of the commercial banks and consequently make the cost of borrowing cheaper.

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Boyd et al. (2001) examines five –year average data on bank credit extension to the private sector, the volume of bank liabilities outstanding, stock market capitalization and trading volume (all as ratios to GDP) and inflation for a cross section sample over 1960-1995, Boyd et al. (2001) finds that, at low to moderate rates of inflation, increases in the rate of inflation lead to markedly lower volumes of bank lending to the private sector, lower levels of bank liabilities outstanding and significantly reduced levels of stock market capitalization and trading volume.

According to Frimpong and Oteng (2010), a high rate of inflation beyond 14% will always hurt GDP, the reason for Bank of Ghana monetary planning committee always targeting a single digit rate. Macroeconomic variables such as inflation, interest rate, exchange rate etc. have been established by considerable research to be of great determinants of GDP elsewhere in developed countries. Successive governments in Ghana had initiated several fiscal and monetary policies aimed at bringing inflation and interest rate down with the view to boosting economic growth as measured by GDP. Whiles these policies might be good, the effects of these macroeconomic variables on the economies of developing countries has not been well established.

Statement of the problem

Macroeconomic stability particularly price stability is a recipe for high and sustainable economic growth in both developed and developing nations, despite the indeterminate causal links between exchange rate, inflation, interest rate and economic growth on both the theoretical and empirical grounds (Suva & Fiji, 2004; Andinuur, 2013). This therefore raises skepticism

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about the potency in stimulating growth. Notwithstanding the controversy and uncertain nature of the relationship between inflation, interest rate and growth and the channels through which inflation and interest rate affect real economic activities, Ghana is pursuing price stability to ensure low and stable prices in order to enhance high economic growth.

Further, the effect of exchange rate, Inflation, and Interest rate on economic growth in Ghana is a serious malady. There is a general consensus that high Inflation rates and Interest rate cause problems for aggregate economic performance, although there is much less agreement about the relationship between Inflation, Interest rate and economic growth and how it affects economic activities at the macroeconomic level. This has generated a significant debate both theoretically and empirically.

Literature on these variables is sparsely available and scattered. Also, the exact correlation between some of these variables and GDP is not well established. To what extent should the government pursue its objective of single digit inflationary target? Are inflation and Policy rates determinants of GDP in Ghana? These and many more are the macroeconomic problems that ought to be answered in Ghana.

Therefore, the study investigates the effect of changes in the exchange rate, inflation and interest rates on the Gross Domestic Product (RGDP) of Ghana over the period.

Purpose of the Study

The purpose of this study is to examine the linkages between exchange rate, inflation, interest rate and economic growth in Ghana between the periods 1980 and 2014.

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Objectives of the Study

In order to achieve this broad objective, the study is specifically designed to:

1. Explore the long run relationships between exchange rate, inflation, interest rate and economic growth in Ghana.

2. Examine the short run relationships between exchange rate, inflation, interest rate and economic growth in Ghana.

3. Determine the causal linkages between exchange rate, inflation, interest rate and growth in Ghana.

Hypotheses of the study

1. H_0: There is no long run relationship between exchange rate, inflation, interest rate and economic growth in Ghana.

    H_1: There is long run relationship between exchange rate, inflation, interest rate and economic growth in Ghana.

2. H_0: There is no short run relationship between exchange rate, inflation, interest rate and economic growth in Ghana.

    H_1: There is short run relationship between exchange rate, inflation, interest rate and economic growth in Ghana.

3. H_0: There is no causal link between exchange rate, inflation, interest rate and economic growth in Ghana.

    H_1: There is causal a link between exchange rate, inflation, interest rate and economic growth in Ghana.

Significant of the Study

There are several reasons why the dynamic interaction between exchange rate, inflation, interest rate and economic growth must be studied.

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First, these variables are important determinants of the growth process of Ghana. Therefore, a literature that will empirically examine the exchange rate-inflation-interest rate-growth causal link is important because high exchange rates harm inflation and interest rate and subsequently economic growth in the economy, thus slowing the growth process. The direction of causality between exchange rate, inflation, interest rate and growth will be crucial for the formulation of policies that will deal with these variables.

Previous studies on the dynamic interactions between exchange rate-inflation-interest rate-growth in Ghana suffer misspecification bias in terms of omitting variables. Some of them also present conflicting results (see Frimpong & Oteng, 2006; Antwi et al., 2013). This study is different from others because of the sample size, the models and the method used in analyzing the data. Finally, this study will close the obvious research gap that already exists in the literature. It will also serve as a point of departure for further research in addition to providing information to future researchers who may be interested in studying these variables in Ghana.

Organisation of the Study

The study is organized into five chapters. The first chapter is the introduction which covers the background to the study, problem statement, objectives of the study, hypotheses, significant of the study, scope of the study, and organisation of the study. Chapter two presents summary of the existing theoretical and empirical literature on the exchange rate-inflation-interest rate-growth interaction. Chapter three is the methodology for the study. Chapter four focuses on models estimation and results and discussion. Chapter five comprises of summary, conclusions and policy recommendations.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

The general objective of this chapter is to present the review of relevant literature on the relationship between exchange rate, inflation, interest rate and economic growth. The review of related literature is aimed at getting supporting theories and empirical evidence for the study as well as helping the study to get the appropriate methodology. This chapter is structured into three main sections. The first section considers the Ghana's growth experience; macroeconomic performance in Ghana. The second section presents and discusses the theoretical literature on exchange rate, inflation, interest rate and economic growth. The final section in this chapter presents a review of empirical literature on exchange rate, inflation, interest rate and economic growth.

Ghana's growth experience

The trend of economic growth in Ghana has been characterized by a lot of ups and downs since independence. Given the high rates of economic growth the country experienced at the early stages of independence, one would have expected that these high rates of growth would have continued to spur the country into becoming a high-income country by the end of the twentieth century. However, Ghana's economy began to experience a slowdown in the growth of GDP by 1965. Aryeetey, Fosu, and Bawumia (2002) mentioned that, Ghana's economic growth was turbulent for much of the period after 1965 and only started stabilizing after 1983. In fact, the country experienced periods of negative economic growth rates between 1965 and 1984, where the

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lowest growth rate of -12.4% was recorded in 1975. This was attributed to the decline in the production of cocoa, minerals, and timber, which were the main foundation of the nation's exports, within that period. Cocoa exports, for example, reduced from 382,000 metric tonnes in 1974 to 159,000 metric tonnes by 1983 (World Bank, 1987).

The poor performance of the economy called for the implementation of an Economic Reform Programme (ERP) and the Structural Adjustment Programme, with the aim of halting the downward trend in economic growth and stabilizing the macroeconomy. Aryeetey and Kanbur (2008) noted that, the economy responded positively to the economic reforms as it recovered from its negative growth rate of 5% in 1983 to an immense positive economic growth rate of about 8% in the following year. Ghana has since the implementation of the ERP and SAP seen consistent, stable, and positive economic growth, with annual growth rates averaging 5.4% (World Bank, 2012).

Although the nation continues to enjoy high economic growth rates, average economic growth of (5.4%) is seen as woefully inadequate given that the country in 1993 set itself to become an upper middle income country by 2020 (Fosu & Aryeetey, 2008). For this target to be achieved, it was estimated using a Harrod-Domar model that the economy needed to grow, on average, at 8% to achieve this goal (Institute of Economic Affairs, 1992). The economy did not show any capacity of achieving this target in five years after the targets were set. The economic and growth performance of the country had been characterized by the non-attainment of macroeconomic targets. Particularly, while GDP was expected to grow between 7.1% and 8.3% in the period 1996-

2000, actual growth was between 4.2% and 5.0% (Fosu & Aryeetey, 2008). The situation of significant divergence between actual and targeted macroeconomic figures is best reflected by developments in 1999.

For example, in 1999, real GDP growth of 4.4% was 1.1% less than the targeted growth; end-of-period inflation was 4.3% higher than targeted, and budget deficit was 3% higher than what was targeted. This trend of non-attainment of macroeconomic targets persisted up to 2002 (Centre For Policy Analysis, 2003). Developments following the successful implementation of the Highly Indebted Poor Country (HIPC) initiative, which brought huge debt relief to the country and the discovery of oil in commercial quantities have seen the country making a lot of progress towards becoming an upper middle income country. GDP growth accelerated from 4% in 2001 to a 14.4% in 2011 while *per capita* GDP growth has increased from U.S. $270.43 in 2001 to U.S. $1570.13 in 2011 (World Bank, 2012).

Nonetheless, the country needs to put in more efforts to become an upper middle income by 2020, given that the average growth rate of the economy is still less than (8%) and the fact that the economy is still hugely dependent on primary commodities as its major exports. Fosu and Aryeetey (2008) noted that, the inability of the Ghanaian economy to grow beyond an average of (6.0%) per annum is basically due to the absence of structural transformation of the economy. This is influenced by the fact that macroeconomic policies have not been grounded in a comprehensive and reliable long-term development framework. To realize constant economic growth and increased production, productivity must be at the hub of economic planning and recovery strategy. To formulate strategies for attaining sustained

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increase in production and rapid economic growth necessary for poverty reduction and the attainment of upper middle income by 2020, all relevant information is necessary. Hence, it is very necessary to decompose the structure of Ghana's economic growth rate in order to get a better understanding of the factors that have produced differences in growth rates in the various periods.

Theoretical Review

In this section, the Keynesian and the Neo-classical models are explained to which form the foundation for this study to investigate the relationship among the variables under study.

The Keynesian Theory

The Keynesian model is actually based on the concepts of Aggregate Demand (AD) and Aggregate supply (AS). This theory posits that, in the short-run, the AS curve slopes upwardly instead of being in the vertical position. Thus, when the AS curve is vertical, shocks to the demand side of the economy affects only prices. However, as cited in Andinuur (2013), Dornbusch, et al. (1996) reveal that, as a result of this upward sloping nature of the AS curve, changes in demand can now result in changes in prices and output. Moreover, due to the short-run dynamic equilibria of the AD and AS curves, there is the formation of an adjustment path which initially exhibits a positive relationship between inflation and growth, but later turns negative. Further, the positive relationship between inflation and growth generally occurs as a result of time inconsistency problem. Therefore, some producers are of the view that their output prices are raising while those of others remain

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the same and that they produce more output, which in turn increases the overall output rises (Dornbusch, et al., 1996). On the contrary, Blanchard and Kiyotaki (1987) think that this positive relationship is traceable to the agreements which firms make to produce goods at higher price in the future. Soon after that, the link becomes negative which describes the occurrence of stagflation when output falls or remains constant against rising prices (Gokal & Hanif, 2004).

Neo-classical Theory

Within the neoclassical school, there are several models that attempt to explain economic growth of nations. However, the dynamic relationship between inflation and growth in output can be deduced. Solow (1956) was one of the first to develop a model to explain growth in output. Solow's model exhibits diminishing returns to scale and labour and constant returns to both factors jointly. Solow (1956) assumed that changes in technology which mainly explain long-term growth is determined exogenously (Todaro, 2000).The Early neo-classical Solow believed that there exists no relationship between inflation and growth as growth was assumed to be exogenously determined (Ray, 1998).

Mundell (1963) provided a dynamic mechanism linking inflation to economic growth. In his model, when inflation increases, it immediately reduces the wealth of the people. This is premised on the fact that the rate of return on a person's real money balances falls. Consequently, people save more in other assets which increase their price and pulls down the interest rate. This boosts up the capital accumulation in the economy thus speeding up growth in output. Tobin (1965) also presented a similar mechanism which

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relates inflation with economic growth by developing Mundell's model. Tobin followed Solow (1956) and incorporated the assumption that money is a store of value in the economy. In Tobin's model, when the rate of inflation increases, it motivates people to replace interest bearing assets with money leading to greater capital intensity and stimulating economic growth. Thus, inflation relates positively with growth in output. Sidrauski (1967) proposed a model where money is "Superneutral". He explains that Superneutrality only holds when real variables, including the growth rate of output, are independent of the growth rate in the money supply in the long-run. The major result in Sidrauski's economy is that an increase in the inflation rate does not affect the steady state capital stock. As such, neither output nor economic growth is affected.

Stockman (1981) another neo-classical theorist provided another explanation to relate inflation and growth. According to his model, an increase in inflation could significantly reduce the output level. In Stockman's model, money is assumed as a complement to capital. So when inflation raises, the purchasing power of money erodes, which leads to low capital accumulation and consequently, there is a decline in output growth. In this way Stockman provided a strong justification for a negative linkage between inflation and economic growth. Thus, within the neoclassical framework, the models yield varied results with regard to the relationship between inflation and growth. Thus inflation can have positive or negative or no effect on growth.

Empirical Review

Numerous researchers have examined the relationship between exchange rate, inflation, interest rate and growth for cross country, developed countries and developing economies using a wide variety approaches. However, there are few widely agreed on results. In this section, a selected number of the empirical studies are reviewed.

Mehmet (2011) explored the association between growth, FDI, trade and inflation in turkey using annual time series data over the period from 1970 to 2008. The results of the Johansen co-integration test revealed that inflation and FDI are positively related to growth.

Faiza, Anish and Bisma (2012) also investigated the relationship between inflation, foreign direct investment and growth in Pakistan using annual time series data over the period of 1990 to 2011. FDI was taken as dependent variable whereas GDP and inflation were taken as independent variables using regression analysis. The result suggests that foreign direct investment relates positively with inflation and growth. As clearly seen from the studies, the conflicting results are due to the different estimation techniques. Whereas Mehmet employed Johansen cointegration test, Faiza et al. used the multiple regression analysis. Similarly, Taiwo (2011) examined the long-run co integration relationship between inflation, investment and growth in Nigeria over the period 1980 to 2006. The results from the ordinary least squares indicated that inflation relates negatively and positively with growth. Critical examination of the study revealed that the above studies fail to check for causality between the variables.

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Omankhanlen (2011) explored the effect of exchange rate and inflation on foreign direct investment and its relationship with economic growth in Nigeria using annual time series data over the period 1980 to 2009. Government expenditure and gross fixed capital formation were added as control variables. A linear regression analysis was used on the thirty year data to determine the relationship between inflation, exchange rate, FDI inflows and economic growth. The study reveals that inflation has no effect on FDI but FDI positively affect economic growth in Nigeria. Linking inflation to growth, Barro (1995) explored the inflation–economic growth nexus using an extended version of the neoclassical growth model and annual data covering more than 100 countries from 1960 to 1990. They included other variables such as the ratio of investment to GDP and fertility rate in their model. Using a system of regression equations, and holding a certain number of the country characteristics constant, the results indicate that there is a statistically significant negative relationship between inflation and economic growth only when high inflation experiences are included in the model.

Bruno and Easterly (1995) in their study used annual data series of 26 countries that had high inflation crises at some point in time over the period 1961 to 1992. The data series were used to specifically assess the performance of the country before, during and after high inflation crisis. After controlling for other factors, they validate the findings of Barro (1995) that high inflation negatively affects growth. However, Bruno and Easterly find that the impact of low to moderate inflation on growth is ambiguous. Thus, their findings are consistent with the view that the costs of inflation only become significant at relatively high rates of inflation.

Furthermore, Sarel (1995) examined the effects of inflation on growth from 87 countries between 1970 and 1990. The study used a panel of annual data on population, GDP, consumer price indices, terms of trade, real exchange rates, government expenditures and investment as control variables. Employing ordinary least square estimation technique, the study found evidence that the function that relates inflation to growth may have a structural break which occurs when the rate of inflation is 8%. Below that rate, inflation does not have any meaning impact on economic growth. However, when the rate of inflation is above 8%, the estimated effect on inflation on growth is negative, and significant.

Ghosh and Philips (1998) also used a panel data of 145 countries spanning from 1960 to 1996, to look at the relationship between inflation and growth. They employed a panel regression together with a linear treatment of the inflation-growth linkage. They also extensively examined the robustness to check whether the inflation–growth nexus appears in a multivariate regression analysis in a nonlinear fashion. Their findings to some extent harmonize with Sarel's findings inflation negatively affects growth even though they did not find any structural break in the relationship between inflation and growth. However, Ghosh and Phillips discovered that at very low rates of inflation, inflation and growth are positively correlated. They further find that the relationship is convex. Taking into consideration the nonlinearity, they discover that the negative relationship between inflation and growth is apparent in both the time and cross section dimensions of the data.

In addition, Malla (1997) analysed a small sample of Asian countries and countries belonging to OECD separately. After controlling for labor and

capital inputs, the results showed a statistically significant negative relationship between economic growth and inflation including its first difference. However, the relationship is not statistically significant for the developing countries of Asia. In addition, Burdekin et al. (2000) employed a variant of Sarel's (1995) econometric procedure, using annual data for 21 developed countries and 51 developing countries including Ghana from 1967 to 1992. They included real GDP per capita, population growth and government expenditure as control variables to avoid omitted variable bias. Up to 3% threshold for developing countries, their findings conflict that of Malla's. However, up to 8% threshold for the industrial countries their studies validate the findings of Malla. The difference in results could be due to the fact that Malla did include control variables in his model to correct the problem of omission bias and misspecification of the model he used.

Malik and Chowdhury (2001) used cointegration and error correction model to assess the long-run relationship between inflation and growth for India, Bangladesh, Pakistan and Sri Lanka using annual data. They discovered that inflation and growth are positively linked in all the four countries. Khan and Senhadji (2001) contend with Malik and Chowdhury when they analyzed the relationship between inflation and growth separately for developed and developing countries using panel data set from a total of 140 countries for the period 1960 to 1998. The authors located a negative and significant relationship between inflation and growth above a threshold level of (1-3%) for developed countries and 11-12% for developing countries which is robust with respect to the method of estimation.

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Chih (2009) estimated the causal interrelationships between inflation and economic growth within a simultaneous equations framework using cross sectional data of 140 countries over the 1970-2005 period. The results indicated that inflation is harmful to growth whereas the effect from growth to inflation is beneficial. On the relationship between inflation and growth, the outcome of the study confirms a negative relationship between inflation and growth. The granger causality test used by Chih confirmed a bilateral causal relationship between growth and inflation. Whilst, the above empirical studies are cross-country, Faria and Carneiro (2001) also engaged a bivariate time series model with annual data over the period 1980 to 1995 to look into the same relationship between inflation and economic growth in the context of Brazil. Their findings confirmed a negative and statistically significant relationship between inflation and growth.

In addition, Gokal and Hanif (2004) also employed correlation analysis and granger causality test to find out whether a meaningful relationship exist between inflation and growth in Fiji. The findings agree with that of Faria and Carneiro. However, Gokal and Hanif established a unidirectional causality from growth to inflation. Furthermore, Hossain (2005) used annual data for the period 1954-2002 to consider the causal relationship between money growth, inflation, currency devaluation and economic growth in Indonesia. On the relationship between inflation and economic growth, the results from the Johansen and granger causality test simply that there is a negative relationship between inflation and growth and directional causality between the variables for the complete or any sub-sample period. In addition, a study by Odhiambo (2011), the causal relationship between inflation, investment and growth was

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examined in Tanzania over the period 1990 to 2009 using the Bounds testing approach. The study discovered that there is a unique co integrating relationship between inflation and growth. The results also proved the existence of a distinct unidirectional causal flow from inflation to growth, without any feedback.

Ahmed and Mortazat (2005) utilized annual data for the period of 1980 to 2005 to study the relationship between inflation and economic growth in Bangladesh. On the relationship between inflation and economic growth, the results from the Johansen and granger causality tests imply that there is a negative relationship between inflation and growth and a unidirectional causality running from inflation to growth. In addition, a study by Elias et al. (2012) on the long run relationship between inflation and economic growth in Bangladesh over the period 1978 to 2010, they use the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests. The results agree with those of Ahmed and Mortazat that inflation relates negatively with growth in Bangladesh. Erbaykal and Okuyan (2008) also, checked the relationship between inflation and economic growth in Turkey using annual data covering 1987 to 2006. By means of Bound Test developed by Pesaran et al. (2001), they discovered a negative and statistically significant relationship between the variables. Examining, the causality relationship between the two series, the Toda and Yamamoto (1995) approach confirmed a unidirectional causality running only from inflation to economic growth.

Similarly, Edgar and Carrera (2009) used the co integration technique to observe the long-run relationship between inflation and growth in Mexico using annual data covering the period 1970 to 2007. They established a

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negative long-run relationship between inflation and growth which was statistically significant. Moreover, they used the Granger Causality test to study the causal linkage between the two time series and found a unit directional causality running from inflation and growth. Thus, the study of Edgar and Carrera agrees with that of Erbaykal and Okuyan.

Shahzad and Shahnawaz (2011) explored the inflation-growth nexus in Pakistan using annual data for the period of 1960 to 2006. The study employed the Johansen and granger causality test and establishes that inflation is positively related to growth. Causality is found to be uni-directional running from inflation to growth. Thus inflation is causing growth in Pakistan but not vice-versa. Kanchan and Chandan (2011) agreed with Shahzad and Shahnawaz when they investigated the dynamic relationship between inflation and growth in Malaysia using time series data from1970 to 2007. In the short run, inflation negatively affects growth, however, in the long-run, inflation is found to positively affect growth. The result further showed that there is a uni-directional causality running from only inflation to growth in Malaysia. Philip (2010) employed the Johansen co integration technique to study the relationship between inflation and growth in Nigeria using annual data spanning from 1970 to 2005. The results of the study indicated that for the period of study, there was a negative co integration relationship between inflation and growth in Nigeria. The Engle and Granger Causality test was used to further check the causality relationship between the two variables. The study also established a uni- directional causality running from inflation to growth.

Aghion, Bacchetta, Ranciere, and Rogoff (2009) showed that exchange rate volatility reduces productivity in developing countries, attributing it to financial channels. The findings showed the adverse effects of exchange rate volatility were larger for the less financially developed countries and are significant for practically all the emerging markets and developing countries.

Corbo et al. (2001) found mixed evidence from seventeen OECD countries estimated individually. Their results showed that inflation targeters exhibited the largest inflation coefficients compared to the output gap coefficients. Lubik and Schorfheide (2007) estimated Taylor type rules in which authorities reacted to output, inflation and exchange rates. The findings reveal mixed responses indicating the Australian and New Zealand central banks changing interest rates in response to exchange rate movements. In contrast the Canadian did not respond to exchange rates.

In addition, Olaiya, Nwosa and Amassoma (2012) used a trivariate vector error correction model and the Johansen and Juselius co-integration approach to study the relationships among inflation, government expenditure and economic growth in Nigeria. They used annual time series data and confirmed a negative cointegration relationship between inflation and growth and unidirectional causality running from economic growth to inflation. Murbuah (2010) used the traditional granger causality test to examine the inflation-growth nexus in Ghana over the period 1955 to 2009. The study established a negative relationship between inflation and growth and a unidirectional causality from growth to inflation. Also, in ascertaining the revenue maximizing rate of inflation for Ghana and also investigating whether the revenue maximizing rate of inflation is growth maximizing, Quartey

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(2010) used time series data from Ghana over the period 1970-2006. The Johansen co-integration technique establishes a negative impact of inflation on growth over the period of study, which agrees with Murbuah. However, Quartey did not check for directional causality. Once again, the above empirical literature presents mixed findings.

Eichengreen and Lablang (2003) carried out a research on twelve countries over a period of 120 years and found strong inverse relationship between exchange rate stability and economic growth. They concluded that the results of each estimates strongly depend on time period and the sample. Schnabel (2007) identified robust evidence through panel estimation that the exchange rate stability is associated with more growth in the European monetary unit (EMU) periphery.

Benita and Lauterbach (2007) studied the daily volatility of exchange rate between the United States of America dollar and 43 other currencies in 1990-2001. This study used several macroeconomic variables to proxy for the domestic economy uncertainty, wealth and openness to international markets as controls in the analysis. The main findings of the study were that exchange rate volatility was positively correlated with real domestic interest rate and with the degree of the central bank intervention. In the panel, the study finds positive correlation between exchange rate volatility, real interest rates and the intensity of the central bank intervention.

Saymeh and Orabi (2013) investigated the effect of interest rate, inflation rate, and GDP on macroeconomic growth in Jordan over the period 2000-2010. A unit root test was performed to check the integration order of the variables. From the Johansen test performed, it was found that all four

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equations had significant existence at 1% or 5% for the trace and max eigenvalue static. It was therefore opined that a long term equilibrium relationship existed among variables. Granger Causality results showed that only inflation causes interest rate while others are independent, hence no causality. However, regression results to check for impacts of both inflation / interest rates on growth rate found that inflation has significant effect on growth rate while only prevailing interest rate has significant influence on growth rate. Lastly, testing for interest, inflation rates and GDP all together, found out that current GDP and one lag GDP have influence power to growth rate.

Hidayat and Suman (2014) studied the effect of inflation, interest rates and government expenditure in Indonesia between 2005-2012. It was found out that the independent variables has about (99%) influence on economic growth. The result was however in line with Keynesian theory, which states that government spending spurs economic growth. The inflation rate was found to be positively affect economic, which cannot be farfetched due to the relatively low rate (below 10%) experienced in Indonesia during the period under study. Interest rates has a negative relationship with economic growth, thus a reduction of the rate will therefore increase investment thus economic growth.

While studying the impact of inflation on economic growth in Tanzania between 1990 -201, Kasidi and Mwakanemela (2013), an inflation-growth relationship was established. The level of responsiveness of change in GDP to that of price level was tested by Coefficient of elasticity, while the relationship between the two variables was established using correlation

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coefficient and co-integration technique. Results suggest that inflation has a negative impact on economic growth. It was further shown that no co-integration existed between inflation and economic growth during the period of study, hence absence of long-run relationship between them in Tanzania.

In a related study, Kamin and Roger (2000) examined the impact of depreciation on output and inflation in Mexico employing VAR model with four variables; real exchange rate, output, price index and US interest rate using quarterly data for the period 1981-1995. The result revealed depreciation shock leads to reduction in output and an increase in inflation. Sheeley (1986) also found that devaluations have a negative impact on output for 16 Latin American countries, while the study by Calva, Reinhart and Vegh (1994) identified correlation between inflation and the real exchange rate in Brazil, Chile and Colombia.

Using pooled time-series/cross-country analysis on the other hand, Edwards (1989) found that devaluations reduce output in developing countries in a where the real GDP is explained by the real exchange rate, government spending, terms of trade, and money growth.

Chapter Summary

From the above review, it is realized that several works have examined the sources of economic growth in both the developed and the developing countries including Ghana, most of these works concentrated on the interrelationship between GDP growth and its determinants without necessarily paying much attention to particular areas such as exchange rate, inflation, interest rate and economic growth linkages where most policies and strategies should be geared towards in order to achieve the desired rate of

growth. This in effect has left some gaps in the economic growth-determinants literature. In the light of this and many others, this study attempts to examine the relationship between exchange rate, inflation, interest rate and economic growth in Ghana during the period 1980-2014. Consequently, it attempts to contribute to the limited existing literature by focusing mainly on which particular areas that most policy issues should be geared towards in the Ghanaian economy as far as economic growth is concerned.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter presents the methodology employed in the study. Specifically, it gives a detailed description of the study design, specification of the model, definition and measurement of variables in the model, estimation techniques, sources of the data in the study, and tools for data analysis.

The Study Design

The study follows the positivist paradigm within the framework of classical and neoclassical economics. The positivist philosophy favours the use of quantitative approach to research used in this study. Also, this philosophy is suitable for the development of mathematical models to measure relationship between quantitative measurements (Bahmani-Oskooee, 2004). Therefore, quantitative method was used in this study.

Moreover, this study adapted the Solow model. This model is modified to include other variables to analyze the determinants of economic growth using time series quarterly data from 1980 to 2014 in Ghana. This is due to the fact that the study is a macro study and involves trends analysis. In order to achieve the main aim of this work, the paper adopts the Johansen's cointegration analysis within the VAR frame work which is more appropriate for determining the short run and long run relationships among the variables. Impulse response functions are also conducted to determine the feedback effects among the variables.

Model Specification

Following (Suva & Fiji, 2004; Andinuur, 2013; Saymeh & Orabi, 2013; & Solow (1991)), the model for this study relating exchange rate and the other variables is specified below.

$$RGDP = f\,(K,\ L,\ FDI,\ INFL,\ REER,\ INTR) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{ (1)}$$

Where *RGDP* is the of real GDP, K, is the physical capital, L is the labour force, FDI is foreign direct investment, *INFL* is the inflation rate, *REER* is the real effective exchange rate, and *INTR* is interest rate. The model in Equation (1) above can be written as an econometric model specified as:

$$RGDP_t = \beta_0 + \beta_1 K_t + \beta_2 L_t + \beta_3 FDI_t + \beta_4 INFL_t + \beta_5 REER_t + \beta_6 INTR_t + \varepsilon_t \dots (2)$$

Where the coefficients $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5,$ and β_6 are the parameters of the respective variables, β_0 is the constant term (drift), *t* denotes time and ε is the error term.

The following are expected

$\beta_1 > 0, \beta_2 > 0, \beta_3 < 0, \beta_4 > 0, \beta_5 < 0, \beta_6 < 0, \beta > 0, \beta < 0$. It is to be noted that all the variables in the model have their values in percentages with the exception of RGDP. This therefore did not necessitate taking natural logarithm of the variables in the model.

The Vector Autoregressive (VAR) representations of the variables of interest are specified below:

$$Y_t = \delta + \gamma_1 Y_{t-1} + \dots \gamma_p Y_{t-p} + v_t \qquad\qquad (5)$$

Where Y_t is a (K*1) vector of endogenous variables, δ is a (K*1) vectors of intercepts, γ_p are the (K*K) fixed VAR coefficients matrices and v_t =

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$(v_{1t}, \dots, v_{kt})$, is an unobserved error term. It is to be noted that, K is the number of variables.

Given the trending properties of the series, the paper employs the information criteria to select the lag length of the VAR, including an intercept and a deterministic trend. The study selects the lag length based on the Akaike Information Criterion (AIC) and Swartz Bayesian Criterion (SBC).

Measurements of the Variables

Economic Growth (GDP)

Economic growth (RGDP) refers to a steady increase in the capacity of an economy to produce goods and services, compared from one period to another. Thus, economic growth can be seen as a sustained increase in the real GDP of an economy over a given period (usually a year). Economic growth is conventionally measured as the percentage change in real GDP. Hence, following the works of Hsing (2007), Tweneboah & Adam (2008) and Kiani (2011), growth of real GDP is used as the proxy to capture output growth. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources (World Bank, 2012). To adjust nominal GDP to remove the effects of inflation, a number of researchers have used the GDP deflator and the consumer price index interchangeably to deflate the nominal GDP. The GDP deflator is somewhat considered to be more efficient than the CPI, because the deflator takes into account both producer and consumer goods. In addition, the GDP deflator uses a flexible basket of goods that depends on the quantities of goods

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and services produced within a given year, while prices are fixed. The CPI on the other hand covers only a fixed basket of consumer goods and services from some based year. The GD deflator is therefore used in this study to deflate the nominal GDP to obtain the real GDP.

Physical Capital (K)

Capital Stock (K); the study follows the work of Fosu and Aryeetey (2008) and uses Gross fixed capital formation as a proxy for capital stock in this study. Gross fixed capital formation is defined as the total value of additions to fixed assets by domestic enterprises, *less disposals* of fixed assets during the year, *Plus* additions to the value of non-produced assets such as discoveries of mineral deposits, plants, machinery, and equipment purchases; and the construction of infrastructure and commercial and industrial buildings (Baafi, 2010). Investment is included in the model because, fluctuations in crude oil prices lead to a rise in the level of uncertainty which subsequently results in the deferral of irreversible investment which in turn affect real GDP growth. It is important to note however that high rate of investment results in high economic growth (Barro & Sala-I-Martin, 1992). Consequently, the study expects the coefficient of capital stock to be positive $\alpha\beta_1>0$ all other things being equal.

Labour Force (L)

Labour force (*L*) consists of the proportion of the population that is economically active. In this study, the proportion of the total population aged between fifteen (15) years and sixty-five (65) years who are active and productive is used as a proxy for the labour force. Jayaraman and Singh (2007)

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argued that, there can be no growth without the involvement of labor. Solow (1956) and Swan (1956) also recommended that labour force should be incorporated in the growth model because of its impact on the work force, hence the inclusion of labour force in the study. All things being equal, the higher the labour force the higher the supply of labour and hence output. The study therefore expects the coefficient of labour to be positive (i.e. $\beta2>0$).

Foreign direct investment (FDI)

Foreign direct investment is the net inflows of investment made to acquire lasting interest in enterprises operating outside the economy of the investor. Thus, FDI represents the flow of capital into a country. It consists of a package of capital, knowledge, skills and so on. Following Asiedu (2006), Nguyen and Haughton (2002), and Agyapong (2012), foreign direct investment will be measured as the log of foreign direct investment stock and the study expects a positive relationship between foreign direct investment and economic growth.

Consumer Price Index (INF)

Consumer Price Index (*INF*) is a measure that captures the changes in the price level of a market basket of consumer goods and services purchased by the household. In this study, the CPI is employed to control for the effect of high oil price on domestic goods and services. High oil price may result in a rise in the general price level and this may be detrimental to economic growth. Rapid increases in the general price level of the economy may result in uncertainty about the future profitability of investment projects. This is because, higher prices of consumer goods and services may dampen demand

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for goods and services in the economy and for this reason, investors may resort to more conservative investment strategies than would otherwise be the case, eventually leading to lower levels of investment and economic growth. The study expects that $\beta 4 < 0$.

Exchange Rate (EXR)

Real effective exchange rate (REER) is the weighted average of a country's currency relative to an index or basket of other major currencies adjusted for the effects of inflation. In this study, the real effective exchange rate used is based on 67 trading partners. Demand for crude oil is relatively inelastic; hence the increase in oil prices increases expenditure on imports by the oil importing country. This may result in an increase in the supply in the local currency, thus weakening the currency relative to foreign currencies. The weakened currency will increase the burden of payments and lead to balance of payment problems and reduction in other imports, which will ultimately affect economic growth. Hence the inclusion of exchange rate in the model. This study uses real effective exchange rate as a measure of the exchange rate as was used by (Jiménez-Rodríguez & Sánchez, 2005). Exchange rate depreciation may lead to increase in the export of goods and services since goods produced in the economy become relatively cheap. This will have a positive impact on economic growth. Depreciation of the domestic currency may also result in the reduction of imports. However, the impact of exchange rate depreciation on the economy may depend on the balance of payment position of the country. Hence, we expect that, $\beta 5 < 0 \ or \beta 5 > 0$.

Interest Rate (INTR)

The interest rate used here is the difference between the domestic interest rate and the foreign interest rate. Thus, it is defined as the rate charged by financial institutions on borrowings (loans). Interest rates will be measured using the Bank of Ghana's prime rate. The prime rate is the annualized interest rate the central bank charges commercial, depository banks for loans to meet temporary shortages of funds. The study expects a positive relationship between the country's interest rate and economic growth.

Unit Root Test

This study started by exploring the stationarity properties of the series using the Augmented-Dickey-Fuller (ADF) test procedure. This test was done in the first place in order to avoid spurious regression which is a common problem among most of the macroeconomic variables whose data generation processes follow a time trend. The ADF test tested the null hypothesis that the variables have unit root or are non-stationary as against the alternative hypothesis that the variables are stationary. The study then resorted to the VAR framework to estimate the long run and short run relationships between exchange rate and the associated explanatory variables.

Sources of Data for the selected variables

The data used for this study are secondary data. Data on exchange rate, Gross Domestic Product, physical capital, labour force, FDI, and inflation rate, were collected from the World Development Indicators (World Bank), while data on interest rate were collected from Bank of Ghana. The data that were collected in relation to all the variables spanned from 1980 to 2014.

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Estimation Techniques

This study employed both descriptive and quantitative analysis. Charts such as graphs and tables were presented to aid in the descriptive analysis. Unit root tests were carried out on all variables using Augmented Dickey–Fuller (ADF) and Phillip-Perron test to ascertain their order of integration in order to avoid the problem of spurious regression. Furthermore, the study adopted the VAR framework for cointegration to obtain both the short and long run parameters of the main variables involved and also Granger causality test was conducted to determine the direction of causality between the dependent variable and the independent variables. All estimations were carried out using Eviews 7.0 packages.
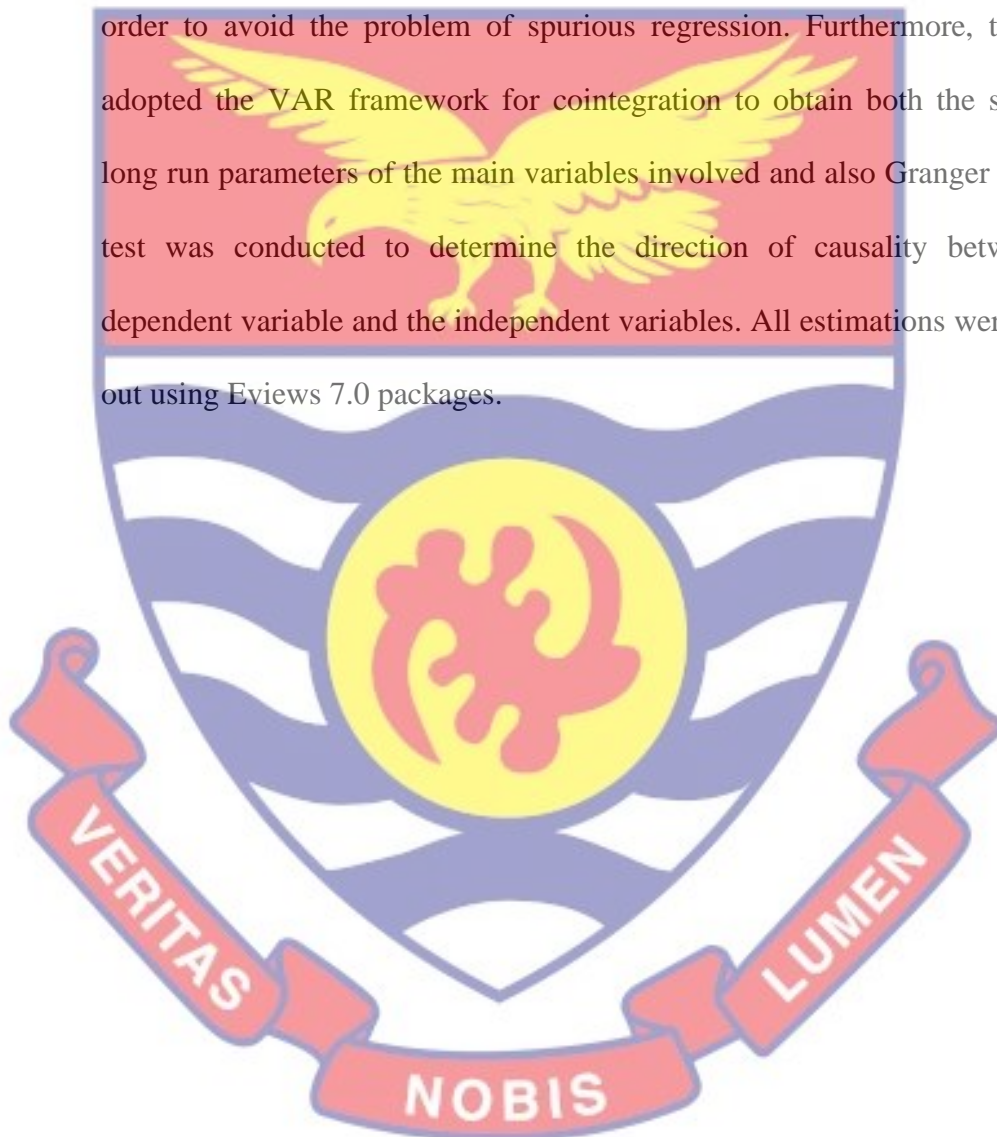
CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The main objective of this study is to examine the relationship between exchange rate, inflation, interest rate and economic growth in Ghana. Thus, this chapter presents a thorough analysis and discussion of the results of the study. The chapter is divided into sections. The results of the descriptive statistics of the variables were examined in the first section. The second section examines the time series properties of the variables where the results of the ADF test were presented. The results of Johansen's approach to cointegration were presented in the third section. Section four presents and discusses the results of the estimated long-run and short run of growth equation using VAR approach. The final section presents and discusses variance decomposition analysis, and granger causality test. These results are discussed in relation to the hypotheses of the study.

Descriptive Statistics

The study conducted the descriptive statistics of the relevant variables involved and which is presented in Table 1. The results in Table 1 show that all the variables have positive average values (means). The minimal deviation of the variables from their means as shown by the standard deviation gives indication of fast growth rate (fluctuation) of these variables over the period. In terms of skewness, all of the variables are positively skewed with exception of physical capital, labour force, FDI, and real effective exchange rate which are negatively skewed.

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Table 1: Descriptive Statistics of the variables

	LNRGD	K	L	FDI	INFL	LNREER	INTR
Mean	5.6880	4.5088	11.1186	3.1267	7.2335	1.9669	5.7647
Median	5.6711	5.1337	17.5077	3.3849	5.1901	2.1350	5.0289
Max.	7.3497	8.1002	18.8194	6.3024	35.3042	2.302904	11.2500
Min.	3.9396	0.7915	0.7467	0.2179	-0.9750	0.7335	2.0041
Std. Dev.	0.2530	1.9496	8.3836	1.8190	6.7800	0.3566	2.4122
Skewness	0.2644	-0.3794	-0.3538	-0.0893	2.4070	-1.3928	0.9298
Kurtosis	33.5991	2.0643	1.1317	1.8397	8.8932	3.8273	3.0312
Jarque-Bera	53.318	8.2234	22.6166	7.8103	328.1248	47.8476	19.6029
Prob.	0.0000	0.0164	0.0000	0.0201	0.0000	0.0000	0.0000
Sum	773.574	613.1928	1512.135	425.2306	983.7522	267.4936	784.0000
Sum Sq. D.	8.6388	513.1379	9488.328	446.6940	6205.666	17.1685	785.5526
Obs.	140	140	140	140	140	140	140

Note: Max represents Maximum, Min represents Minimum, Std. Dev. represents Standard Deviation while Sum Sq. D. represents Sum of Squared Deviation

Source: computed using Eviews 7.0 Package

The Jarque-Ber.statistic which shows the null hypothesis that all the series are drawn from a normally distributed random process cannot be rejected for the variables. The minimum and maximum values capture the range of variables. The total number of observation is 140. Finally, the maximum and minimum values are shown in the Table 1 as indicated early on.

Results of the Unit roots Test

The results of the Augmented Dickey-Fuller (ADF) test for the variables of interest are indicated in Table 2 below. From the results, all the

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variables were non-stationary at levels but became stationary after their first differences stationary at 1 percent level of significance with intercept as well as with intercept and trend. Therefore, all the variables, gross domestic product, exchange rate, inflation rate, interest rate, physical capital, labour force, and FDI are integrated at first order, I(1). As a result, the Johansen's cointegration approach can be used to determine the number of co-integrating equations.

Table2: Results of the ADF test

	Constant			Constant and Trend		
Variable	Level	1st Difference	Conclusion	Level	1st Difference	Conclusion
LRGDP	-2.7417	-12.4088***	I (1)	2.8302	-12.6719***	I (1)
INF	-1.4639	-5.5627***	I (1)	-1.9092	-5.4580***	I (1)
INT	-1.6527	-8.5553***	I (1)	-1.7992	-8.6547***	I (1)
LREER	-1.2048	-5.6599***	I (1)	-2.1333	-5.5616***	I (1)
FDI	-1.6868	6.5774***	I(1)	1.9984	6.4423***	I(1)
K	-1.8040	-6.3292***	I(1)	-2.2394	-6.3080	I(1)
L	-1.8564	5.7973***	I(1)	-1.3540	4.0558***	I(1)

Note: *** denotes 1% significance level.
Note again: The null hypothesis is that the variable has a unit root. The rejection of the null hypothesis for ADF test is based on the MacKinnon (1996) critical values at 5, 10 or 1 percent.

Source: Authors' Computation

Having done the unit root test, the Vector Autoregressive (VAR) was used to determine the optimal lag length for the Johanson co-integration test which is based on the AIC as presented in Table 2. From the results, the optimal lag length based on AIC is 5. Using the selected optimal lag length of 5, the likelihood ratio test which depends on the maximum Eigen values of the

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stochastic matrix of the Johanson (1991) procedure for exploring the number of co-integrating vectors was used.

Table 3: Selection of Optimal Lag Length

Lag	Log	LR	FPE	AIC	SC	HQ
0	-645.5247	NA	0.300387	10.14882	10.23795	10.18504
1	-99.81612	1048.784	7.64e-05	1.872127	2.317757	2.053189
2	-14.67289	158.3132	2.60e-05	0.791764	1.593897*	1.117675
3	2.118804	30.17257	2.57e-05	0.779394	1.938031	1.250154
4	43.03586	70.96553	1.75e-05	0.390065	1.905206	1.005674*
5	60.77974	29.66554*	1.71e-05*	0.362817*	2.234461	1.123275
6	65.92471	8.280183	2.04e-05	0.532426	2.760575	1.437735
7	69.80221	5.998014	2.50e-05	0.721840	3.306493	1.771998
8	74.73522	7.322438	3.02e-05	0.894762	3.835918	2.089769

* 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

Long run relationship

This section addresses the study's objectives of long run relationship among the variables under consideration which rejects the null hypothesis of no long run relationship. Table 3 below presents the results for the co-integrating test. From Table 3, the Maximum Eigenvalue statistics show that there are two (2) co-integrating vectors at 5 percent level of significance. The null hypothesis of zero co-integrating vectors is rejected against the alternative of one co-integrating vector. Similarly the null hypothesis of at most 1, at most 2, and at most 3 co-integrating vectors are also rejected against the alternative hypothesis. It is can be concluded that there are two co-integrating vectors

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specified in the model and that there exists a long run relationship among the variables of interest.

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.604815	123.4774	32.11832	0.0000
At most 1 *	0.302085	47.83447	25.82321	0.0000
At most 2	0.093152	13.00478	19.38704	0.3277
At most 3	0.031413	4.244976	12.51798	0.7064

Max-eigenvalue test indicates 2 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The derivation of the long run relationship was done by normalizing on LRGDP and dividing each of the co-integrating coefficients by the coefficient of real GDP. The long run relationship is specified as:

$$LRGDP = 0.0445T + 0.5477LREER - 0.3724INFL - 0.0758INTR + 0.2463FDI + 0.4665K + 0.3962L \qquad (3)$$

The error correction term of equation (33) can be expressed as:

$$ECM = LRGDP - 0.0445T - 0.5477LREER + 0.3724INFL + 0.0758INTR - 0.2463FDI - 0.4665K - 0.3962L \qquad (4)$$

From equation 3, it can be observed that all the variables are significant and they represent the long run effects on output. Starting with the trend, it exerts a positive effect on real GDP. This means that holding all other factors constant in the long run, as time passes by, the real GDP of Ghana will grow by about 4% each quarter. This is justified by the fact that as time passes

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by technology, institutions and human behaviour changes and such changes will naturally grow the activities in the real sector.

Real effective exchange rate is positive and statistically significant. Thus, the coefficient of 0.5477 means that 100 percent increase in real effective exchange rate would lead to approximately 55 percent increase in real GDP. This implies that real effective exchange rate has a positive impact on output. This is consistent with theoretical expectation of the classical views on the role of exchange rate in the macro economy. It is also consistent with other empirical studies such as Benita and Lauterbach (2007), Eichengreen and Lablang (2003) who also found a positive impact of real effective exchange rate on output. Therefore, real exchange rate has a significant effect on economic growth in Ghana.

Also, Inflation with a coefficient of -0.3724 has a negative and significant impact on output. Specifically, a one percent decrease in inflation will increase output by 0.37 percent. A higher level of inflation represents distortion in an economy. If LDCs are streamlining their investment regulatory framework, implementing policies which promote macroeconomic stability and improve infrastructure, they can achieve a higher level of economic growth (Asiedu, 2006Ghosh& Philips, 1998); .This variable is used to capture macroeconomic instability, (Asiedu, 2006). It shows that stability of a country is an important element for achieving economic growth.

Stockman (1981) argued that individuals' welfare falls whenever there is an increase in inflation. The negative effect of inflation on output is an indication that inflation causes economic growth in the long-run which is consistent with the results by Bittencourt (2010) who for four Latin American

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Countries (Argentina, Bolivia, Brazil and Peru) found out that inflation has a negative but significant effect on economic growth. Ahmed and Mortaza (2005) found a statistically significant long-run negative relationship between inflation and economic growth for Bangladesh. Gokal and Hanif (2004) also found a statistically significant negative effect of inflation on output for Fiji.

In the long run, foreign direct investment is statistically significant and it exerts a positive effect on real GDP in Ghana. The coefficient of 0.2263 implies that in the long run 100 percent increase in foreign direct invest will lead to approximately 23 percent increase in real GDP. The economic rationale for offering special incentives to attract FDI frequently derives from the belief that foreign investment produces externalities in the form of technology transfers and spillovers. Romer (1993), for example, argues that there are important "idea gaps" between rich and poor countries. He notes that foreign investment can ease the transfer of technological and business know-how to poorer countries. These transfers may have substantial spillover effects for the entire economy. Thus, foreign investment may boost the productivity of all firms, not just those receiving foreign capital (Rappaport, 2000).

Most macroeconomic studies that used aggregate FDI flows for a broad cross-section of countries, generally suggest a positive role for FDI in generating economic growth especially in particular environments (De Gregorio, 1992). For instance, Borensztein et al. (1998) argue that FDI has a positive growth-effect when the country has a highly educated workforce that allows it to exploit FDI spillovers. While Blomstrom et al. (1992) find no evidence that education is critical, they argue that FDI has a positive growth-effect when the country is sufficiently rich. In turn, Alfaro et al (2009) found

that FDI promotes economic growth in economies with sufficiently developed financial markets.

The coefficient of interest rate which served as an exogenous variable was statistically significant and it exerted a negative impact on output. This means that 1 percent increase in the rate of interest in the long-run would lead to 0.0758 percent increase in economic growth. Thus, the negative and significant effect of interest rate on real GDP is an indication that interest rate is a key variable influencing real GDP in the country. This finding is consistent with the finding by Saymeh and Orabi (2013). Thus, the result is imperative to bring in adequate corrective measures to be adapted to the peculiar economic structures and the behaviour of agents in Africa that would allow us to capture the full impact of government expenditure on economic growth and other economic aggregates (Kouassy, 1994).

The coefficient of capital of 0.4565 shows that a 1% change in capital input would result in a 0.4565 percent increase in real GDP, holding all other factors constant. The sign of the capital variable support the theoretical conclusion that capital contributes positively to growth of output since the coefficient of capital in this long-run growth equation is positive and significant. This positive relationship between capital stock and output is consistent with the expectation of the classical economic theory. It is consistent with conclusions reached by Aryeetey and Fosu (2005), Fosu and Magnus (2006), and Ibrahim (2011) in the case of Ghana.

Labor force is positive and significant with a coefficient of 0.3962 indicating an increase in output by this amount if there is a 1 percent increase in the labor force (L).This is consistent with the argument of (Jayaraman &

Singh, 2007) who asserted that there can be no growth achievement without the involvement of labour as a factor input hence, the positive and significant coefficient. This result however contradicts the works of Aryeetey and Fosu (2005), and Asiedu (2010) who found a negative effect of labour on output.

Short run relationship

This section also addresses the study's objective of short run relationship among the variables based on the hypothesis. The results are presented in Table 5.

Table 5: The Result of the Short Run Dynamics

	Error Correction Model:D(LNRGDP)		
Variable	Coefficient	Standard Error	T-value
Constant	-0.02017	0.01198	-1.68366*
D(LRGDP(-1))	1.31783	0.16344	8.06308***
D(LRGDP(-2))	0.87800	0.18347	4.78552***
D(INFL(-1))	-0.03463	0.00577	-6.00173***
D(INT(-2))	-0.02286	0.00285	-8.02105***
D(LREER(-1))	0.50342	0.06769	7.43714***
D(K(-1))	0.02258	0.00429	5.26340***
D(FDI(-1))	0.43351	0.03568	12.14994***
D(L(-1))	0.2456	0.08445	2.77671**
ECM(-1)	-0.05224	0.00647	-6.88331***
R-squared	0.656538	Akaike AIC	-1.085821
Adj. R-squared	0.640334	Schwarz SC	-0.868502
F-statistic	6.00877***	Sum sq. resid	2.262058
Mean dependent	-0.012137	Log likelihood	82.20710
S.E. equation	0.135512	Durbin-Watson stat	2.041958
S.D. dependent	0.323046		

Source: Author's Computation

The VECM relates the changes in growth in real GDP with the other lagged variables and the disturbance term of lagged periods. The coefficient of the speed of adjustment (i.e. ECM (-1)) is negative and significant at 1 percent. The estimated coefficient of the ECM (–1) is -0.05224 (significant at

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1%) indicating that in the absence of changes in the independent variables, deviation of the model from the long term path is corrected by 5% per quarter. Further, the short-run results indicate that, the first and second lags of the first and second differences of LRGDP exert significant and positive effect on ΔLRGDP consistent with the findings of Pitchford (1992), Rodrik (2009), and Osei-Assibey (2013).

From Table 4 above, all the variables under consideration are statistically significant at 1 percent. That is, the results indicate that the past one year of inflation rate and the past two years of interest rate had negative impacts on the growth of real GDP in Ghana respectively. These results are consistent with the findings by Pitchford (1992), Rodrik (2009), and Osei-Assibey (2013). Therefore, 0.1 unit increase in the past one year of inflation rate and past two years interest rate will cause growth in real GDP in Ghana to decrease by 0.03 percent and 0.02 percent respectively while 1 percent increase in the past one year of exchange rate and physical capital will cause real GDP growth in Ghana to increase by approximately 0.50, 0.02 percents respectively. This shows how changes in the country's exchange rate and physical capital can greatly influence the real GDP growth. Furthermore, the results in Table 5 indicates that the past one year of FDI and the past one year of labour force both had positive impacts on the growth of real GDP in Ghana respectively. Thus, the results indicates that in the short run, 1 percent increase in the past one year of FDI and labour force will cause real GDP growth in Ghana to increase by approximately 0.43, 0.25 percents respectively. Therefore, in the short run, the above variables reflecting inflation rate, interest rate, physical capital, and exchange rate, FDI, labour force being the

study's focused variables are important in influencing the country's macroeconomic policy relating to real GDP growth.

Granger Causality Test

This section also addresses the study's third objective based on the hypothesis. The results of the pair-wise Granger causality test are presented in Table 6. The results in Table 6 suggest that the null hypothesis that real exchange rate does not Granger cause real GDP is rejected at 5 percent significance level. This means that real exchange rate Granger causes real GDP. In the same way, real GDP Granger causes real exchange rate (i.e. they have bi-directional causality).

Table 6: Results of Pair-wise Granger Causality Test

Null Hypothesis	F-Statistic	Probability
LREER does not Granger Cause LRGDP	6.81400	[0.0015]***
LRGDP does not Granger Cause LREER	17.4783	[0.0024]***
INFL does not Granger Cause LRGDP	2.87252	[0.0602]*
LRGDP does not Granger Cause INFL	1.76880	[0.1530]
INT does not Granger Cause LRGDP	3.36087	[0.0378]**
LRGDP does not Granger Cause INT	0.62799	[0.5353]

Note: ***,**, and * denotes 1%, 5%, and 10% significance level.
Source: Authors' Computation

The results in Table 6 above suggest that the null hypothesis that inflation and interest rate do not Granger cause real GDP is rejected at 5 percent significance level. This means that inflation and interest rate Granger cause real GDP. However, the causality runs from inflation and interest rate real GDP and not the other way round (unidirectional causality).

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Variance Decomposition Analysis

Following the VAR estimation, the study decomposed the forecast error variance by employing Sim's Recursive Cholesky decomposition method. The forecast error variance decomposition provides complementary information for a better understanding of the relationships between the variables of a VAR model. It tells us the proportion of the movements in a sequence due to its own shock, and other identified shocks (Enders, 2004). Thus, the variance decomposition analysis will enable us identify the most effective instrument for each targeted variable based on the share of the variables to the forecast error variance of a targeted variable. The results of the forecast error variance decomposition of the endogenous variables, at various quarters are shown in Table 6. In explaining the forecast error variance of real GDP in Table 6 below, it is observed that in the short term horizon (two years) innovations of labour force and interest rate are the most important sources of variations besides its own shock.

Table 7: Result of Variance Decomposition of real GDP

QRT.	LRGDP	LREER	FDI	INTR	INFL	K	L
2	99.00729	0.499066	0.169052	0.057626	0.230251	9.71E-05	0.036620
4	62.96160	1.990906	2.340852	13.47513	2.098972	0.201425	16.93111
6	56.26521	1.637509	3.532111	12.18873	3.135443	0.374743	22.86625
8	66.35733	1.484675	1.781420	15.39414	1.480192	0.556578	12.94566
10	49.031212	1.138417	5.769860	21.964900	2.024601	0.884737	19.186260
12	40.0295	0.96131	6.64029	22.1188	2.80428	0.71040	26.7353

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Period							
	0	2	6	2	2	7	8
14	47.59342	1.785971	2.852338	25.38090	1.266367	0.354120	20.76689
16	39.53871	1.361595	4.240410	31.91050	1.232832	0.366460	21.34949
18	34.16273	1.147707	4.203408	30.11913	1.739442	0.247632	28.37995
20	39.36854	1.550242	2.675581	30.87261	1.057237	0.097399	24.37838
22	37.04776	1.282895	3.132430	35.08717	0.940834	0.125314	22.38360
24	34.54767	1.251019	2.974802	31.35679	1.340624	0.108161	28.42093
26	37.21048	1.356489	2.723712	32.74994	1.005595	0.053899	24.89989
28	36.44793	1.222952	2.900300	35.50643	0.915458	0.095446	22.91148
30	35.25698	1.321850	2.694271	31.14209	1.239722	0.081272	28.26381

Cholesky Ordering: LRGDP LREER FDI INTR INFL K L

Throughout the medium-term and long-term horizon the innovations to government expenditure and labour force serves the important sources of variation to real GDP. The source of least forecast error variance of real GDP is the innovations of gross fixed capital formation throughout the short-term, medium-term and long-term horizons. The most effective instrument for real GDP seems to be interest rate.

Chapter Summary

The study empirically investigated the relationship between economic growth and exchange rate, inflation, and interest rate and its implications for

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Ghana's macroeconomic policy over the period 1980Q1 to 2015Q1. The main interest is to study how changes in the variables influence Ghana's macroeconomic policy decisions. The study uses the Johansen's Cointegration and error-correction techniques within the Vector Autoregressive framework (VAR) to identify the variables in explaining the real GDP in Ghana. From the study, it is found that all the variables such as growth in inflation rate, interest rate, FDI, physical capital, labour force, and exchange rate turned out to be non-stationary at their levels but became stationary at their first differences. Further, from the study, all the variables indicated their correct signs and were statistically significant. The Granger Causality test indicated that there is bi-directional causality between exchange and real GDP and unidirectional causality between inflation rate, interest rate and economic growth. The impulse response functions also indicated feedback effects among the variables. The study therefore clearly indicates that these policy variables are capable of influencing the country's macroeconomic policy decisions in both short and long run.

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this final chapter is to present the summary, conclusions and recommendations. Whereas the summary presents a brief overview of the research problem, objective, methodology and findings, the conclusions capture the overall outcomes regarding the findings of the study in light of the hypotheses. Recommendations also present specific remedies to be implemented by specific bodies. The chapter also presents the limitations and direction for future research.

Summary

Macroeconomic stability particularly price stability is a recipe for high and sustainable economic growth in both developed and developing nations, despite the indeterminate causal links between exchange rate, inflation, interest rate and economic growth on both the theoretical and empirical grounds (Suva & Fiji, 2004; Andinuur, 2013). This therefore raises skepticism about the potency in stimulating growth. Notwithstanding the controversy and uncertain nature of the relationship between inflation, interest rate and growth and the channels through which inflation and interest rate affect real economic activities, Ghana is pursuing price stability to ensure low and stable prices in order to enhance high economic growth.

Further, the effect of exchange rate, Inflation, and Interest rate on economic growth in Ghana is a serious malady. There is a general consensus that high Inflation rates and Interest rate cause problems for aggregate economic performance, although there is much less agreement about the

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relationship between Inflation, Interest rate and economic growth and how it affects economic activities at the macroeconomic level. This has generated a significant debate both theoretically and empirically.

The main objective of this study was to examine the relationship between exchange rate, inflation, and interest rate and economic growth in Ghana using quarterly time series data from 1980 to 2015. Specifically, it investigated the short-run, long-run and causal relationship between exchange rate, inflation, interest rate, and economic growth in Ghana using the Johansen cointegration, vector error correction (VECM), vector autoregressive (VAR) and Granger causality approaches. The Johansen (1988) approach to cointegration and the VECM were employed to examine the long-run and short-run dynamics among the variables used in the estimation. The VAR approach was used to conduct variance decomposition analysis in order to identify which variables contributed to the forecast error variance of a targeted variable. Finally, the study examined the causal relationship between exchange rate, inflation, and interest rate and economic growth including other variables in the model using the VECM based causality techniques. The variables employed in the study included real GDP, exchange rate, inflation, interest rate, foreign direct investment to GDP, physical capital, and labour force participation rate. All tests and estimations were conducted using econometric view (Eviews) 7.0 package.

The stationarity properties of the variables were tested using the Augmented-Dickey Fuller (ADF) test statistics. The unit roots results suggest that all the variables were stationary after taking first difference. The study

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then proceeded to examining the long-run and short-run relationships among the variables.

The cointegration analysis revealed the presence of one economically interpretable long-run relationship among real GDP, and its determinants. The cointegration result suggests the first hypothesis was rejected thereby concluding that there is a long run relationship between exchange rate, inflation, interest rate as well as other variables and economic growth in Ghana.

From the long-run model exchange rate, physical capital, foreign direct investment to GDP, and labour force participation rate exhibited positive and significant relationship with economic growth (real GDP) except for inflationary rate, interest rate which was negatively related to growth. This is also consistent with the predictions of the endogenous growth literature.

The short-run results revealed that exchange rate, FDI, physical capital, and labour force have a positive effect on economic growth as in the long-run. Further, foreign direct investment as a share of GDP, gross fixed capital formation as a share of GDP, government expenditure and labour force are all positive as in the long run. However, inflation and interest rate exerted a statistically significant negative effect on economic growth in the previous period. The existence of a long-run relationship among real GDP, and other explanatory variables is further confirmed by a negative and statistically significant coefficient on the lagged error correction term. The size of this coefficient suggests that about 5 percent of the disequilibrium caused by previous years' shocks converges back to the long-run equilibrium in the current year.

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The evidence from the forecast error variance decomposition suggests that the variables that influenced economic growth significantly were exchange rate and labour force while the source of least forecast error variance of real GDP is the innovations of gross fixed capital formation throughout the short-term, medium-term and long-term horizons.

The results of the Granger-causality test suggested unidirectional causality between trade inflation and interest rate and economic growth. However, there is bi-direction of causality among exchange rate and economic growth in Ghana.

Conclusions

Based on the empirical evidence revealed in the study, the following conclusions can be drawn:

1. Both the long-run and short-run results found statistically significant positive effects of exchange rate, FDI, physical capital, and labour force on economic growth in Ghana. This means that 100 percent increase in exchange rate, FDI, physical capital, and labour force in Ghana would lead to approximately 50, 43, 02 and 24 percents increase in economic growth in both long-run and short-run respectively. Thus, the Keynesians and neo-classical theories are valid in both the long-run and short-run.

2. The study also found a positive and significant effect of FDI on real GDP both in the long run and short run. This re-emphasises the significant role that FDI plays in the growth process of Ghana.

3. Gross fixed capital formation (K) and labour force exerted a positive and statistically significant effect on economic growth. This is an

indication that, gross fixed capital formation and labour force are critical in achieving sustained economic growth in Ghana. However, inflation and interest rate exerted a statistically significant negative effect on economic growth both in the long run and short run.

4. From the results of the forecast error variance decomposition, the most important variable for economic growth is government expenditure and the least variable for economic growth is capital stock.

5. The Granger causality test results revealed a unidirectional relationship between inflation, interest rate and economic growth running from inflation and interest rate to economic growth implying that these policy variables causes economic growth. However, there was bidirectional causality between exchange rate and economic growth.

Recommendations

Based on the findings from the study, the following recommendations are proposed.

Firstly, given that the study found a positive causal effect of exchange rate on economic growth, Bank of Ghana needs to ensure a stable exchange rate in order to stimulate economic growth in Ghana. Thus, the Bank of Ghana needs to put measures in place to ensure a stable exchange rate for a long time. This can be done in the form of regularly monitoring the exchange rate at least every day or quarter in the year instead of how it is being done now. This will encourage the private sectors to come on board in complementing government's effort to achieving economic growth.

Another policy implication of the study is that the Bank of Ghana and other regulators need to ensure that low inflationary rate is maintained in the

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Moreover, financial institutions in Ghana need to also consider reducing their interest rate to attract borrowing from the private sector so as to boost development in the financial sector leading to more growth in the economy.

Finally, the finding that physical capital, labour force, and FDI positively economic growth shows how important it is to maintain high physical capital, increase labour force and devising ways of attracting more FDI in the Ghanaian economy. Thus, to ensure high economic growth in the country, the Government needs to first ensure that there is growth in the physical capital, labour force, FDI as well as maintaining macroeconomic stability.

Limitations of the Study

This study employed the Johansen approach to cointegration and one major limitation with the Johansen's approach to cointegration is that it is based on VAR methodology which is inherently over parameterised and sensitive to both model specification and lag length selection. The selected lag length has implications for the outcome of the cointegration, variance decomposition and causality test. Nevertheless, the cointegration, variance decomposition and causality test produced consistent results.

Another limitation of the study typical of such studies in developing nations had to do with the quality and limited availability of quarterly data on some key variables used in the study. To produce highly reliable estimates especially with cointegration analysis, long span of annual time series data of all the variables was needed. As a result of the inadequate annual series, quarterly series were generated through interpolation for the purpose of

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estimation. However, there is no gain in the power of these tests by switching from low frequency to high frequency data and merely increasing the number of observations over a short time period (Hakkio & Rush, 1991; Campbell &Perron, 1991). The use of interpolated quarterly series did not, however, pose danger to the reliability of the results because other authors including Osei (2005) have employed similar approach and arrived at reliable results.

Direction for Future Research

Economic growth is influenced by other variables apart for exchange rate, inflation and interest rate as used in the study. Therefore, future research could consider using many more variables for both cointegration and causality tests in addition to using improved econometric techniques and long span of annual time series data.
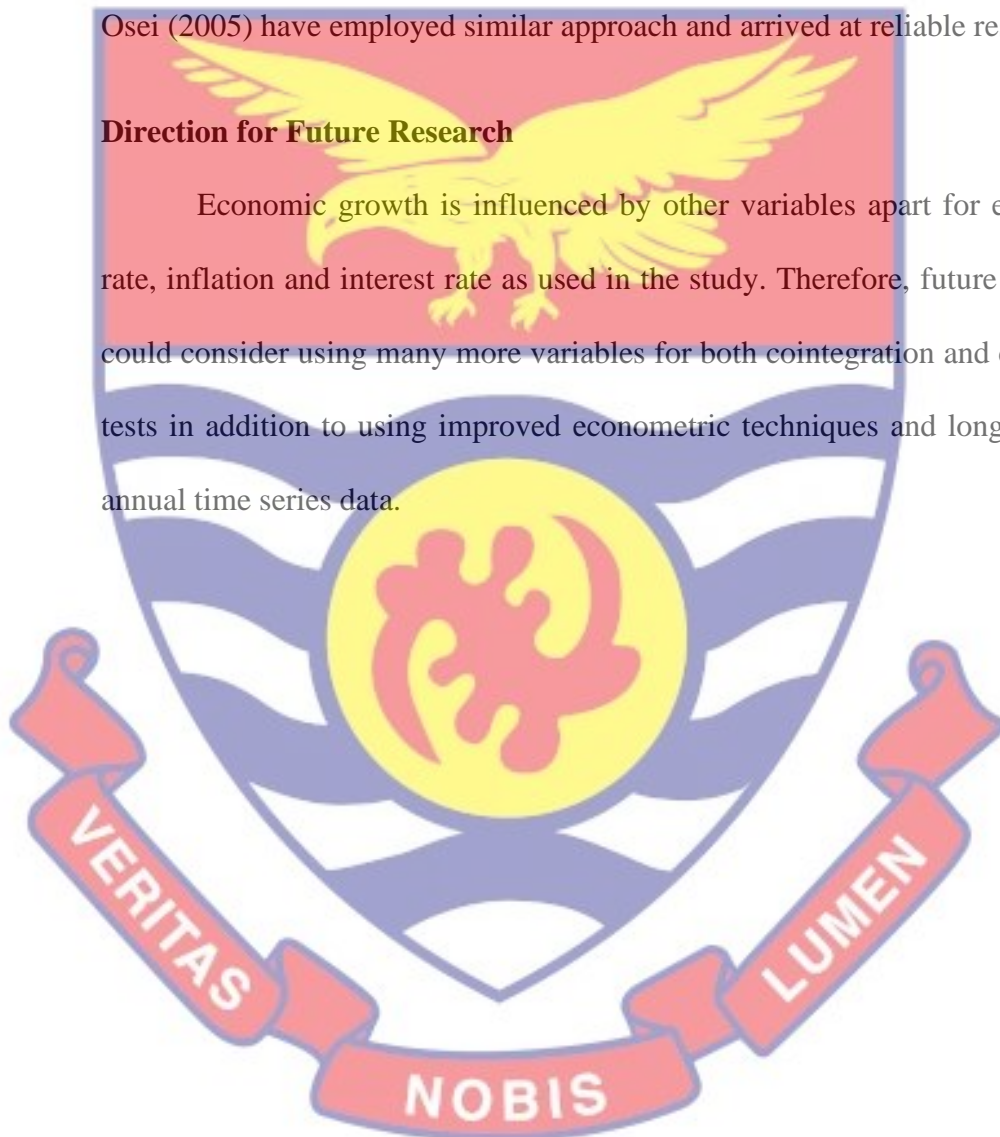
REFERENCES

Banbura M, Giannone D., & Reichlin L. (2010). Large Bayesian vector. *Journal of Applied Econometrics, 2*(5), 71-92.

Barro, R. J. (1995). Inflation and economic growth. *National Bureau of Economics Research*.

De Mello, L., & Moccero, D. (2010). Monetary policy and macroeconomic stability in Latin America*:* The cases of Brazil, Chile, Colombia and Mexico. *Journal of International Money and Finance, 30*, 1-17.

Dickey, D., & Fuller, W. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366), 427-431.

Frimpong, J. M., & Oteng-Abayie, E. F. (2010). When is inflation harmful? Estimating the threshold effect for Ghana. *American Journal of Economics and Business Administration, 2*, 232-239.

Granville, B., & Mallick, S. (2010). Monetary policy in Russia: Identifying exchange rate shocks. *Economic Modeling*, *2*(7), 432-444.

Ito, T., Isard, P., & Symansky, S. (1999). *Changes in exchange rates in rapidly development countries: Theory, practice, and policy issues.* Chicago: University of Chicago Press.

Khan, S., & Senhadji, S. (2001). Threshold effects in the relationship between inflation and growth. *IMF Staff Papers, WP*, *48*(1), 1-21.

McConnel, C. R., & Brue, S. L. (2008). *Economics*. McGraw: Hill International   Edition.

54

McKinnon, R. I. (1991). *The order of economic liberalization: Financial control in the transition to a market economy.* Baltimore and London: Johns Hopkins University Press.

Osei-Assibey, E. (2013). *Exchange rate, interest rate and inflation in Ghana: Is there a missing link?* Department of Economics, University of Ghana, Legon-Accra.

Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861-1957. *Economica, 25*(100), 283-289.

Pitchford, J. (1992). Macroeconomic policy and the exchange rate: working together? *Indira Gandhi Institute of Development Research.*

Uhlig, H. (2005). What are the effects of monetary policy on output? Results from an agnostic identification Procedure .*Journal of monetary economics   5*(2), 381- 419.

World Bank (2013). World Development Report.