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COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

KNUST

**PUBLIC SECTOR WAGE, INFLATION AND EXCHANGE RATE DEPRECIATION IN
GHANA**

**A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, IN PARTIAL
FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A MASTER OF
PHILOSOPHY DEGREE IN ECONOMICS
(MPHIL ECONOMICS)**

BY

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DECLARATION

I hereby declare that, I have personally undertaken this study herein submitted as partial requirement for the award of a Master of Philosophy Degree in Economics and that, to the best of my knowledge, no material published by any other person or presented for the award of any degree in any university is contained in it except where acknowledgment has been duly made in the text.

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DEDICATION

This paper is dedicated to God almighty, my parents, Mr. Paul K. Azumah and Madam Alice Barasu.

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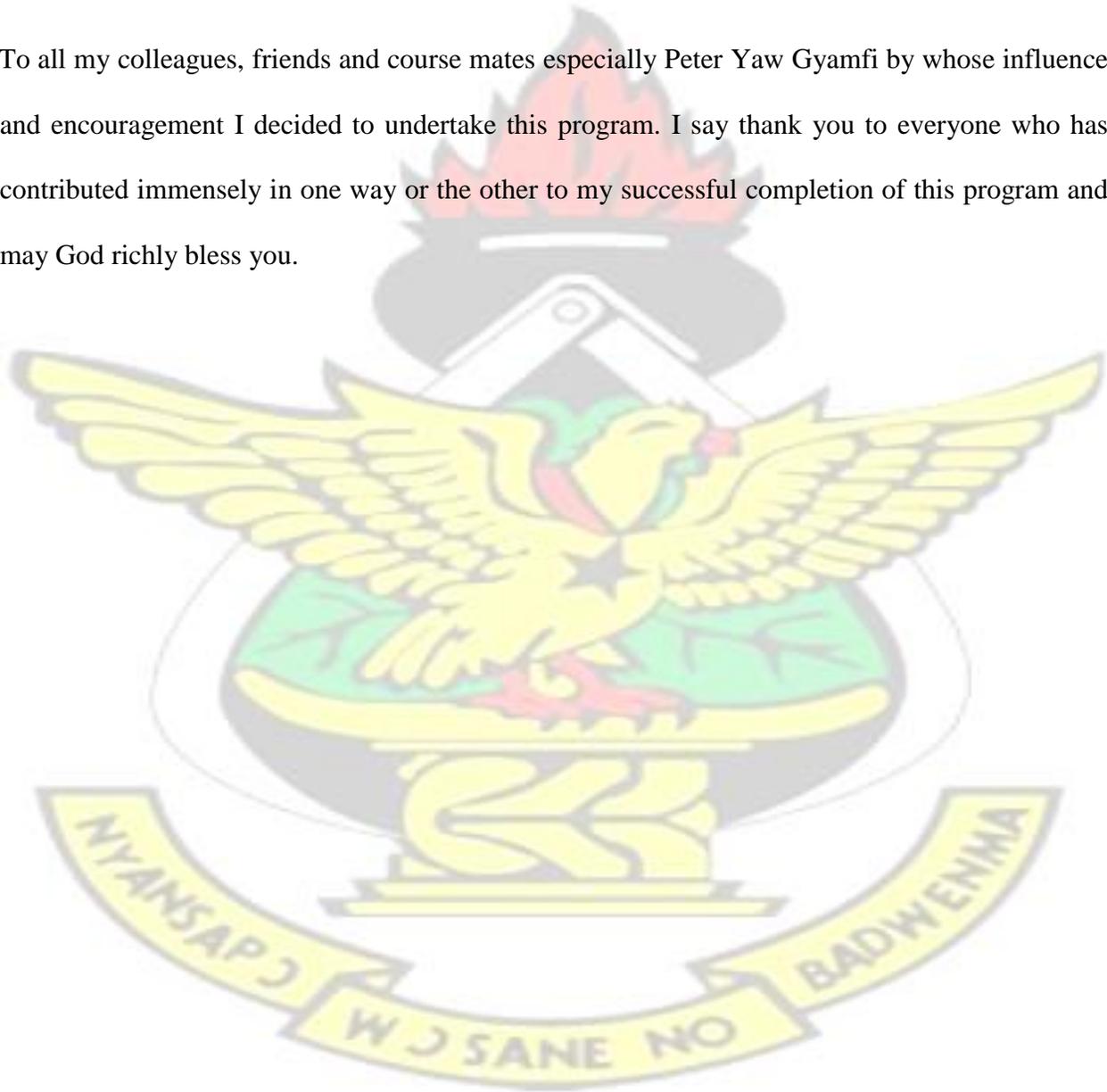


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ABSTRACT

Exchange rate depreciation and price instability in Ghana have become alarming sparking a lot of debates in recent times among researchers, policy analyst, academicians, politicians and the public at large. While some attribute these problems to economic mismanagement and corruption among other factors, others maintain the overwhelming situation could be the result of the high wage bill. This paper aims mainly at determining empirically the impact of public sector wage bill on inflation and how inflation influences exchange rate depreciation in Ghana. An annual time series secondary data for the period 1986- 2014 was employed for the study using the Auto Regressive Distributed Lag (ARDL) model. The results suggest that public sector wage bill- GDP and exchange rate depreciation relate positively to inflation both in the short run and in the long run. A positive relationship between inflation and public wage- expenditure was also established in the long run and a negative relationship in the short run. This affirms the position that though inflation is mainly driven by monetary expansion, other factors like wages as component of fiscal activities are vital sources. On a different facade, inflation, public wage-GDP and public wage- expenditure have a significant negative impact on exchange rate depreciation in the long run. However, public wage- expenditure and inflation exert a positive impact on exchange rate in the short run with public wage- GDP imposing a negative effect. This maintains the negative effect of wage- inflation on exchange rate in Ghana. The study thus suggested that, as monetary policy receives much priority, fiscal policy, an obvious alternative requires equal attention for a sustained exchange rate and price stability.

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LIST OF ABBREVIATIONS

- ADF:** Augmented Dickey Fuller- Test statistics
- ARDL:** Auto Regressive Distributed Lag
- BOG:** Bank of Ghana
- ECOWAS:** Economic Community of West African States
- GDP:** Gross Domestic Product
- GSS:** Ghana Statistical Service
- GUSS:** Ghana Universal Salary Structure
- IMF:** International Monetary Fund
- OECD:** Organization for Economic Co-operation and Development
- SSSS:** Single Spine Salary Structure
- SSPP:** Single Spine Pay Policy

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CHAPTER ONE

INTRODUCTION

1.0 Background

High rate of inflation, high public sector wage bill and unstable exchange rates are some of the multilayered macroeconomic challenges that have bedeviled the Ghanaian economy since independence notwithstanding the copious economic programs postulated to counterbalance their presence. As explained by (Friedman, 1968) in his quantity theory of money quoted by Ekanayake (2012) that 'inflation is always and everywhere a monetary phenomenon', others believe there are fiscal theories that explain inflation. This suggests that inflation is not only a monetary phenomenon. For instance, Ekanayake (2012) found that public sector wages is a key factor that link fiscal deficit and inflation in Sri Lanka. He inferred that inflation is not only a monetary phenomenon in Sri Lanka and that public sector wage expenditure is a key factor in explaining the deficit-inflation relationship. In Metin (1998), fiscal expansion was a determining factor for inflation in Turkey. Again, Dogas (1992) found that the public deficit affects inflation in Turkey and Choudhary and Parai (1991) in their work also found that budget deficits as well as money supply growth rate have significant impact on inflation referenced in Metin (1998). According to Sachs and Susan (1989), Latin American countries have suffered large budget deficits from high wages financed by money creation, massive capital flight, and high inflation rates and overvalued currencies.

According to the Balassa- Samuelson effect, a push for higher wages in one sector will ignite similar demands in other sectors (Alison, 2011). High wage is a stronger standard, providing significantly more purchasing power according to the National Employment Law Project. More purchasing power means increase in aggregate demand with its attendant effects on prices. A

general increase in the costs of goods preceded by and results from increase in wages leads to wage push-inflation similar to the wage-price spiral which suggests high wages increase disposable income raising the demand for goods and the cost of production causing prices to rise (Amit, 1986). High inflation makes domestic goods more expensive in relation to foreign ones. High domestic prices increase the demand for foreign goods. This leads to an increase in demand for foreign currency at the expense of the local ones as more foreign currency is needed to buy foreign goods (Ofori-Abebrese, 2008).

On average, imports of goods and services consumed in Ghana accounts for about 70 per cent of business input costs (Bank of Ghana Report, 2012). The demand for the domestic currency falls due to the fall in demand for local goods as a result of their high prices. The exchange rate rises leading to the depreciation of the local currency. Again, it is reported by the Ministry of Finance in 2013 that Ghana's wage bill constitutes the highest proportion of its total expenditure in recent times after capital spending implying increase in the wage bill will lead to an increase in government expenditure hence its debt. An attempt to finance this debt through external borrowing and printing of currencies can trigger inflation. Government can also increase taxes as a way of raising more revenue to finance the debt. This also has serious implications on the private sector. Increase taxes will raise private sector cost of production and for them to stay in business, the cost is passed onto the consumers in terms of high prices further triggering inflation.

It is observed In Ghana that much attention has always been given to price inflation to the neglect of wage inflation. This is evidence in most of the measures adopted by Bank of Ghana (BoG) in its quest to clip inflation- they are mostly monetary in nature. For instance, Bawumia and Abradu-Otoo (2003) found that, there are other vital factors that determine inflation in Ghana in spite of

the significant role played by monetary expansions. They find wages, fiscal policies, exchange rate depreciation, oil prices, and food supply among others as other important sources of inflation in Ghana. Similarly, a study by Sowa (1994) cited in Metin (1998) revealed that inflation in Ghana is influenced more by output volatility than by monetary factors both in the short run and in the long run. Also, exchange rate is significantly correlated with inflation implied by the relationship of movements in exchange rate with major macroeconomic variables (Mumuni and Owusu-Afriyie, 2004).

Public sector wages per worker have obviously been increasing both in real and nominal terms over the years. According to the Institute of Statistical, Social and Economic Research (ISSER) (2012), there has been a sharp rise in public sector wage bill in Ghana in terms of Gross Domestic Product (GDP) from 4.1 per cent in 1991 to 6 per cent in 1994, 8.1% in 2011 and 9.8% in 2012. The rate of inflation increases correspondently from 10.3% to 34.2% and 8.58% to 8.84%. The currency depreciation also rose from 11.54% in 1991 to 21.76% in 1994 but decreased from 27.3% in 2011 to 14.6% in 2012. In terms of government expenditure, it rose from 40% in 1991 to 45.8% in 1992 and later exhibited some downward trends between the period 1994- 2008 from 33.1% to 24.81% respectively and later soared to 32.37% in 2012. This astronomical jump might be orchestrated by the introduction of the Single Spine Pay Policy (SSPP) in 2009. According to BOG (2007), in 2002, there was an increase in the lowest and highest real wages by 11.6% and 12.9% respectively and the increase in 2003 was 13.4% and 11.7% respectively. Then in 2004, the lowest and the highest real wage rates hurdled even higher by 22.5% and 34.9% respectively. The year 2005 marked the best year for real wages as they climbed by more than 28% respectively, where the tax-free threshold witnessed an upward adjustment at the same time. The basic monthly public sector wage rates even in dollar terms have risen from \$17 in 2000 to reach the one-dollar-a-day

benchmark in 2003, and then increased to as high as \$41 in 2005. The monthly minimum public sector pay for 2006 was \$47, \$57 in 2008, \$67.43 in 2011, \$71.6 in 2012 and \$72.2 in 2013. The rate of inflation was 10.9%,

18.1%, 8.58%, 8.54%, 13.5% and the rate of currency depreciation was also 1.1%, 24.1%, 14.6%, 18.4% and 14.5%. Hence, it can be inferred that, the nominal value of the basic (minimum) public sector wage on the Ghana Universal Salary Structure (GUSS) in dollar terms climbed up by about 188% between the period 2000 and 2006. Also, within 2000 and 2008, the annual growth rate of average individual remunerations in the public sector was 17% in real terms, much faster than GDP growth per capita which was just about 3%. The Ministry of Finance (2013) revealed the wage bill has more than tripled over the period 2009- 2012 which is undoubtedly alarming.

Just as Ghana has witnessed dramatic fluctuations in wages and exchange rates, inflation is not any different. The first episode of inflationary situation in Ghana occurred between the periods (1957-1972). The rate of inflation increased from a single digit of 1.7% in 1962 to 3.9% in 1970 and 10.1% in 1972 accompanied by active state involvement of economic activity (GSS, 2000). In the second episode within the period (1973- 1982), the situation became exacerbated where the figure shot up from 17.5% to 22.3% engineered by the various military takeovers who embarked on expansionary management of the economy leading to high balance of payment deficits. Such deficits were financed through expansionary monetary policy leading to increase in prices, hence inflation. Inflation reached its unprecedented peak ever in the history of Ghana at 122.8% in 1983 (GSS annual Report, 1984) when government expenditure and fiscal deficit in terms of GDP stood at 4.57% and 14.04% respectively and the cedi depreciated by 93.67%, the second highest ever. In 1987, the rate of inflation eased off and stood at 39.8% when the wage

bill was 4.8% and the cedi depreciated by 48.9% following the adoption of a floating exchange rate in 1986. Again, between 1996 and 1997 inflation was at 25% and 8% respectively when the wage bill per GDP was 5.65% and 5.69% and currency depreciation was also 16.91% and 22.66%, which was however short lived as inflation rose to 40.5% in 2000, reflecting fiscal mismanagement (Bemanke et al., 2005). In 2000 when Ghana recorded one of the highest rates of inflation in recent times, the cedi depreciated by 96.8%, the highest ever. It fell to 10.9% in 2006 when the cedi depreciation fell drastically to 1.1% but the wage bill rose marginally to 6.1%. Inflation again rose to 18.1% in 2008 when the wage bill increased to 6.51% and cedi depreciation rose to 24.1%. The sharp fall in the value of the cedi since 2008 was however attributed partly to the 2007 redenomination by BOG according to the West African Monetary Zone (WAMZ) (2012). Inflation came to its lowest at 8.58% in 2011 and stayed till 2012. Between 2011- 2012 the wage bill increased from 8.1% to 9.8% and cedi depreciation rose from 14.6% to 18.4% following the introduction of the Single Spine Pay Policy (SSPP). Ghana's inflation rate started showing an upward trend from 8.84% in 2012 to 13.5 in 2013 and increased further to 17% at the end of 2014 when the wage bill decreased to 8.7% and currency depreciation rose to 31.2% in 2014.

1.1 Statement of the Problem

High wage bill, high rate of inflation and continuous depreciation of the cedi have been a great national concern over the years. The situation has become alarming in recent times sparking a lot of debates among researchers, policy analyst, academicians, politicians and the public at large concerning the causes and the link between these important macro variables. As some theorists view some of these problems from the monetary perspective, others tagged as fiscal philosophers think otherwise. One of such theorists is Milton Friedman (1968) who explains in his quantity

theory of money cited in (Ekanayake, 2012) that inflation phenomenon as a result of too much money chasing too few goods. The monetarists approach tags a unique price level inflation as, always, and everywhere, a monetary phenomenon which emanates from a rise in money supply. This is in variance with Keynes inflation theory that, prices increase over any increase in production in the absence of excess demand in the market due to the existence of pressure from organized labour unions for increased wages. The employers resolve to transfer the increased wages into prices culminating into wage-price spiral, which triggers inflation relating also to the cost-push school of thought (Amit, 1986). Thus, contrary to the monetarists view, the Post-Keynesian and Structuralist inflation theories affirm inflation is not as a result of increased money supply but increase in wages, increase in import prices, increase in commodity prices and exchange rate effects among others (Perry and cline, 2013).

Empirically, a study conducted by Parsley and Wein (2000) in 99 cities in the USA and Japan identified a positive and significant correlation between exchange rate volatility and price dispersion. This is confirmed by Bleaney (1996) who also found a significant positive relationship between inflation and real exchange rate. However, there are those who do not find any connection between exchange rate and macro- variables and Krugman (1988) cited in Albuquerque and Portugal (2004) justifies this in his work. Again, Flood and Rose (1995) referenced in Albuquerque and Portugal (2004) do not find any trade- off between inflation and exchange rate.

Some analysts such as Marfo (2012), Bawumia (2013) and Bemanke et al. (2005) attribute continuous currency depreciation and rising price levels to economic mismanagement, corruption, and high deficit among others. Others like Asiana et al. (2014), among others argued the overwhelming situation could be the result of the high wage bill aggravated by the introduction of the Single Spine Salary Structure (SSSS) in 2009, increase in the volume of imports with a fall in

export value. According to the Ministry of Finance (2013), the wage bill has more than tripled over the period 2009- 2012. It increased from GH¢2.9b (\$2.58b) in 2009 representing 62% of tax revenue to GH¢9b (\$5b) in 2012. The 2012 wage bill forms 73% of tax revenue including salary arrears, 40.8% of total expenditure and 11.9% of GDP. IMF (2005) also noted that Ghana's wage bill as percentage of GDP is higher than the average wage bill in Sub- Sahara Africa between 2000- 2004 and higher than that of ECOWAS between 1990- 2004. Inflation has also been on the ascendency and continues to fluctuate rising from 10.9% in 2007 to 16.5% in 2008 and 19.3% in 2009 and stands at 17%% at the end of 2014. The exchange rate increased from 15.8% in 2008 to 18% in 2012 and 19.4% at the first quarter of 2014 and at the end of 2014, it jumps to 31.2%.

It is undeniable fact, and clear that Ghana's wage bill constitutes the highest proportion of its expenditure in recent years. If increase in government expenditure can lead to an increase in aggregate demand raising price levels with its attendant implications on the private sector, then increase in wages should be a great concern. But the emphasis in Ghana has always been on the use of monetary measures without giving fiscal measures of which wage is one much consideration. That is to say the aggregate price level (and price inflation targeting- fixing price to effect movements in the interest rate) has received much attention but the aggregate wage rate (and wage inflation targeting- rule that makes interest rate responds only to wage movements) which is an obvious alternative has received almost no attention (Canzoneri et al., 2004).

After several measures put in place to bring inflation and exchange rate depreciation under control i.e. stabilizes general price levels and the cedi, no permanent results have been achieved.

Among some of these measures which are mostly monetary in nature are increase in the BOG prime rate, contraction in money supply, and increase in the supply of the dollar (Databank Africa Strategy Report, 2014). It is obvious most policies, proponents and theorists have advocated for

the use of monetary measures to solve these problems with little or no regards to the role of wages which is an element of fiscal policy.

Some critical questions we must ask are whether high wages increase the rate of inflation in Ghana? Does high inflation rate increase imports leading to a fall in the value of the cedi? What are the effects of an increase in the rate of inflation on exchange rate depreciation? To provide answers for these questions, there is therefore the need to investigate empirically if ballooning public sector wage bill has any hand in the inflation- exchange rate volatility in Ghana.

1.2 Study Objectives

a. General Objectives

The prime objective of this study is to examine, empirically, the effects of public sector wages on inflation and how inflation impacts on exchange rate depreciation in Ghana.

b. Specific Objectives

- ❖ To identify the trends in the variables (inflation, exchange rate and wages)
- ❖ To determine the impact of public sector wages on inflation
- ❖ To explore the effects of changes in general price levels on exchange rate depreciation

1.3 Hypothesis

In track with the aforementioned objectives, the study strives to test the following hypotheses;

- ❖ H_0 : Public sector wage has no significant impact on the rate of inflation
- ❖ H_1 : Public sector wage has significant impact on the rate of inflation
- ❖ H_0 : Inflation rate has no significant effect on exchange rate depreciation
- ❖ H_1 : Inflation rate significantly affects exchange rate depreciation

1.4 Significance of the Study

Instability in exchange rate and the rate of inflation in Ghana have always been a problem and a major concern from time immemorial. Instability in these variables is a necessary evil and set back to the economic progress of Ghana. Several measures and policies have been put in place to reverse the situation but it appears no permanent solutions have been achieved so far. Why does the problem persist in spite of all such policies? Has it got to do with the inability of authorities to identify the root cause of the problem leading to the adoption of wrong measures? Is it as a result of mismanagement, corruption, high deficit and wage hikes as argued by some analysts? The outcome of this study will answer these questions begging for answers. Again, much attention has always been on the monetary side as it appears to be the dominant phenomena to the problem making it imperative to also explore the fiscal facet. Also, to the best of my knowledge so far, no empirical study has been carried out and published concerning the effect of public sector wages on inflation and inflation on exchange rate depreciation in Ghana.

The study of the effects of wages on inflation and the effects of inflation on exchange rate depreciation has become important since it must be verified if such effects should be a worry for the central bank's actions when a monetary policy decisions are at stake. Again, finding the effects of public sector wage on inflation and inflation on exchange rate will enable authorities to know the alternative causes of the volatility in these variables and device lasting solutions to eternally entomb these economic cankers. Couple with these, in Ghana we often hear of monetary authority but rarely do we hear of fiscal authority. This study will enable policy makers know if there is also the need for an autonomous fiscal body like a Fiscal Policy Committee aside the Finance Ministry analogous to the Monetary Policy Committee under BoG. Thus, if public sector wage imposes a

significant positive impact on inflation, then a policy decision of instituting various measures of reducing the wage bill significantly will be influenced. Besides, if a significant positive impact of inflation on exchange rate depreciation is established will influence policy makers to bring down inflation or if there will be the need to maintain some level of inflation if the results prove otherwise.

A review of literature showed that, vast growing volumes of research were conducted in other countries both advanced and developing with only a few in Ghana. It is found that among these works done, except very few who studied the impact of inflation on the exchange rate, majority did the contrary especially in Ghana providing limited knowledge on the impact of inflation on exchange rate. Again, a direct link between inflation and exchange rate depreciation has not been established in any of such papers. Interestingly, to the best of my knowledge no paper is available specifically linking public sector wages to inflation in Ghana and directly establishing such a connection internationally. Besides, with the study on government expenditure and inflation, except very few who carried out their study in the presence of public sector wages, vast majority did not give it any attention. These are exactly the vacuums this present study intends to close especially in Ghana.

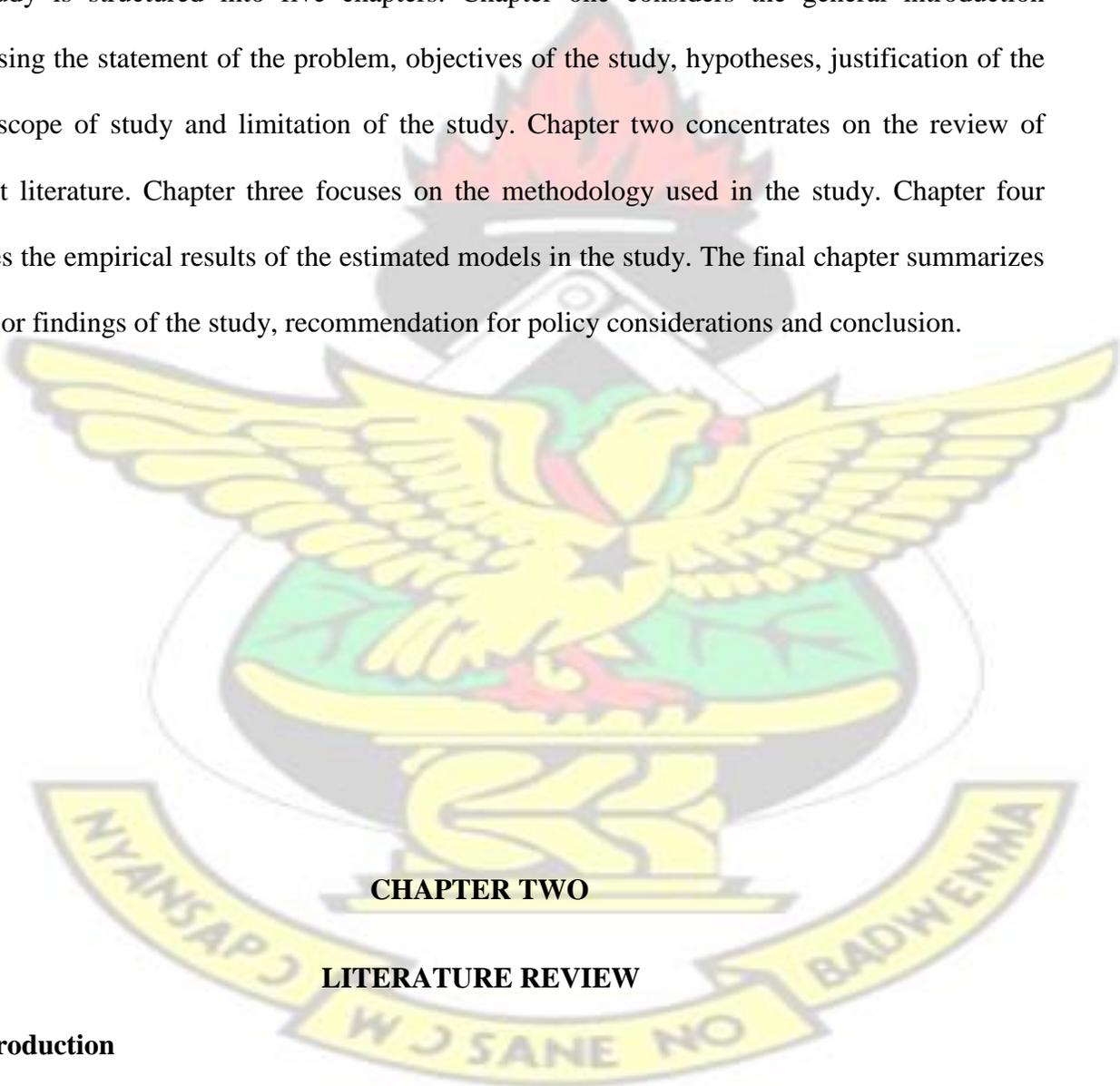
1.5 Scope of the Study/ Delimitation

Public sector wage, inflation rate and exchange rate are not only broad but also complex areas so far as the Ghanaian economy is concerned. Because of limited time, space and resources, the study was limited to the effects of public sector wage on inflation and inflation on exchange rate in Ghana

from the period 1986 to 2014 that is 29 observations using time series annual data. The appropriate macro econometric methods were employed to determine the effects and interrelations among the variables.

1.6 Organization of the Study

The study is structured into five chapters. Chapter one considers the general introduction comprising the statement of the problem, objectives of the study, hypotheses, justification of the study, scope of study and limitation of the study. Chapter two concentrates on the review of relevant literature. Chapter three focuses on the methodology used in the study. Chapter four analyses the empirical results of the estimated models in the study. The final chapter summarizes the major findings of the study, recommendation for policy considerations and conclusion.



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter is related to several strands of literature divided into two parts. The first part contains a review of the theoretical literature as the basis on which this study is built. The second one focuses

on the empirical review of the relevant studies on the effects of public sector wage on inflation, inflation on exchange rate volatility and their interrelationships.

2.1 Theoretical Review

2.1.1 The Monetarists Theory of Inflation

Most Economists have debated the extent to which inflation is a monetary phenomenon.

Prominent is the Classical economics that emerged in modern forms one of which is monetarism.

Monetarists rejected the fiscal policy as stabilization tool on grounds of its weakness and the crowding- out effect. Monetarists hold the view that changes in the money supply are the single most important determining factor of the levels of output, employment, and price levels (Campbell and Stanley, 1996). This argument is supported by Barro (1989) who claims that a rise in budget deficit does not impact on aggregate demand, interest rate and price level. Monetarism maintained that the price and wage flexibility offered by the competitive markets would generate fluctuations in aggregate demand to change the product and resource prices rather than output and employment. They argued against government interference in the economy that it has contributed to the instability of the system- to the business cycle- through its clumsy and mistaken attempts to achieve greater stability through discretionary fiscal and monetary policy.

They realized a different cause- effect chain between money supply and the level of economic activities than the Keynesian model suggests. Friedman (1968) cited in Ekanayake (2012), in explaining inflation phenomenon says that inflation is caused by too much money chasing too few goods. The monetarists approach grounded on the quantity theory of money relates a unique price level inflation as everywhere and always a monetary phenomenon which originates from a rise in money supply. Economists hypothesized that the price level is positively related to the quantity of

money formalized in the quantity theory of money, which predicts that changes in the price level is proportional to the changes in the quantity of money (Lipsey, 1989). This relates to demand-pull inflation.

2.1.2 The Keynesian Theory of Inflation

Keynesians contend there are many loose links in the cause- effect chain with the outcome that monetary policy is an indeterminate and weak stabilization tool compared with fiscal policy (Campbell and Stanley, 1996). The Keynesian view is that the market system is insufficiently competitive and flexible to guarantee macroeconomic stability. Keynes asserts that because government spending such as wages is a component of aggregate expenditures and tax changes have dependable effects on consumption and investment, fiscal policy is a powerful and active stabilization instrument. Keynes position is maintained by other proponents of fiscal theory of inflation such as Wallace and Sargent (1981) in Ekanayake (2012) who suggest that inflation is at least partially determined by the budgetary policies of the fiscal authority and that long- run price stability is not completely in the purview of the monetary authority. This view is also contended by Carlstrom and Fuerst (2000), Leeper (1991), Sims (1994), and Woodford (1994, 1995) cited by Ekanayake (2012). The core information of these works is that the price level is determined purely by fiscal variables i.e. government debt, present and future revenue and spending plans, and monetary factors play no role in determining the price. Basically, the strong form fiscal theory argues that when there is a fiscal deficit, individuals consider it to be increasing their wealth. This, in turn, raises aggregate demand thereby generating inflation and leaving no role for the monetary authority. But the Ricardian equivalence hypothesis proposed by Barro (1989) on the contrary debunks this view that aggregate demand, interest rates and price levels are affected by fiscal deficits.

According to Campbell and Stanley (1996), Keynes rejected the monetarists view on one ground that monetary policy entails lengthy mechanism and the uncertainties at each step limits its effectiveness and dependability. Thus, money matters, but its manipulation through monetary policy is not as powerful a device as fiscal policy. Again, unlike the monetarists, Keynes believes product prices and wages are downwardly inflexible, velocity is unstable and output is not constant. Keynesian economics further view aggregate demand as unstable from one period to the other, even without changes in money supply but through investment volatility.

The Keynesian theory of inflation revealed that when organized institutional forces of trade unions press for higher wages, in the absence of excess demand in the economy, prices increase in excess of any increase production. This is also to say that in the presence of excess demand prices go up avowing the demand-pull school of thought. In another vain, employers translate the increased wages into prices which leads to the wage- price spiral affirming the cost- push school of thought. Thus, the level of money wage rate imposes a momentous influence on the level of costs which in turn determines the short run prices levels. Certainly, as first approximation for macroeconomic analysis, the general price level may often be assumed to be more or less proportional to the money wage rate. Hence, the higher the generally given money wage rate, the higher the resultant general price levels. According to Amit (1986), this in essence provides the basic framework of short period macroeconomic analysis of capitalist economy based on two basic principles which states that the level of aggregate demand is determined by quantities and a given level of the money wage determines the general price level.

Another variant of Keynes inflation theory takes into account unemployment level as a determining factor of inflation. He holds that, the level of price in the short-run period depends not only on money flow but also on unemployment level. This theory is based on the fact that that, if aggregate

expenditures exceed the full employment output, an inflationary gap is created which stimulates inflation. Hence, inflation depends on excess demand comparative to output.

2.1.3 The Structuralizes Theory of Inflation

The structuralists theory maintained that less developed countries by the nature and size of their economies are more vulnerable to inflationary tendencies Argy (1970). They based this argument on the fact that there are stringencies or holdups such as, economic rigidities, institutional and socio- political influences in these countries, in varied ways that obstruct output growth. Looking at inflation from the supply side of the economy, the theory identifies some mechanisms that fuel inflation as low inelastic supply of food items and agricultural products due to foreign exchange shortage and the presence of bottlenecks in the agricultural sector.

2.1.4 Wage Theories and Prices

According to Keynes's Law of demand contained in the book of Fellner and Haley (1949), a general reduction of wages will constitute a reduction in costs, in incomes, and in demand.

Keynes pointed out that costs incurred in producing any commodity constitute the incomes out of which comes the demand. Thus, under certain circumstances a change in wages and so in total costs including normal profits will bring an equal change in demand. The implication is that if wages constitute costs and if a rise in costs brings about a rise in prices and inflation from the cost-push school of thought, then increase in wages brings about increase in prices and inflation which is the wage-push inflation. Another deduction is that if increased wages raises income, consumers' purchasing power is strengthened which creates an increased aggregate demand and with a given aggregate supply, prices go up hence inflation. In another vain, when employers translate the increased wages into high prices, it leads to wage- price spiral triggering inflation.

Campbell and Stanley (1996) made a distinction between wage- price guideposts and wage- price controls which are also referred to as incomes policies. To them, both guideposts and controls establish standards for noninflationary wage and price increases. But guideposts rely on voluntary compliance by labour and businesses, whereas under controls the standards are enforced by law. These policies are devised to contain excessive rises in nominal payments (wages, rents, interest and profits) which presumably are contributing to inflation. By limiting the increase in nominal income and prices, income policies affect real income (the amounts of goods and services one can obtain with nominal income). They argued that real income depends on the two targets of wage-price guideposts and controls which are the size of the nominal income and the prices of goods and services bought.

Perry and Cline (2013) also noted that inflation is the outcome of cost pressure emanating from wages, commodity prices, real exchange rate and also wage resistance to previous inflation. This is based on the Post- Keynesian and the Structuralist inflation model similar to the basic Philips curve. However, unstable spiral between prices and nominal wages may be produced by an increase in real wages claimed by workers according to the new structuralist tradition observed by Taylor (1983) reported in (Perrie- Richard and Hoffmaister, 1997).

Thus, theoretically inflation is expected to positively relate to wages, expenditure and fiscal deficits.

2.1.5 The Relationship between Exchange Rates and Inflation

Exchange rate (the price of one currency in terms of another) is determined by the interaction of demand and supply in respect of foreign currency in any particular period of time (Ofori- Abebrese, 2008). It is noted in her work that when the domestic currency (cedi) appreciates, exports become expensive and imports become relatively cheap. She argued that fundamentally, anything that leads

to a rise in the demand for domestic goods relative to foreign goods results in an increase in the demand for domestic currency and a decrease in its supply causing it to appreciate. Inferring from this argument, one can narrow it down to price levels hence inflation as the basic cause of any change in the demand for and supply of both foreign and domestic goods *ceteris paribus*. Thus, increase in price levels (inflation) increases the demand for foreign goods (imports) accompanied by the depreciation of the domestic currency.

Again, according to Bilson (1978), an increase in the rate of inflation will lead to a fall in demand for money and an increase in expenditure on goods which results in an increase in prices. The currency is expected to depreciate due to the price rise to maintain the PPP. This assertion is based on a simple theoretical monetary model starting with the relative demand for money function fundamental to the behavioral equation of the monetary approach assumed to be of Cagan functional form.

Roos (1985) quoted in Osei- Assibey (2013) categorizes exchange rate depreciation theories into two. They are those explaining short run movements (capital flows- asset models) and long run movements (capital flows and current accounts- balance of payment models). The asset approach based on the assumption that assets are traded in an efficient market predicts the spot rate value changes like any other asset. The asset models are broadly divided into two main types; the monetary approach and the portfolio balance. The monetary approach postulates that exchange rate is determined by the relative price levels of two countries. This also relates to the purchasing power parity (interest rates parity) which contends that it is the differences in prices (interest rates) among countries that cause exchange rates to move. These relative price levels are subsequently determined by the demand and supply of money. Thus, increase in money supply other things being equal leads to proportionate fall in the value of the domestic currency due to increased

domestic prices. The balance of payment approach focuses on current account as a determinant of exchange rate. Current account deficit (surplus) mirrors depreciation (appreciation) of exchange rate which also relates to the absorption approach. In consequent, high inflation countries tend to experience depreciating currencies.

2.2 Empirical Review

2.2.1 Government Expenditure (Public Wages) and inflation

Ekanayake (2012) examines the validity of the hypothesis which suggests there is a connection between fiscal deficit and inflation in less developed countries and explored further such connection in the absence of public sector wage. Using an Autoregressive Distributed Lag (ARDL) in his analysis with annual data from 1959 to 2008 in Sri Lanka, with a persistent fiscal deficit and rising inflation with large public sector found that there is a positive correlation between fiscal deficit and inflation. He noted that a one percent rise in the ratio of fiscal deficit to narrow money results in about eleven percent increase in inflation. It is further found that, this relationship becomes weaker in the absence of public sector wage expenditure. It can therefore be inferred from Ekanayake's study that, inflation is not always and everywhere a monetary phenomenon as postulated by the monetarist spearheaded by Friedman but public sector wage expenditure is a major factor in explaining the deficit- inflation relationship as exemplified in Sri Lanka. This study confirms the position of the proponents of fiscal policy such as Keynes and Lipsey.

Similarly, in the work of Buffie (1999), it is identified that the weak correlation between fiscal deficit and the rate of inflation may be due to the public sector wage cycles. He employed a perfect foresight model and hypothesized that, public sector wage cuts in developing states are accompanied by the same or diverse increase in real wage. The public's inflationary expectations

are related to these wage trends. In consequent, even in a low fiscal deficit period resulting from public sector wage cuts, inflation might spark weakly or negatively connecting the fiscal deficit and inflation. He admitted that when the public sector wage cut is eliminated, fiscal deficit and inflation relationship may remain unaffected.

Perrie- Richard and Hoffmaister (1997) conducted a study in four middle- income countries namely, Chile, Korea, Turkey and Mexico examining the short run relationships between money growth, nominal wage growth, exchange rate depreciation, the output gap and inflation. The generalized VAR technique proposed by Koop et al. (1996) and a quarterly data from 1979Q1 to 1995Q4 was adopted. They arrive at a result suggesting that the rate of inflation in all countries increases due to nominal wage growth. Based on the outcome of this study, a positive correlation between exchange rate depreciation and inflation is maintained. This impact they said persisted substantially in Mexico and Korea.

Mihaljek and Saxena (2009) also conducted a study on wages, productivity and structural inflation in emerging market economies. They employed an analytical framework considering a simple aggregate model of the economy with Cobb- Douglas constant- returns to scale production function. They found out that wages adjust for inflation revealing positive correlations. A significant correlation between inflation and wage growth was discovered in Chile, China, Czech Republic, Hong Kong, Philippines and Thailand. Also, except in Brazil, South Africa, Korea and China, there was an observation of a close alignment of average growth rates of labour productivity and real wages in most emerging market economies. They find a faster growth in real wages in these countries than average growth of labour productivity. The implication of this is that the labour market of these economies produces increasing real unit labour costs, hence increasing inflation. This result confirms the theory of the wage- price spiral interpreted by Keynes.

According to the work of Perry and Cline (2013), using a vector autoregressive technique and a deduction from the Post- Keynesian identification strategy and structuralist theories of inflation, there exist a positive correlation between the rate of inflation and inflation volatility and wages in US. They argue that basically, a fall in inflation rate and inflation volatility was as a result of a fall in wages and deteriorating import prices triggered by international competition and exchange rate effects. They support this argument that a fall in inflation has been a wage and import price moderation using graphical analysis, impulse response functions and variance decomposition. They went further to argue for the wage- price spiral suggesting that inflation generally is due mainly to the wage pressure on costs. They also found exchange rates volatility not due to inflation as the only basic causal factor. Inflation can be affected by exchange rates effects first i.

e. the pass- through effects before exchange rates can be affected by inflation in the model. They concluded from their empirical results that a clear positive increase in inflation results from a positive increase in wages and that after import prices, wages have the second magnitude effect on inflation.

Alison (2011) outlines in a panel regression results that the relationship between monetary union and high levels of wage inflation in the public sector, relative to the manufacturing sector is statistically significant. The study exposes the conventional view suggesting that, inflation and fiscal deficits are worsened due to public sector unions' agitation for wage increases, which does not reflect in their productivity since the provision of essential and price inelastic services are monopolized by the public sector. This conventional view is challenged by Alison (2011), arguing that it is the accidental effect of the institutional movements towards European Economic and Monetary Union (EMU) that cause the recent public sector wage inflation increase in relation to what occurs in the manufacturing sector in the Euro- countries. This occurs as public employer's

capability to deny inflationary wage payments to public workers is weakened by the removal of some constraints by these unions. Alison (2011) further noticed that public sector wage inflation was curtailed during the pre- EMU regimes i. e. under their predecessors, the European Monetary System (EMS). He found that an increase in public sector wage generates inflation which he described as public sector wage inflation. He therefore suggests a limit to public sector wage rise by governments to avoid excess expenditure that translates into inflation.

2.2.2 Inflation and Exchange Rates

Kashif (2011) studies the long run relationship between inflation and exchange rates in Pakistan using Ordinary Least Square (OLS) model and a monthly data from 1970-2009. He considers inflation as the explanatory variable and the exchange rate as the explained variable per contemporary study. The study maintains there is a strong negative correlation between inflation and exchange rate. This finding may suggest and render invalid the argument of imported inflation. He also found that a rise or fall in the value of a currency is caused by the macroeconomic variables such as the interest rates, monetary policy and inflation. In effect, changes in spot and forward exchange rates are the results of changes in inflation. This finding may suggest and render invalid the argument of imported inflation. This also implies in the short run, there is no significant pass-through of depreciations to prices. The theoretical analysis contending a weak short run link between exchange rate and inflation is consistent with this study.

Using Structural Vector Auto- Regressive (SVAR) model, Sanusi (2010) estimates the pass-through effects of exchange rate to consumer prices in Ghana. He finds that, a vital source of

inflation in Ghana is the depreciation of the exchange rate. He however reveals that, in explaining the actual inflationary pressures in Ghana, monetary expansion has been more domineering than the exchange rate depreciation drawing from variance decomposition analysis. The findings of this study seem to be consistent with the findings of others who contend the exchange rate pass-through to consumer price in Ghana is significantly high but contrary to others who find a low exchange rate pass-through in Ghana.

Mwase (2006) in investigating the effects of exchange rate changes on consumer price in Tanzania, a Structural Vector Auto Regression (SVAR) model and a data set from 1990 to 2000 were adopted. The study suggests that, in spite of currency depreciation, there was a decline in the exchange rate pass through to inflation in the later part of 1990. This decline was however linked to the implementation of structural and monetary reforms during the period and does not imply less significant fluctuations in the exchange rate in interpreting macroeconomic volatilities.

The West African Monetary Zone (WAMZ) (2012) conducts a research in the WAMZ countries to investigate the impact of the effects of exchange rate changes on growth in output and inflation. In estimating the impulse response function and variance decompositions to determine the responsiveness of output and inflation to exchange rate changes, a Vector Autoregressive (VAR) model is adopted by the study. The paper uses quarterly data series covering the period 1981Q1- 2010Q4 for all countries except Ghana and Guinea. It covers the period 1983Q2 to 2012Q4 for Ghana and 1989Q1 to 2010Q4 for Guinea. Evidence from the study justifies that in all member countries, the exchange rate had a significant impact on inflation. For Liberia and Sierra Leone, an inverse correlation between real exchange rate and real output growth was obtained by

the study. This suggests that real exchange rate depreciation in both countries could result in output growth. However, in Ghana, Nigeria, Gambia and Guinea, the study maintains a weak positive relationship, something the paper attributes partly to supply side factors.

Again, Abradu- Otoo and Bawumia (2003) in an attempt to ascertain the relationship between money growth, inflation and exchange rate in Ghana employs an error- correction mechanism and co- integration analysis. Monthly data series covering the period 1983 1999 is used. The results of the study suggest a long run relationship between inflation, money supply growth cedi depreciation and real income. It is also found that, there exit a positive correlation between exchange rate, and money supply growth and inflation in Ghana but found inflation to be inversely related to real income. They found that the growth of money supply has a more significant impact on inflation than the depreciation of the cedi. If this is to suggest that monetary expansion is the major source of inflation in Ghana, then it contravenes the findings of Sanusi (2010) that a vital source of inflation in Ghana is the cedi depreciation. Again, the inverse relationship found in this study between inflation and real income is also inconsistent with the results of WAMZ (2012).

Madesha et' al (2013) using Granger causality test empirically probes the relationship between exchange rate and inflation in Zimbabwe. An annual data for the period 1980 to 2007 was used. The findings of this study show inflation and exchange rate Granger- cause each other and thus have a long run relationship.

Mumuni and Owuau- Afriyie (2004) in their study, explore the factors that drive exchange rate in Ghana specifically the cedi/ dollar rate. They employ cointegration techniques and error correction model in their analysis. The outcome of the study contends that the dynamics in the cedi/ dollar rate are significantly determined by the rate of inflation and the Treasury bill among others.

Similarly, to explore exchange rate determinants in Ghana with much emphasis on inflation, Immurana et' el (2013) using an Autoregressive Distributed Lag (ARDL) to co- integration model with an annual data series covering the period 1985- 2010 maintains inflation significantly affects exchange rate positively in the long run but affects it negatively in the short. Also, the long run positive impact of inflation on exchange rate in this study upholds the findings of Mumuni and Owuau- Afriyie (2004).

2.3 Conclusion

In a nutshell, this chapter has been buttressed with several strands of literature both theoretically and empirically. The review centered on the relationship between wages as components of government expenditure and inflation and exchange rates and inflation both in Ghana and across the globe.

Inflation and exchange rates in Ghana have been characteristically unpredictable and volatile. Inflation was viewed as a monetary phenomenon by some theorists and others looked at it from the fiscal perspective. Some studies have also found a link between wages and inflation and exchange rate and inflation. Some have found this connection to be weak or mixed with others suggesting no such links at all. The review showed that, vast growing volumes of research were conducted in other countries both advanced and developing with only a few in Ghana. Even with the limited work done on Ghana, except Mumuni and Owuau- Afriyie (4004), Abradu- Otoo and Bawumia (2003) and Immurana et' el (2013) who studied the impact of inflation on the exchange rate, majority did the contrary. Interestingly, to the best of my knowledge no paper is available for review specifically on the link between public sector wages and inflation in Ghana. Besides, with the study on government expenditure and inflation, except Ekanayake (2012) and few others, who

carried out their research in the presence of public sector wages, vast majority did not give it any attention. Thus, the present study has become imperative especially in Ghana.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The methodology employed for the study to explore the impact of public sector wages on inflation and how inflation affects exchange rate depreciation is presented in this chapter. The chapter is divided into four sections. The first section presents the type of data and sources, model specification with theoretical background and definition of variables are described in the second and third sections respectively and estimation procedures are discussed in the last section.

3.1 Type and Sources of Data

The data type used in this study is sourced from secondary bases covering the period 1986- 2014. The sample period chosen for the study is based on the availability of data for all the variables. An annual collated time series data on inflation, interest rate, money supply and exchange rate depreciation (bilateral exchange rate depreciation) are obtained from BoG data base and statistical reports. Public sector wage bill is acquired from ISSER and the IMF, government expenditure and fiscal deficits are calculated from the Ministry of Finance data by the Institute of Economic Affairs (IEA) and the IMF.

3.2 Model Specification

Drawing from the Post- Keynesian and Stucturalist positions, cost pressures and wage demands, prices of imports, markups and commodity prices are underscored by the Post- Keynesian pricing models to explain the Great Inflation Moderation. Perry and Cline (2013) used the Post- Keynesian pricing model to show the causes of decline in inflation and inflation volatility. Based on this model, the significance and relevance of cost factors as against monetary policy changes is tested during the period of inflation moderation.

The Post- Keynesian pricing model do not rely on natural rates and thus, discards the Wicksellian theory of natural rate of interest and emphasized cost push inflation. Again, at the macroeconomic level, the model in one way or the other depends entirely on cost and pricing and typically treats money as endogenous. In addition, cost push pressures coming from commodity prices and exchange rate depreciation are underlined by the Structuralist schools.

Thus, the Post- Keynesian and the Structuralist inflation model analogous to the basic Philips curve is constructed (Perry and Cline, 2013) as in equation 3.1.

$$p_t = \delta_0 + \delta_1 w_t + \delta_2 p_t^c + \delta_3 e_t + \delta_4 p_{t-1} \quad (3.1)$$

Where the rate of inflation is represented by p_t , w_t is the growth of unit labour costs at time t i. e. wage growth – growth of labour productivity, the superscript c denotes commodity prices, e is the growth of prices of import, δ_0 reflects the markups and p_{t-1} represents the price at one period lag. Inflation thus, is as a result of the effects of cost pressure arising from wages, commodity prices, the real exchange rate and also the resistance of wage to previous inflation (p_{t-1}).

On the front of determining the effect of inflation on the exchange rate, a simple theoretical monetary model is established that directly leads into the empirical analysis of the study. In so doing, the demand for money function is employed. This function is fundamental to the behavioral equation of the monetary approach hypothetical of Cagan functional form (Bilson, 1978) represented as;

$$\frac{M}{P} = ke^{-\varepsilon i} y^{\eta} \quad (3.2)$$

From equation 3.2, **M** is the nominal money demand stock, **P** represents price level, **i** denotes the rate of interest, **e** is the exchange rate and **y**= real income level with **k**, **ε**, and **η** being the parameter estimates.

Money stock and real income are assumed to be exogenously determined in the simple model considered. Thus, the fundamental effects of changes in the exchange rate are the exogenous changes in the expected rate of inflation. In effect, changes in the price level leads to the establishment of money market equilibrium.

The purchasing power parity condition as assumed in the model by Bilson (1978) is presented as;

$$S = \frac{P}{P^*} \quad (3.3)$$

Where **S** represents the current spot rate (GH¢/ US\$), **P** denotes the home/ domestic price index (Ghana) and **P*** is the foreign price index (US).

The Uncovered Interest Rate Parity (UIP) condition which infers that, the differential of the domestic and foreign interest rate is just equal to the anticipated depreciation rate of the domestic currency is assumed by monetary models of exchange rate determination (Mumuni & Owusu-

Afriyie, 2004). This condition is illustrated below;

$$\Delta S_{t+1}^e = (i - i^*) \quad (3.4)$$

Where S^e is the expected exchange rate, i = the domestic interest rate, i^* represents the foreign interest rate and Δ represents change.

The relative money demand function is arrived at in equation 3.5 by substituting equation 3.2 into 3.3, and assuming identical money demand function for US.

$$\frac{M}{SM^*} = \frac{k}{k^*} \left[\frac{y}{y^*} \right]^\eta e^{-\varepsilon(i - i^*)} \quad (3.5)$$

Where SM^* = the domestic value of the foreign money stock, M = stock of the domestic currency, M^* = stock of the foreign currency, y/y^* = real income ratio, k/k^* = shift factor, $i - i^*$ = interest rate differential and ε = exchange rate.

From equation 3.5, SM^* is the cedi value of US money stock, M is the stock of the cedi and M^* is the stock of the dollar. The ratio on the left hand side is the relative real quantity of the two currencies in terms of the purchasing- power parity condition. On the right hand side of the equation, the interest rate differential and the real income ratio are described as the factors that influence the relative demand for the both currencies.

The demand for the domestic currency falls as a result of a rise in the domestic rate of interest. This leads to a fall in the value of the local currency in terms of the foreign currency. The other factor included in the function is the ratio of real income. In the relative demand for money function, real income is included as proxy for domestic residents' wealth whose preference could be presumed to be local currency and an index of the size of transactions carried in the currency. Under all conditions, the exchange rate will appreciate through an increase in real income per the predictions

of monetary theory. Through the interest rate differential, speculations in effect enter the model and this speculation could also enter the model slightly in a different plethora of view.

Monetary expansion under the rational expectations hypothesis does not only induce directly exchange rate depreciation but also further sparks exchange rate depreciation through the creation of further monetary expansion expectations.

Contrary to the relative demand for money theory above, it is noted that an appreciation of the domestic currency is as a result of a rise in the relative domestic interest rate within the Dornbusch (1976) sticky price model referenced in (Mumuni & Owusu- Afriyie, 2004). In the short run, the sticky price model entails Keynesian features supported by the monetary approach implications in the long run. Mumuni and Owusu- Afriyie (2004) also observed under the fixed- price model of Mundell- Fleming that this deduction is not different. Generally, in this model, it is postulated that deteriorating trade balance is as a result of a rise in domestic real income that depreciates the exchange rate. Besides, there are imports of capital due to a rise in the domestic interest rate leading to exchange rate appreciation.

The relative cost of holding the two currencies in terms of other financial assets is the interest rate differential. Bilson (1978) used the Fischer condition to describe the differential of the nominal interest rate as the difference between the expected rates of inflation of the two price indices. This is expressed in equation 3.6 below.

$$\Delta S^e = i - i^* = P^e - P^{e*} \quad 3.6$$

Where $P^e - P^{e*}$ = the differential of expected inflation rate between the two countries (Ghana and US); domestic (P^e) and foreign (P^{e*}).

Multiplying through equation 3.5 by $\frac{M}{M^*}$, the basic equilibrium exchange rate is obtained in equation 3.7 below.

$$S = \frac{M}{M^*} \left[\frac{y}{y^*} \right]^\eta \frac{k}{k^*} e^{\varepsilon(t-t^*)} \quad (3.7)$$

The economic fundamentals that affect the exchange rate are brought about by the basic equilibrium exchange rate in equation 3.7. Bilson (1978) used this equation as the basis for his test of the monetary approach to exchange rate determination. The test is based on the hypothesis that;

- (a) The estimated parameters derived from the sample data should be in line with other estimates of the money demand function if monetary approach is ‘correct’
- (b) If for instance the exchange rate is depreciated by higher real income even if the model’s forecast power were high, the approach will not be supported by the sample evidence.

Beginning with a shift factor $\frac{k}{k^*}$, equation 3.7 is quoted in a more formal and testable format.

Certain exogenous change in the relative demand for the two currencies is allowed to specify the shift factor. Prominence is given to monetary and fiscal policy uncertainties of factors that account for such movement. Also, is the falling store of value function of the cedi due to the cedi/ dollar rate instability with the resultant effect of a fall in demand for the cedi. In accounting for these factors, a trend (t) is allowed in the shift factor as presented below in equation 3.8.

$$\ln\left(\frac{k}{k^*}\right) = k_o + \lambda t \quad 3.8$$

Where k_o = constant and λ = rate of growth of relative money demand.

Bilson (1978) in accounting for the slow pace of actual price level adjustment to the equilibrium, an idea borrowed from the study of demand for money function, adopted the partial adjustment mechanism as a form of distributed- lag mechanism where the change in the exchange rate (price) level is proportional to the differential of equilibrium value of exchange rate (price) and the actual level. This is shown below in equation 3.9.

$$\ln S - \ln(S_{-1}) = \gamma[\ln(\underline{S}) - \ln(S_{-1})] \quad 3.9$$

From equation 3.9, γ = the coefficient of partial adjustment and \underline{S} = equilibrium exchange rate.

Substituting equations (3.7) and (3.8) into (3.9) plus a stochastic term and taking a natural log, equation 3.10 is derived below:

$$\ln \underline{S} = \beta_0 + \beta_1 \ln M + \beta_2 \ln M^* + \beta_3 \ln(i - i^*) + \beta_4 \ln y + \beta_5 \ln y^* + \beta_6 t + \beta_7 \ln S_{-1} + \varepsilon \quad (3.10)$$

Thus, drawing from the Post- Keynesian pricing model as Perry and Cline (2013) put it, the empirical model of inflation for Ghana is constructed in model I. The objective is to determine the impact of public wages on inflation.

MODEL I

$$\ln INF_t = \alpha_0 + \alpha_1 \ln PWB_t + \alpha_2 \ln EXRDEP_t + \alpha_3 \ln M_t^s + \alpha_4 \ln GFD_t + \alpha_5 \ln PWBE_t + u_t \quad (3.11)$$

Again, based on a simple theoretical monetary model of determining exchange rate starting with the demand for money function as explained by Bilson (1978), the empirical testable model for exchanged rate determination for Ghana is also specified in model II for the study. The objective is to determine the effect of inflation on exchange rate depreciation.

MODEL II

$$\ln EXRDEP_t = \gamma_0 + \gamma_1 \ln INF_t + \gamma_2 \ln INT_t + \gamma_3 \ln M^s + \gamma_4 \ln PWB_t + \gamma_5 \ln PWBE_t + v_t \quad (3.12)$$

Where INF = Inflation rate which is Ghana's general consumer price levels, $EXRDEP$ = Exchange rate depreciation of the cedi, PWB = Public sector wage bill as percentage of GDP, $PWBE$ = Public wage bill as percentage of expenditure, INT = Interest rate representing the monetary policy rate of BoG, M^s =Money supply which is the broad money (M2+), GFD = Government fiscal deficit, α_0, γ_0 and δ_0 are the Constant intercepts, u_t, v_t and w_t are the Stochastic error terms that capture all relevant potential variables that were omitted from the model. Ln is the Notation of natural logarithm, $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5$ are the parameter elasticity coefficients and t = Time subscript.

3.3 Variables Definition and Expected Signs

After specifying the inflation and the exchange rate models for the study, the variables used in the model are defined, and their measurements and expected signs explored under this section.

Public sector wage bill-GDP (PWB) as an independent variable in both models is the total government expenses on wages and salaries only in cash expressed as percentage of GDP. This is based on the World Bank (2007) narrow definition. The wages and salaries are government total remuneration in cash and kind and social contributions paid on behalf of employees as captured by IMF (2001) and OECD (2011). The public wage bill used in the study combines both definitions as the data is obtained from different sources. Public wage bill as percentage of GDP (PWB) is used because it grows in proportion to GDP. The wage bill is expected to relate positively to inflation and exchange rate depreciation drawing from the Post- Keynesian simple pricing model, thus $\alpha_1 > 0$ and $\gamma_4 > 0$.

Public wage bill as percentage of total government expenditure (PWBE) is also used as an independent control variable in both models. Public wage bill- expenditure is expected to impact positively on exchange rate depreciation and inflation based on the Post- Keynesian simple pricing model, hence $\alpha_5 > 0$ and $\gamma_5 > 0$.

Government fiscal deficit (GFD) in the study is an independent variable in Model I defined as the conventional budget deficit. The conventional government deficit is the total expenditure- total receipt which represents the IMF functional definition (Dovina et al., 2002). According to Lipey's fiscal theory of inflation, fiscal deficit is expected to impact positively on inflation. Keynesian Economics however argues for a long run negative relationship between fiscal deficit and inflation, thus $\alpha_4 > 0$.

Interest rate (INT) in Models I is also an independent variable which represents the BoG policy rate. An increase in the interest rate is supposed to cause a fall in money demand and an increase in exchange rate hence, a positive relationship based on the simple theoretical monetary model of exchange rate determination (Bilson, 1978), hence $\gamma_2 > 0$.

Money supply (M^s) which is also an independent variable is the broad money (M2+) as defined by BoG. Also, per the simple theoretical monetary model of exchange rate an increase in money supply results in an increase in the inflation rate and increased money supply is also expected to cause an increase in exchange rate depreciation. This is also in line with the Monetarists theory of inflation. Thus, based on the Monetarists theory and simple theoretical monetary model of exchange rate determination, money supply expectedly relates directly to inflation and exchange rate depreciation, thus $\alpha_3 > 0$ and $\gamma_3 > 0$.

Inflation (INF) in Model I is the dependent variable and an independent variable in Model II which is the general consumer price index (CPI). Theoretically, an increase in the rate of inflation is

expected to have a depreciating effect on the cedi hence, a positive relationship between inflation and exchange rate depreciation based on the monetary approach to exchange rate determination (Bilson, 1978), thus $\gamma_1 > 0$.

Lastly, exchange rate depreciation (EXRDEP) is a dependent variable in model II and an independent variable in model I. This is a bilateral exchange rate depreciation of the cedi against the major trading currency in this study. According to the Post Keynesian pricing model and the monetary model of determining exchange rate, inflation and exchange rate are expected to relate positively, hence, $\alpha_2 > 0$.

3.4 Estimation Techniques

In analyzing public sector wages and inflation and inflation and exchange rate depreciation interrelationships both in the long and the short run, the Auto- Regressive Distributed Lag (ARDL) model was employed (Pesaran et al., 1997). In order to undertake empirical investigations of the long run relationship between inflation and its exogenous variables and exchange rate depreciation and its independent variables, co-integration test was adopted. An Error- Correction Model (ECM) was also estimated to capture the short run dynamics of the models. To integrate the unit root properties of the data series and to test for the null hypothesis of non- stationarity, unit root test was employed using Augmented Dickey-Fuller (ADF), (Dickey and Fuller, 1979).

It is obvious that there is the existence of non- stationarity (non- constant mean and variance) in most macroeconomic variables such as wages, inflation, exchange rates, money supply fiscal deficit among others. Consequently, there is the need to ensure the reliability of analyzing the study by examining the stationary properties of the variable in question so as to avoid biased, spurious and misleading outcomes. In so doing, the Augmented Dickey Fuller (ADF) unit root test is

adopted to test for stationarity (Dickey & Fuller, 1979). In this test, the null hypothesis is either rejected or accepted that the series is non-stationary. This decision is based on comparing the t-ratio of the lagged term with the tabulated value. The null hypothesis is accepted if the t-ratio is less than the critical value given by the one-sided Mackinnon. The first difference of the series is estimated by the equation if the null hypothesis is accepted otherwise, the series is stationary given the assumption that the series is integrated of order one $I(1)$.

Also, in analyzing the long run relationship between inflation and exchange rate depreciation and their respective exogenous variables i. e. if they are co-integrated or share a common trend, the Auto-Regressive Distributed Lag (ARDL) bounds test was employed (Pesaran et al., 2001). The choice of the ARDL model is based on its efficiency in small sample size as in this study (29 observations) and the possibility of the variables having different optimum number of lags. The ARDL also allows for co-integration estimation by the use of the Ordinary Least Square (OLS) after identifying the lag of the model.

Unless a lagged error-correction term is included, tests involving differenced variables will be misspecified leading to the loss of some vital information when the variables are co-integrating. To recover all the long run information lost in the original estimation process, an error correction model (ECM) is estimated in which the error correction term obtained from the long run co-integrating vectors are included as independent variables in the estimation process. In testing the long run correlation between exchange rate depreciation and inflation and their independent variables, the bound test procedure was applied for co-integration by estimating the following conditional (restricted) version of the ARDL model.

$$\begin{aligned} \Delta \ln INF_t = & \varphi_0 + \gamma_1 \ln INF_{t-1} + \gamma_2 \ln PWB_{t-1} + \gamma_3 \ln EXRDEP_{t-1} + \gamma_4 M^S_{t-1} \\ & \gamma_6 \ln PWBE_{t-1} + \sum_{i=1}^p \varphi_{1i} \Delta \ln INF_{t-i} + \sum_{j=1}^q \varphi_{2j} \Delta \ln PWB_{t-j} + \sum_{k=1}^q \varphi_{3k} \Delta \ln EXRDEP_{t-k} \\ & + \gamma_5 \ln GFD_{t-1} + \sum_{l=1}^q \varphi_{4l} \Delta \ln M^S_{t-l} + \sum_{m=1}^q \varphi_{5m} \Delta \ln GFD_{t-m} + \sum_{n=1}^q \varphi_{6n} \Delta \ln PWBE_{t-n} + u_t \end{aligned} \quad (3.13)$$

$$\begin{aligned} \Delta \ln EXRDEP_t = & \varphi_0 + \gamma_1 \ln EXRDEP_{t-1} + \gamma_2 \ln INF_{t-1} + \gamma_3 \ln INT_{t-1} + \gamma_4 \ln M^S_{t-1} + \\ & \gamma_5 \ln PWB_{t-1} + \gamma_6 \ln PWBE_{t-1} + \sum_{g=1}^p \varphi_{1g} \Delta \ln EXRDEP_{t-g} + \sum_{h=1}^q \varphi_{2h} \Delta \ln INF_{t-h} + \\ & \sum_{i=1}^q \varphi_{3i} \Delta \ln INT_{t-i} + \sum_{j=1}^q \varphi_{4j} \Delta \ln M^S_{t-j} + \sum_{k=1}^q \varphi_{5k} \Delta \ln PWB_{t-k} + \sum_{k=1}^q \varphi_{6k} \Delta \ln PWBE_{t-k} + v_t \end{aligned} \quad (3.14)$$

Where in both equations, φ_i on the difference of the independent variables are the short run multipliers/ dynamics of the model to be estimated through the ECM while γ_i denotes the long run multipliers. The term, φ_0 is the drift/ constant and u_t and v_t are the error terms.

There are three (3) steps involved in the ARDL bound test procedure;

The first step is testing for the presence of long run relationship among the Variables by estimating equations 3.14 and 3.15 by the OLS. In so doing, an F- Test was conducted for the joint significance of the numerical values of the lagged levels of the variables.

It would be hypothesized that;

$$H_0 : \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0 \text{ (not co-integrated/ no long run effect or relationship/}$$

has unit root)

$$H_1 : \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 \neq 0$$

A test for co integration is provided by two asymptotic critical values where the independent variables are I (d) (where $0 \leq d \leq 1$). The explanatory variables are assumed to be integrated of

order zero, I (0) by the lower bound values and integrated of order one, I (1) by the upper bound values. The null hypothesis of no co- integration is rejected if the F- statistics is above the upper bound and accepted if it falls below the lower bound. It however remains inconclusive if it lies between the lower and the upper bound critical values.

The second stage is to test the long run relationship after establishing the presence of co- integration. The restricted version of the ARDL long run model for inflation and exchange rate depreciation are presented below.

$$\begin{aligned} \ln INF_t = & \varphi_0 + \sum_{i=1}^p \gamma_1 \ln INF_{t-1} + \sum_{i=0}^{q1} \gamma_2 \ln PWB_{t-1} + \sum_{i=0}^{q2} \gamma_3 \ln EXRDEP_{t-1} + \sum_{i=0}^{q3} \gamma_4 \ln M^S_{t-1} \\ & + \sum_{i=0}^{q4} \gamma_5 \ln GFD_{t-1} + \sum_{i=0}^{q5} \gamma_6 \ln PWBE_{t-1} + u_t \text{-----(3.15)} \end{aligned}$$

$$\begin{aligned} \ln EXRDEP_t = & \varphi_0 + \sum_{i=1}^p \gamma_1 \ln EXRDEP_{t-1} + \sum_{i=0}^{q1} \gamma_2 \ln INF_{t-1} + \sum_{i=0}^{q2} \gamma_3 \ln INT_{t-1} \\ & + \sum_{i=0}^{q3} \gamma_4 \ln IM^S_{t-1} + \sum_{i=0}^{q4} \gamma_5 \ln PWB_{t-1} + \sum_{i=0}^{q5} \gamma_6 \ln PWBE_{t-1} u \text{-----(3.16)} \end{aligned}$$

The selection of the orders of the ARDL (p, q1, q2, q3, q4, q5 and q6) is based on the Schwarz Bayesian Criterion (SBC).

The third step in the ARDL model to detect the short run dynamics of the parameters is the estimation of an Error- Correction Model (ECM) reconciled with the long run evaluates. This is presented below.

$$\Delta \ln INF_t = \sum_{i=1}^p \varphi_{1i} \Delta \ln INF_{t-i} + \sum_{j=1}^q \varphi_{2j} \Delta \ln PWB_{t-j} + \sum_{k=1}^q \varphi_{3k} \Delta \ln EXRDEP_{t-k}$$

$$\begin{aligned}
& + \sum_{l=1}^q \varphi_{4l} \Delta \ln M^S_{t-l} + \sum_{m=1}^q \varphi_{5m} \Delta \ln GFD_{t-m} + \sum_{n=1}^q \varphi_{6n} \Delta \ln PWBE_{t-n} + \rho ECM_{t-1} \\
& + u_t \text{-----} (3.17)
\end{aligned}$$

$$\begin{aligned}
\Delta \ln EXRDEP_t & = \beta_0 + \sum_{g=1}^p \varphi_{1g} \Delta \ln EXRDEP_{t-g} + \sum_{h=1}^{q1} \varphi_{2h} \Delta \ln INF_{t-h} + \sum_{i=1}^{q2} \varphi_{3i} \Delta \ln INT_{t-i} \\
& + \sum_{j=1}^{q3} \varphi_{4j} \Delta \ln M^S_{t-j} + \sum_{k=1}^{q4} \varphi_{5k} \Delta \ln PWB_{t-k} + \sum_{m=1}^q \varphi_{6l} \Delta \ln PWBE_{t-l} + \rho ECM_{t-1} \\
& + u_t \text{-----} (3.18)
\end{aligned}$$

The convergence of the short run dynamics coefficients of the model to equilibrium are denoted by φ_i in equations 3.18 and 3.19. The Error- Correction Model is ECM_{t-1} and ρ is its coefficient which measures the adjustment speed of short run convergence to long run equilibrium in the event of a shock in the system.

CHAPTER FOUR

ESTIMATION, ANALYSIS AND INTERPRETATION OF EMPIRICAL RESULTS

4.0 Introduction

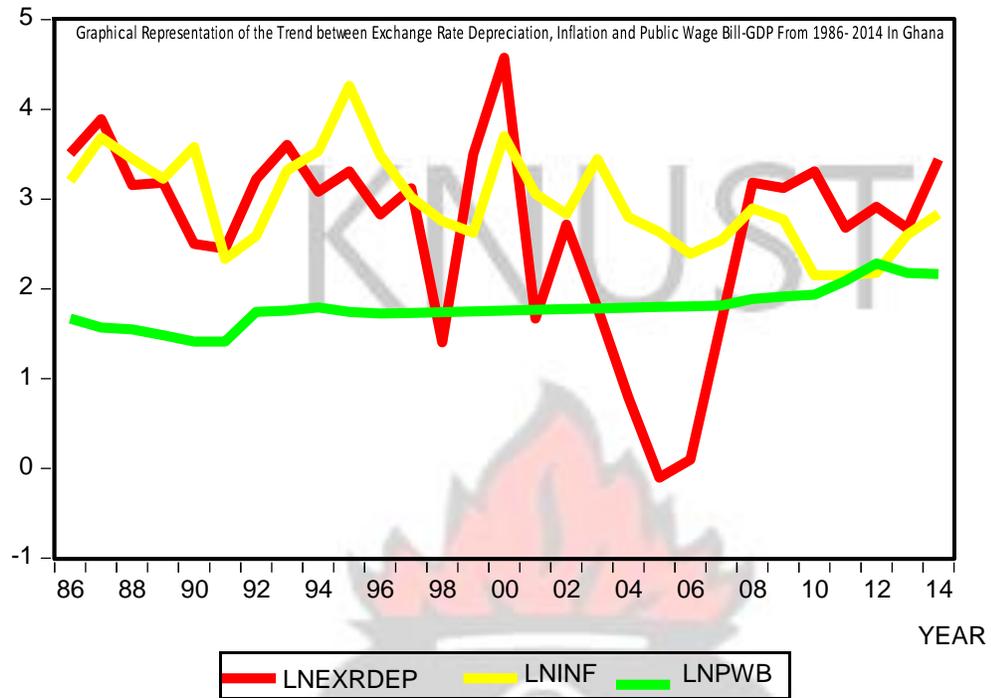
This chapter presents a detailed analysis and discussion of empirical results emanating from the study. The chapter is apportioned into four sections. The first section showcases the trend analysis of wage bill, exchange rate depreciation and inflationary developments in Ghana. The second section examines the time series properties of the data through unit root and bounds test for co-integration. Section three displays and discusses the estimated long run and the short run results using the ARDL approach. An analysis of a direction of causality is presented in the last section. Eviews 9.0 and Gretl 7.4 were the software employed in the estimation.

4.1 Trend Analysis of Wage bill, Exchange Rate Depreciation and Inflationary Developments in Ghana

The trend analysis was conducted to show the pictorial relationship between public wage bill-GDP, exchange rate depreciation and the rate of inflation in Ghana. This is presented in Figure 4.1.

Fig. 4.1 Graphical Analysis of the Trend between Exchange Rate Depreciation, Inflation and Public Wage Bill-GDP from 1986- 2014 in Ghana

LOG VALUES OF THE VARIABLES



Data Source: (Plotted by the Researcher Based on Available Data)

In Figure 4.1, it can be realized that exchange rate and inflation have been much volatile all the time whereas wage bill- GDP exhibited some relative stability especially between 1995- 2006. The graph indicates a significant positive movement between exchange rate depreciation and inflation despite the inconsistencies in some few instances. It is also observed that the growth of the wage bill has been below the rate of inflation between 1986- 2010 and below exchange rate depreciation between 1986- 1998. The exchange rate exhibited the greatest volatility as compared to inflation dynamics. The movements in the wage bill also induce a direct movement in inflation in most periods as observed in the diagram above and an indirect movements in exchange rate in most instances. For example between 1995- 2005, public wage bill- GDP remained relatively stable at approximately 5% and started picking up marginally in 2006 at

6.1%. Inflation decreased from 70.8% in 1995 to one of its lowest at 13.8% in 1999 and picked up to 40.5% in 2000 and later dropped to 10.9% in 2006. Exchange rate depreciation decreased from 27.3% in 1995 to 4.1% in 1998 and rose to 96.8% in 2000 and decreased to 0.9% in 2006.

4.2 Tests for Stationarity

The stationarity status of all variables in both models specified for the study were determined prior to the long run relationships between inflation, exchange rate depreciation and their dynamic regressors estimation. The outcomes of the unit root tests through the Augmented Dickey Fuller (ADF) are illustrated in Table 4.1.

Table 4.1 Unit Root Test Results
Augmented Dickey Fuller – Test

	Constant	Constant & Trend	Constant	Constant & Trend
<i>lnINF</i>	-2.828548*	-1.803127*	-6.131881***	-5.934493***
<i>lnEXRDEP</i>	-2.767253*	-2.683282*	-6.105646***	-6.081603***
<i>lnPWB</i>	-0.393869	-2.633310*	-4.699567***	-4.620040***
<i>lnM^s</i>	-4.608012***	-4.261570***	-5.149442***	-5.025897***
<i>lnPWBE</i>	-1.727693	-0.704030	-7.433020***	-7.872736***
<i>lnINT</i>	-1.318369	-1.968965*	-4.757814***	-4.613425***
<i>lnGFD</i>	-1.618159	-1.906903*	-7.138367***	-2.528076*

Note: The rejection of the null hypothesis of a unit root/ non- stationary is indicated by ***, **, * at 1%, 5% and 10% significance level respectively

It is observed from Table 4.1 that inflation, exchange rate depreciation and money supply are stationary at the log level without trend which implies they are integrated of order zero $I(0)$. All the variables except public wage- expenditure are stationary at the level with constant and trend. Public wage bill- GDP, public wage bill- expenditure, interest rate and government fiscal deficit are non-stationary at the log level since the null hypothesis of a unit root is accepted at any of the error levels. However at the first difference with no trend, all the variables are stationary as the null hypothesis of a unit root/ non- stationarity is rejected at 1% significance level since the Pvalues at this level are less. Again, at the first difference with trend and constant, all the variables are stationary. The implication of this is that these variables are integrated of order one $I(1)$.

4.3 Test for Long- run Relationship

After establishing the stationarity status of all the variables, the study tests for the presence of long run correlation among the variables by means of Bounds Test. The results are presented in Table 4.2.

Table 4.2 ARDL Bounds Test for Co-integration Results

Model I			Model II		
Test Statistic	Value	K	Test Statistic	Value	K
F-statistic	160.9149	5	F-statistic	5.198317	5
Critical Value Bounds					
Significance	Lower Bound $I(0)$		Upper Bound $I(1)$		
10%	2.26		3.35		
5%	2.62		3.79		
1%	3.41		4.68		

The Bounds test results confirm the existence of long run relationship between the dependent variables and their respective regressors since the F- Statistics exceeds the upper critical values at 5% significance level (95% confidence level) for both models.

4.4 Long Run Results for Model I

Model I was estimated to discover the long run link between inflation (the dependent variable) and its respective exogenous variables. The results are shown in Table 4.3.

Table 4.3 Estimated ARDL Long Run Results for Model I

Dependent Variable:				
Regressors	Coefficient	Std. Error	t-Statistic	Prob.
	0.734965	0.223980	3.281383	0.0305
<i>lnEXRDEP</i>	0.253187	0.072000	3.516475	0.0245
<i>lnMS</i>	0.940369	0.100096	9.394642	0.0007
<i>lnGFD</i>	-0.198768	0.078160	-2.543105	0.0638
<i>lnPWBE</i>	0.859088	0.317552	2.705343	0.0538
<i>Constant</i>	-5.270863	1.254405	-4.201883	0.0137
F (340.3710) = 0.000019			DW=1.8644	

It was found from the results in Table 4.3 that the coefficients of public sector wage bill as percentage of GDP and public wage bill as percentage of expenditure are positive and statistically significant at 5%. This implies that public sector wage bill is positively correlated with the rate of inflation in the long run. Specifically, a percentage rise in Ghana's wage bill as percentage of GDP and expenditure leads to approximately 0.734965% and 0.859088% rise in the rate of inflation

respectively. This leads to the rejection of the null hypothesis that public sector wage has no impact on inflation at 5% significant level. Thus, increase in government wage bill will increase the rate of inflation in Ghana in the long run. This finding is in line with the theory proposed by Bhaduri (1986) that the general price level is determined by given level of the money wage. This also reflects the position of fiscal theorists that inflation is not everywhere and always a monetary phenomenon but inflation is at least partially determined by the budgetary policies of the fiscal authority and that long- run price stability is not completely in the purview of the monetary authority. Keynes also proposes that inflation is the result of cost pressure emanating from wages. The result supports the empirical works of Perrie- Richard and Hoffmaister (1997) in four middle-income countries, Mihaljek and Saxena (2009)) in emerging market economies and Perry and Cline (2013) in USA that wages and inflation are positively correlated.

Again, in line with economic theory the coefficient of the depreciation rate of the Ghana cedi is found to be positive at 5% significance level of error depicting a direct long run correlation between inflation and exchange rate. Precisely, 1% increase in the depreciation rate of the cedi increases Ghana's inflation rate by approximately 0.253187%. Hence, depreciation of the cedi increases inflation rate in Ghana. Depreciation of the cedi makes imports more expensive in the local market. Considering Ghanaians inelastic demand for imports, this increases the inflation rate in the country. The outcome of this study supports the positions of Abradu- Otoo and Bawumia (2003), (WAMZ) (2012) and Sanusi (2010) who finds exchange rate depreciation to be the vital source of inflation in Ghana.

Expansion in money supply exacerbating the inflationary tendencies in Ghana is confirmed in the results as it has the highest positive coefficient at 1% statistically significant level. It was found that money supply has the strongest long run direct impact on inflation in Ghana. A percentage rise

in money supply increases inflation by 0.940369%. This reflects the monetarists' position that changes in the price level is proportional to the changes in the quantity of money. This also confirms the position that excessive growth in money supply is the sole most predominant source of inflation in Ghana. This certifies the findings of Abradu- Otoo and Bawumia (2003) which maintains that monetary expansion plays a significant role in determining inflation in Ghana.

Arguably, government fiscal deficit assumed a negative coefficient at 10% significant level. This implies there is an inverse relationship between fiscal deficit and inflation in Ghana in the long run. Statistically, 1% jump in fiscal deficit reduces the rate of inflation by 0.198768%. Thus, inflation in Ghana is less influenced by fiscal deficit. This could have been as a result of what Keynesian Economics explains that government deficit may be vital in long run price stabilization if it is geared towards the productive sectors of the economy and the removal of supply- side constraints to fuel growth and employment. This is however in contrast with Lipey's fiscal theory of inflation that predicts a positive relationship between fiscal deficit and inflation. This result contravenes those of Ekanayake (2012) and Metin (1998) in the Turkish and the Sri Lankan economy respectively that fiscal deficit and inflation are positively related.

4.5 Short Run Error Correction Results for Model I

The short run error correction model was estimated to identify the short run dynamics of the variables. It thus shows the short run correlation between the endogenous variable (inflation) and the various exogenous variables. The results are presented in Table 4.4.

Table 4.4 Estimated ARDL Short Run Error Correction Results for Model I

Dependent Variable:				
Regressors	Coefficient	Std. Error	t-Statistic	Prob.
	-0.466975	0.050087	-9.323323	0.0007

$\Delta \ln PWB$	0.375597	0.209833	1.789982	0.1480
$\Delta \ln PWB - 1$	-3.124042	0.579797	-5.388165	0.0057
$\Delta \ln PWB - 2$	4.014513	0.456702	8.790233	0.0009
$\Delta \ln EXRDEP$	0.167312	0.017981	9.305067	0.0007
$\Delta \ln EXRDEP - 1$	0.284042	0.018603	15.268829	0.0001
$\Delta \ln EXRDEP - 2$	0.018159	0.023660	0.767514	0.4856
$\Delta \ln MS$	0.098897	0.036435	2.714374	0.0533
$\Delta \ln MS - 1$	-0.276507	0.060035	-4.605774	0.0100
$\Delta \ln GFD$	0.316166	0.051752	6.109259	0.0036
$\Delta \ln GFD - 1$	0.680141	0.090659	7.502175	0.0017
$\Delta \ln GFD - 2$	-1.160726	0.112410	-10.325846	0.0005
$\Delta \ln PWBE$	-1.123889	0.259929	-4.323827	0.0124
$\Delta \ln PWBE - 1$	-0.117250	0.265103	-0.442283	0.6811
$\Delta \ln PWBE - 2$	-4.716510	0.244046	-19.326308	0.0000
$ECM(-1)$	-0.690941	0.048637	-14.206059	0.0001

Selected Model: ARDL (2, 3, 3, 2, 3, 3) based on the Schwarz Bayesian Criterion

It is observed from Table 4.4 that public wage bill as percentage of GDP is positively related to the inflation rate in the short run just as in the long run. Though the coefficient remains positive it is statistically insignificant in the short run. This means that in Ghana, public wage as percentage of GDP does not impact on inflation in the short run. This may mean that the increased wages turn to have a long run impact on the private sector to ignite the wage- price spiral as postulated by Keynes. Besides, because the public sector employs minority of Ghanaians relative to the private sector,

high public wage cannot have more impact until in the long run when the private sector responds accordingly. Keynes also maintains because government spending such as wages is a component of aggregate expenditures and tax changes have dependable effects on consumption and investment. It can thus be inferred from Keynes argument that workers in Ghana probably save more for investment than current consumption in the short run.

On the contrary, public wage as percentage of expenditure is found to be indirectly related to inflation in the short run. It has a negative coefficient at a statistically significance level of 5%. One percent rise in wage as percentage of expenditure reduces inflation by about 1.12% in the short run. Thus, increase in public wage as percentage of expenditure does not add up to the inflationary pressure in the short run. It can be deduced from this result that, this component of expenditure is matched with output in the short run and also directed towards the productive sectors of the economy and that it contributes less to inflation.

The Cedi depreciation rate in the short run also has a positive coefficient at 1% significance level implying a short run positive relationship with inflation just as in the long run. Inflation in Ghana is increased by approximately 0.17% as a result of 1% increase in the depreciation rate of the cedi. Thus, exchange rate depreciation correlates positively with inflation in Ghana both in the long run and in the short run but the long run impact is more.

Just like in the long run, money supply is positively correlated with inflation in the short run. It has a positive coefficient of 0.098897 at 5% significance level of error. This result indicates that general price level goes up by approximately 0.1% in the short run due to a percentage growth in money supply. It can also be inferred that expansion in money supply impacts less on inflation in the short run than in the long run.

Government fiscal deficit shows a positive relationship with inflation in the short run contrary to the long result. Fiscal deficit has a positive coefficient of 0.316166 which is statistically significant at 1%. Inferentially, fiscal deficit in Ghana significantly drives inflation in the short run. 1% growth in fiscal deficit drives inflation up to about 0.32% in the short run. This result suggests that though the impact of fiscal deficit on inflation can be detrimental in the short run due to inelastic productivity or aggregate supply, it can be instrumental in long run price stabilization and reducing inflationary tendencies. The result also confirms the positive relationship between fiscal deficit and inflation proposed by Lipsey. Ekanayake (2012) and Metin (1998) found similar results in the Turkish and the Sri Lankan economy respectively that fiscal deficit correlates positively with inflation.

It can be observed from Table 4.4 that the short run model exhibits convergence to equilibrium in the long run out of a temporal shock. The coefficient of the error term is negative and statistically significant at 1%. The ECM coefficient of -0.690941 implies that about 69% of disequilibrium out of the shock in the preceding year converges back to equilibrium in the long run. This value is very high which means that any disequilibrium within the short run inflation dynamics of Ghana is quickly adjusted and converged back to equilibrium in the long run.

4.6 Diagnostic and Normality Tests for Model I

These tests were conducted to identify any spurious results and also to ascertain the validity of the model.

Table 4.5 Diagnostic and Normality Test Results for Model I

Test Statistics		Prob.
Serial Correlation	Breusch- Godfrey Serial Correlation: LM Test	CHSQ= 0.109125 F(2,2) 0.9016

Heteroscedasticity	ARCH	CHSQ= 0.683484 F(1,23)	0.4169
Functional Form	Ramsey RESET Test	CHSQ= 3.020198 F(1,3)	0.1806
Normality	Jarcque- Bera	=0.8441	0.6557

ARCH in the table is the Auto- regressive Conditional Heteroscedasticity, CHSQ= Chi Square and the values in the bracket are the degrees of freedom

It is shown in table 4.3 that the overall regression is statistically significant at 1%. It is also found that about 99% of the variation in inflation is accounted for by changes in the independent variables indicated by the adjusted R- squared of approximately 0.99. Again, the joint significance of the determinants in the ECM is suggested by an F-statistic value of approximately 340. Besides, a DW statistical value about 2 implies no autocorrelation. Again, in table 4.5 the null hypothesis of no auto correlation, no heteroscedasticity and normality cannot be rejected since the P-values were larger than 5% significant level. The model is correctly specified for passing the RESET test. Thus, it can be conclude from the above analysis that the model has passed all the essential diagnostic tests rendering the results offered in this study unbiased and valid for policy analysis.

4.7 Long Run Results for Model II

Model II was estimated to determine the long run connection between exchange rate depreciation (the dependent variable) and its respective exogenous variables. The results are shown in Table 4.6.

Table 4.6 Estimated ARDL Long Run Results for Model II

Dependent Variable:									
Regressors	Coefficient	Std. Error	t-Statistic	Prob.					
	-4.273737	1.047363	-4.080475	0.0028					
<i>lnINT</i>	4.039383	0.682820	5.915739	0.0002					
<i>lnMS</i>	1.846831	0.653507	2.826031	0.0199					
<i>lnPWB</i>	-4.400302	1.229335	-3.579416	0.0059					
<i>lnPWBE</i>	-1.214298	0.974636	-1.245899	0.2443	<i>Constant</i>	8.702054	5.813083		
	1.496977	0.1686							
$R^2 = 0.955359$ $\bar{R}^2 = 0.8759997$ $F(12.03799) = 0.000336$ $DW = 1.797986$									

Contrary to economic theory, inflation is negatively related to exchange rate depreciation in the long run as observed in Table 4.6. It assumes a negative coefficient of -4.273737 at 1% significance level of error. If inflation increases by 1%, exchange rate depreciates by approximately 4.27%. Thus, the null hypothesis that an increase in the rate of inflation has no significant effect on exchange rate depreciation cannot be accepted. Contrary to theoretical expectation, the result shows increased general price level imposes a long run appreciating effect on the Ghana cedi. This may suggest that the demand for most Ghanaian goods by local consumers especially oil and energy remain highly inelastic. In consequence, the demand for foreign goods does not go up and foreign demand for local goods fails to fall as they are less responsive to price changes. By implication, the demand for both export and import remain highly inelastic defying Lipsey's plethora of view that local inflation raises the quantity of imports. The result is in line with the findings of Kashif (2011) that, there is a strong negative relationship between inflation and

exchange rate in Pakistan but contradicts the findings of Mumuni and Owuau- Afriyie (2004) and Immurana et al. (2013) in Ghana.

Interest rate in coherence with economic theory relates positively to exchange rate depreciation in the long run. Its coefficient is positive and statistically significant at 1%. Increase in the interest rate by 1% depreciates the cedi by 4% in the long run. It is found that the interest rate is the most depreciating factor of the cedi in Ghana in the long run. Thus, increased interest rate in Ghana reduces the demand for money and borrowing for that matter depreciating the cedi. This is in contrast within Dornbusch (1976) sticky price and Mundell- Fleming fixed- price model referenced in (Mumuni & Owusu- Afriyie, 2004) that increased interest rate attracts foreign investment that leads to currency appreciation.

Money supply growth in Ghana also has a long run positive correlation with exchange rate depreciation. The positive coefficient of money supply at 5% significant error implies that an expansion in money supply by a percentage increases exchange rate depreciation by 1.85% in the long run. Thus, money supply growth has a long run depreciating effect on the cedi. The findings of (Mumuni & Owusu- Afriyie, 2004) and Bawumia and Abradu- Otoo (2003) that expansion in money supply increases exchange rate depreciation in Ghana support this result.

Public sector wage per GDP has a long run significant negative relationship with exchange rate depreciation in Ghana. As public sector wage bill- GDP rises by 1%, exchange rate depreciation falls by approximately 4.4%. It must be concluded that increased public wage bill in terms of GDP induces a decrease in exchange rate depreciation in Ghana and has a more significant long run negative effect. This reflects the significant long run contribution of public wages to inflation in Ghana. It must be reasoned from this that the negative impact of inflation on the value of the cedi

influences the relationship between public wage bill and exchange rate depreciation in the long run. That is to say high wage inflation exerts an appreciating impact on the cedi.

Public sector wage bill- expenditure has an insignificant long run negative relationship with exchange rate depreciation. A percentage rise in public sector wage bill as percentage of expenditure decrease exchange rate depreciation by approximately 1.2%. It must be established that increased public wage bill in terms expenditure induces a decrease in exchange rate depreciation. This also mirrors the significant long run contribution of public wages to inflation in Ghana. It is therefore logical to hold from this that the negative impact of inflation on exchange rate depreciation influences the relationship between public wage bill and exchange rate depreciation in the long run. Inferentially, high wage- inflation imposes an appreciating effect on the cedi.

4.8 Short Run Error Correction Results for Model II

The short run error correction model was estimated to identify the short run dynamics of the variables. It thus shows the short run correlation between the endogenous variable (exchange rate depreciation) and the various exogenous variables. The results are presented in Table 4.7.

Table 4.7 Estimated ARDL Short Run Results for Model II

Dependent Variable:				
Regressors	Coefficient	Std. Error	t-Statistic	Prob.
	0.553699	0.357791	1.547551	0.1561
<i>DlnINF</i> – 1	0.864176	0.315064	2.742863	0.0227
<i>DlnINF</i> – 2	1.345498	0.270355	4.976782	0.0008
<i>DlnINT</i>	3.821229	0.581628	6.569886	0.0001
<i>DlnMS</i>	1.014301	0.288489	3.515908	0.0066
<i>DlnMS</i> – 1	-1.545780	0.295181	-5.236725	0.0005
<i>DlnPWB</i>	-4.516009	1.696661	-2.661705	0.0260
<i>DlnPWB</i> – 1	-3.953166	1.466276	-2.696058	0.0246
<i>DlnPWBE</i>	7.002851	1.807798	3.873690	0.0038
<i>DlnPWBE</i> – 1	7.914721	1.351665	5.855533	0.0002
<i>DlnPWBE</i> – 2	5.282096	1.956133	2.700274	0.0244
<i>ECM</i> (–1)	-0.945993	0.149633	-6.322106	0.0001

Selected Model: ARDL (1, 3, 0, 2, 2, 3) based on the Schwarz Bayesian Criterion.

Unlike the long run estimates, inflation assumes the expected positive sign in the short run rendering it positively related to exchange rate depreciation in Ghana. The inflation coefficient however is statistically insignificant meaning it has less short run effect on exchange rate. Exchange rate depreciation is expected to go up by some 0.55% resulting from one percent rise in inflation. But at a period lag, inflation exhibits a statistically significant positive relationship with exchange rate depreciation as 1% rise in inflation increases exchange rate depreciation by about

0.86%. This implies past inflation at one period imposes a significant positive impact on the depreciation of the cedi. By implication, increased local inflation reduces the demand for the cedi in the short run. Moreover, high domestic inflation increases imports leading to a fall in money demand that depreciates the cedi in the short run.

Interest rate maintains its positive relationship with depreciation of exchange rate in the short run period just as in the long run as theory predicts. It has a positive coefficient which is statistically significant at 1%. One percent increase in the interest rate depreciates the cedi by 3.82% in the short run as against 4% in the long run. From the estimated results, interest rate affects exchange rate depreciation more in the long run than in the short run in Ghana.

Likewise, money supply just as in the long run sustains its positive correlation with exchange rate depreciation in the short run. Its coefficient remains positive and statistically significant at 1%. Monetary expansion by 1% raises exchange rate depreciation by 1.01% as against 1.85 in the long run. Also, expansion in money supply depreciates the cedi more in the long run than in the short run.

Again, public wage bill as percentage of GDP also upholds its consistency in the short run. It correlates negatively with exchange rate depreciation. It assumes a negative coefficient at 5% significant level. An increase in public wage bill by 1% leads to a decrease in exchange rate depreciation by 4.52%. Thus, an increase in public wage bill in terms of GDP does not cause an increase in exchange rate depreciation both in the short run period and the long run period implying it does not depreciate the cedi.

Contrary to the long run results, public wage bill as percentage of expenditure correlates positively with exchange rate depreciation in the short run. Interestingly, it has the highest coefficient of

7.002851 at 1% significant level. The implication of this is that a percentage rise in public wage bill in terms of expenditure depreciates the cedi by 7%. Thus, public sector wage bill as percentage of expenditure has the highest depreciating effect on the cedi in the short run. This could result from the significant role of government expenditure on foreign goods and services, diplomatic and foreign missions in depreciating the cedi as the wage bill constitute the highest component of government expenditure. Hence, increased government expenditure has a short run depreciating effect on the cedi.

From Table 4.7, the short run model exhibits convergence to equilibrium in the long run out of a temporal shock. The coefficient of the error term is negative and statistically significant at 1%. The ECM coefficient of -0.945993 implies 95% of disequilibrium out of the shock in the previous year converges back to equilibrium in the long run. This value is very high which means that any disequilibrium within the short run exchange rate volatility dynamics in Ghana is quickly adjusted and converged back to equilibrium in the long run.

4.9 Diagnostic and Stability Tests for Model II

These tests were conducted to identify any misleading results and also to determine the validity of the model.

Table 4.8 Diagnostic and Stability Test Results for Model II

Test Statistics	Prob.
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Serial Correlation	Breusch- Godfrey Serial Correlation: LM Test	CHSQ= 1.995365 F(2,7)	0.2062
Heteroscedasticity	Breusch- Pagan- Godfrey Test	CHSQ= 1.045883 F(16,9)	0.4925
Functional Form	Ramsey RESET Test	CHSQ= 1.215689 F(1,8)	0.3023
Normality	Jarque- Bera	= 0.5867	0.7457

CHSQ= Chi Square and the values in the bracket are the degrees of freedom

It can be observed in Table 4.6 that the overall regression is statistically significant at 1%. It is also found that about 88% of the variation in inflation is accounted for by changes in the independent variables indicated by the adjusted R- squared of approximately 0.876. Again, the joint significance of the determinants in the ECM is suggested by an F-statistic value of approximately 12. Besides, a DW statistical value about 2 implies no autocorrelation. Besides, Table 4.8 shows that, the null hypothesis of no auto correlation, no heteroscedasticity and normality cannot be rejected since the P-values were larger than the 5% significant level. The model is therefore correctly specified as it has passed the RSET test. It can thus be conclude from the above analysis that the model has passed all the essential diagnostic tests rendering the results offered in this study unbiased and valid for policy directions.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND POLICY IMPLICATIONS

5.0 Introduction

This is the concluding part of the study. The major findings and their policy implications emanating from this study are summarized in this chapter.

5.1 Summary of Major Findings

Exchange rate and price instability preceded by high public sector wage bill are some of the macroeconomic challenges that have bedeviled the Ghanaian economy. Following measures which are mostly monetary in nature such as control of monetary expansion to the neglect of fiscal measures instituted by authorities to combat the situation, it appears less has been achieved. Drawing on existing literature from both developing and developed countries, this study seeks to investigate empirically, the impact of public sector wage bill on inflation rate and how inflation influences exchange rate depreciation in Ghana. An annual time series data from the period 1986-2014 was employed for the study. Using the Augmented Dickey- Fuller (ADF) unit roots tests, the variables were found to be mixed integrated of orders zero $I(0)$ and one $I(1)$. Also, a long run cointegration relationship between inflation and exchange rate depreciation and their determinants was identified using the ARDL bounds test.

To begin with, it was found in the study in Model I that public wage bill- GDP and public wage bill- expenditure relate positively to inflation in the long run period and are both statistically significant. In the short run, public wage bill- GDP has a positive insignificant impact on inflation and public wage bill- expenditure has a negative significant impact on inflation. Thus, as increased public wage bill- GDP significantly increases inflationary pressures in the long- run, the impact in the short run is less.

Couple with the above, public wage bill- GDP in Model II is found to be indirectly related to the depreciation rate of the cedi in the long and the short run at a significant level.

Again, public sector wage bill as percentage of expenditure in Model II has the highest depreciating effect on the cedi in the short run. It thus has a significant positive relationship with the depreciation rate of the cedi in the short run and a long run negative impact.

Furthermore, depreciation rate of the cedi in Model I was also identified to exert a significant positive impact on inflation in both periods. Thus, a fall in the value of the cedi leads to a significant rise in general price levels in Ghana. However, inflation in Model II has a significant negative impact on exchange rate depreciation in the long run and a positive insignificant short run effect.

Moreover, it was also found that money supply has a significant direct impact on inflation in Model I and a significant direct impact on exchange rate depreciation in Model II in Ghana both in the long run and in the short run. It was also found that expansion in money supply depreciates the cedi more in the long run than in the short run. Besides, money supply has the strongest long run significant positive impact on inflation in Ghana.

In addendum, the study also found that fiscal deficit in Model I correlates with inflation inversely in the long run and directly in the short run at highly significant level.

Finally, interest rate in Model II appears to inflict the highest long run positive significant effect on the depreciation of the cedi and the second largest in the short run.

5.2 Conclusion

Achieving price and exchange rate stability has been in the orbit of concern of state authorities for time immemorial. In the past few years, the appropriate bodies have been able to bring down inflation unprecedentedly to a single digit and sustained it for about two years. The high pace of depreciation of the cedi also compelled BoG to redenominate it pegging the value to almost that of the dollar. However, it seems the fight was lost once more as the cedi started depreciating

immediately in less than a year after its redenomination accompanied by continuous rise in general price levels. The main aim of this work is to determine empirically the impact of public wage bill on inflation and the impact of inflation on the value of the cedi in Ghana while controlling for other variables over the period 1986- 2014 using the ARDL model as an econometric tool. It was discovered from the study that public wage bill, currency depreciation rate, money supply, and fiscal deficit all have significant impact on inflation in Ghana. Also, inflation, money supply, interest rate and public wage bill were found to impact significantly on the exchange rate in the Ghanaian economy. An important gap this study has left that requires further research is to identify the exact impact of government wage bill on its fiscal deficit in Ghana.

Specifically in relation to the objectives of this study, public sector wage- GDP was found to exert a long run significant positive impact on inflation in Ghana. Based on this outcome, it is postulated that inflation in Ghana is also a fiscal phenomenon in spite of the significant and domineering role played by monetary expansion. In consequent, equal attention must be accorded fiscal policy in the fight against inflation in Ghana for appreciable and sustained results.

Secondly, it was also found that inflation has a long run significant negative impact on exchange rate depreciation in Ghana. This in contrast with theoretical expectation shows that an increase in the rate of inflation has a long run appreciating effect on the cedi implying the demand for both imports and exports remain highly inelastic in the Ghanaian economy.

Lastly, deducing from the trend analysis of inflation, public wage bill and exchange rate depreciation, there seems to be a significant positive movement between public wage bill and inflation and a significant positive movement between inflation and exchange rate depreciation.

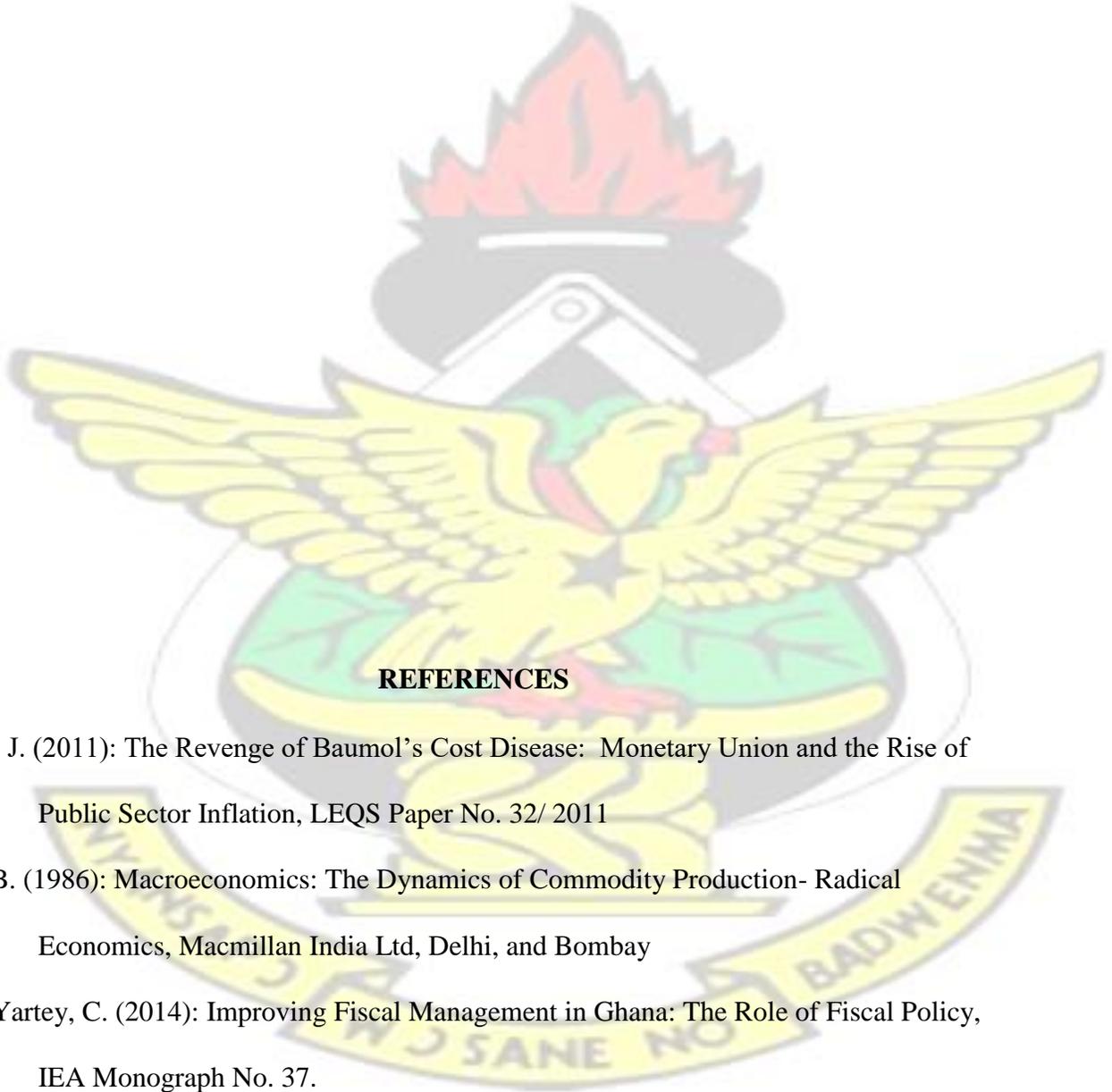
5.3 Policy Implications

The core finding of this study is that inflation and exchange rate fluctuation in Ghana is not always and everywhere a monetary situation but public sector wages as elements of fiscal policies are equally other vital sources. This mirrors the position of fiscal theorists that inflation is not everywhere and always a monetary phenomenon but inflation is at least partially determined by the budgetary policies of the fiscal authority and that long- run price stability is not completely in the purview of the monetary authority.

Based on this information that public sector wage which is an element of fiscal policy and exchange rate depreciation substantially drive inflationary tendencies in Ghana, it is proposed that priority must also be given fiscal policy in price and exchange rate stabilization. There is also the need for an independent non- political fiscal body. Thus, a Fiscal Policy Committee independent of the Ministry of Finance should also be established to undertake the following as parts of its responsibilities; to ensure wage sustainability through negotiation of public sector wage adjustment subject to budgetary constraints aimed at reducing the wage bill- to- tax revenue, public sector reforms with specific emphasis on right-sizing the public service and policy freeze on employment into some unproductive sectors of the economy, rationalize the wage bill, pensions, gratuities and social security payments as part of measures to reduce the wage bill- to- tax revenue to ECOWAS thresholds. Revenues modernization program must be adopted to improve revenue and fiscal performances under Ghana Revenue Authority. The Fair Wages and Salaries Commission should be discarded and embedded in the new Fiscal Policy Committee to avoid overlap of some functions and duplication and political interference.

Finally, since inflation has a long run appreciating effect on the cedi, it is recommended that some level of inflation must be maintained by the proposed fiscal body.

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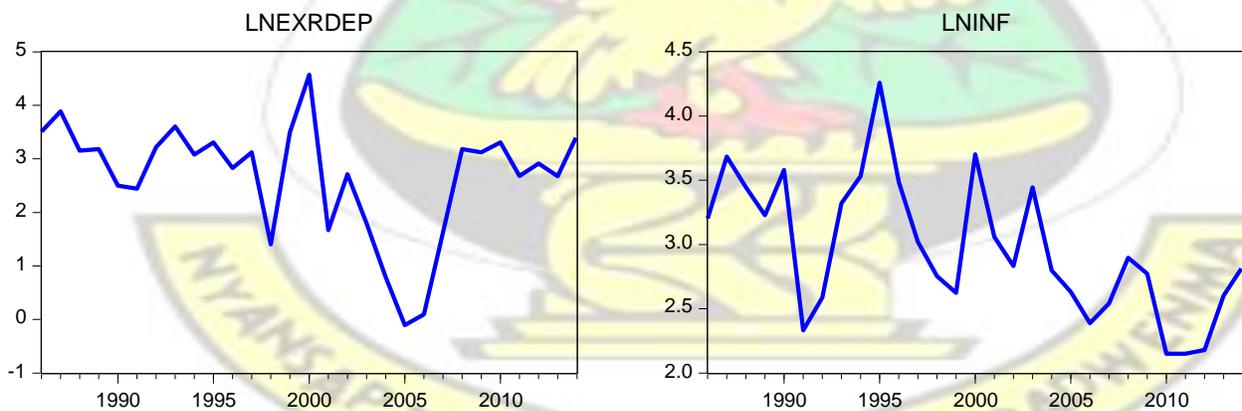
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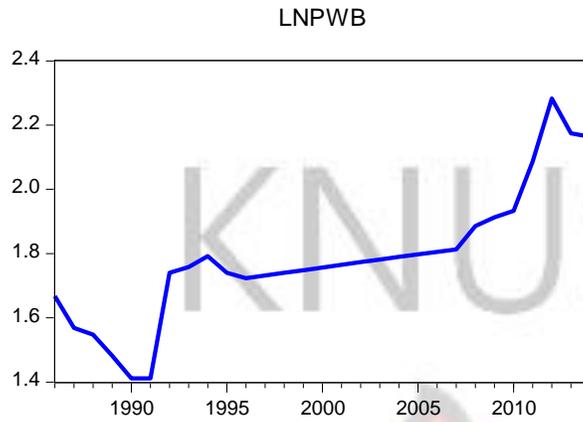
APPENDICES Appendix A: Transformed Data

YEAR	LNINF	LNPWB	LNGFD	LNINT	LNMS	LNEXRDEP	LNPWBE
1986	3.202746	1.667707	1.036737	3.020425	3.869852	3.506458	3.763523
1987	3.683867	1.568616	0.559616	3.157	3.976498	3.888959	3.797734
1988	3.446808	1.547563	0.703098	3.258097	3.83465	3.156149	3.797734
1989	3.226844	1.481605	0.405465	3.258097	4.001268	3.181797	3.744787
1990	3.580737	1.410987	1.241269	3.401197	2.587866	2.498974	3.725693
1991	2.332144	1.410987	0.858662	2.995732	3.665555	2.445819	3.688879
1992	2.587764	1.740466	1.954445	3.401197	3.956687	3.218876	3.824284
1993	3.321432	1.757858	2.175887	3.555348	3.511565	3.60441	3.566712
1994	3.532226	1.791759	2.144761	3.496508	3.962136	3.080073	3.499533
1995	4.259859	1.740466	2.132982	3.806662	3.76519	3.307985	3.523415
1996	3.487375	1.722767	2.319442	3.806662	3.668635	2.827905	3.490429
1997	3.020425	1.731334	2.287471	3.806662	3.786169	3.120601	3.470695
1998	2.753661	1.739828	2.104134	3.610918	2.86159	1.403643	3.450565
1999	2.624669	1.748251	2.144761	3.295837	3.235424	3.496508	3.43002
2000	3.701302	1.756603	1.899118	3.295837	3.993495	4.572647	3.409045

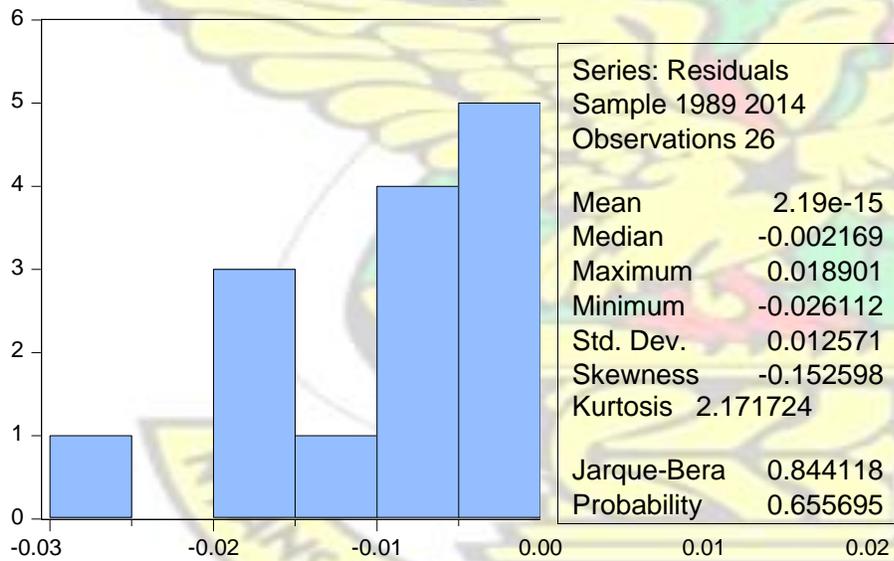
2001	3.058707	1.764886	1.894617	3.295837	4.034846	1.667707	3.387621
2002	2.833213	1.773102	1.477049	3.198673	3.669038	2.714695	3.365727
2003	3.443618	1.78125	1.20896	3.068053	3.145911	1.791759	3.343344
2004	2.797281	1.789332	1.108563	2.917771	3.305977	0.788457	3.320447
2005	2.631889	1.79735	1.043804	2.74084	2.968747	-0.10536	3.297015
2006	2.388763	1.805304	1.549688	2.525729	3.672255	0.09531	3.27302
2007	2.541602	1.813195	1.684545	2.60269	3.606435	1.629241	3.248435
2008	2.895912	1.885553	2.132982	2.833213	3.66812	3.182212	3.211247
2009	2.772589	1.912501	1.947338	2.890372	3.208384	3.122365	3.402863
2010	2.149434	1.93297	2.237513	2.60269	3.463162	3.306887	3.317816
2011	2.149434	2.086914	1.991976	2.525729	3.526212	2.681022	3.52312
2012	2.179287	2.282382	2.499795	2.70805	3.22443	2.912351	3.477232
2013	2.60269	2.174752	2.40243	2.772589	2.970443	2.674149	3.456001
2014	2.833213	2.163323	2.385086	3.044522	3.605498	3.440418	3.446808

Appendix B: Plot of the Variables in their Log Levels





APPENDIX C: Jarque- Bera Normality Test Results for Model I



APPENDIX D: Jarque- Bera Normality Test Results for Model II

