

KWAME NKRUMAH UNIVERSITY OF SCIENCE
AND TECHNOLOGY
COLLEGE OF HUMANITIES AND SOCIAL
SCIENCES

The Government Revenue and Expenditure Nexus: The
Sustainability of the Implementation of the Single Spine
Salary Structure in Ghana

By
Eric K. K. ABAVARE

A Thesis submitted to the School of
Graduate Studies
in Partial Fulfillment of the Requirements
for the Award of Masters in Business Administration
(Finance Option)

July, 2015

Declaration

I hereby declare that except where specific reference is made to the work of others and acknowledge in customary manner, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This dissertation is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgements.

Eric K. K. Abavare

July, 2015

I declare that, I have supervised the student to carry out thesis herein submitted and confirmed that the student has my expressed permission to present it for assessment in this University

Prof. J. M. Frimpong

August, 2015

Contents

Declaration	i
Table of Contents	v
Dedication	v
Acknowledgements	viii
List of Tables	viii
List of Figures	ix
Acronyms	xii
1 INTRODUCTION	1
1.1 The study Background	1
1.2 Overview of Ghana’s fiscal profile	6
1.3 Politics of call for suspension of the single spine salary structure implementation	10
1.4 Problem statement	12
1.5 Objective of the study	13
1.6 Research question	14
1.7 Significance of the study	15
1.8 Scope of the study	16
1.9 Limitation of the research	16
2 LITERATURE REVIEW	17
2.1 Introduction	17
2.2 Public finance: Brief overview and definition	17
2.3 Definition of public finance	19

2.4	Fiscal Policy	21
2.5	Definition of Single Spine Salary Structure	23
2.6	Persistent increasing wage bill and fiscal consolidation	24
2.7	Theory of political and public wage expenditure business cycle	27
2.8	Long-term sustainability of fiscal policy	30
2.9	Brief Literature Review	31
2.9.1	Theoretical Literature	31
2.9.2	Empirical Literature	33
2.9.3	Empirical Methodology	34
2.9.4	Empirical studies on sustainability of fiscal policy	37
3	METHODOLOGY	40
3.1	Introduction	40
3.2	Econometric Techniques	40
3.2.1	Study Variables	40
3.2.2	Test of Unit Root	41
3.2.3	Lag Structure Testing	45
3.2.4	Granger Causality Test	45
3.2.5	Diagnostic Testing	47
3.3	Cointegration approaches	48
3.4	Estimation methodologies	49
3.4.1	Order of integration and hypothesis definition	50
3.4.2	Granger two-step cointegration estimation	52
3.4.3	Steps for testing cointegration in a single equation: Engle-Granger approach	53
3.4.4	Johansen Cointegration and Vector Error Correction Model	55
3.4.5	Steps for testing cointegration in a multiple equation: Johansen approach	58
3.4.6	Equilibrium Correction and Cointegration shifts	59
3.4.7	Regression with Break-points	60
3.5	Research Approach and Design	63
4	EMPIRICAL ANALYSIS AND INFERENCES	64
4.1	Introduction	64
4.2	Empirical Results	64

4.2.1	Stationarity and Unit Root Test	65
4.3	Bivariate Analysis	66
4.3.1	Pairwise Granger Causality Test	67
4.3.2	Granger two step cointegration analysis (ECM)	68
4.4	Multivariate Cointegration Analysis	73
4.4.1	Optimal Lag Selection	73
4.4.2	Johansen Cointegration and Vector Error Correction Model (VECM)	74
4.5	Regression with Break points	76
5	SUMMARY AND CONCLUSION	79
5.1	Preamble of the study	79
5.2	Summary of what has been done	80
5.3	Conclusion and Policy recommendation	82
6	REFERENCES	84

Dedication

This work is dedicated to my beloved Mother, Ms. Florence Effua Mensah for her strength and drive to see me becoming useful to society.

Acknowledgements

I am indeed thankful to the great *I am Who I am* and in Him all things consist. I wish to express my profound gratitude to Professor J. M. Frimpong, my Advisor, who painstakingly helped mould my Finance Mind. I say thank you.

I am deeply indebted to my friend and Teacher, Mr. Nana Akosah of Research Department, Bank of Ghana for his invaluable contribution in this thesis: from idea generation, constructive criticism and close guidance which resulted in this final work.

I would also like to acknowledge the Lecturers in the KNUST School of Business (KSB) whom in diverse ways helped to shape my “business-like thinking”.

My next thanks goes to Colleagues in the Department of Physics, KNUST whose encouragement and support in diverse ways saw the end of this work and my own Students in whom, i often times inconvenienced by changing their lecture schedules to enable me take classes at the KSB, i say thank you for your patience.

I equally extend my heartfelt appreciation to my classmates whom in various ways helped shape my finance knowledge including making my Classroom room life an exciting one, will always miss you folks.

Lastly but not the least, I wish to express my sincere thanks to the members of the Abavare family, my in-laws Mr. and Mrs. Eden Mensah for their continual encouragement and support throughout my programme and above all my loving wife Freda whose love and continue support amid constructive criticisms gave me strength to push on, i say

thank for being there for me at all times.

List of Tables

4.1	Results of the Unit Root Tests for Levels and First Differences of the Variables: 2000 to 2014	66
4.2	Pairwise Granger Causality Tests for Revenue and Expenditures: 2000 to 2014	67
4.3	Bivariate Granger Two Step Cointegration Method: Nominal Estimates	71
4.4	Bivariate Granger Two Step Cointegration Method: Real Estimates	72
4.5	Lag Selection Criterion	73
4.6	Johansen Cointegration Test	74
4.7	VECM Estimates for Government Revenue (TRG)	75
4.8	VECM Estimates for Government Expenditure (TEXP)	76
4.9	OLS with Breakpoint	78

List of Figures

1.1	Ghana's Fiscal Profile at a glance	7
-----	--	---

Acronyms

ADF	Augumented Dickey-Fuller
ARDL	Autoregression Distributed Lag
BP	Bai-Perron
BOG	Bank of Ghana
CPI	Consumer Price Index
ECF	Extended Credit Facility
ECOWAS	Economic Community of West African States
ECM	Error Correction Model
FWSC	Fair Wage and Salaries Commission
GDP	Gross Domestic Product
GETFUND	Ghana Education Trust Fund
GIFMIS	Ghana Integrated Financial Management and Information System
GSS	Ghana Statistical Service
GOG	Government of Ghana
GYEEDA	Ghana Youth Employment and Entrepreneurial Development Agency
HIPC	Heavily Indebted Poor Countries
IMF	International Monetary Fund
KPSS	Kwiatkowski Philip Schmidt and Ship
MESW	Ministry of Employment and Social Welfare
MOF	Ministry of Finance

NDC	National Democratic Congress
NHIS	National Health Insurance Scheme
NPP	New Patriotic Party
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PP	Philips Perron
PURMARP	Public Financial Management Reform Program
SADA	Sahara Accelerated Development Authority
SSSS	Single Spine Salary Structure
SSPP	Single Spine Pay Policy
SUBA	Subah Infosolutions Ltd
TRG	Total Government Revenue including Grants
TR	Total Government Revenue without Grants
TEXP	Total Government Expenditure
TEXPP	Total Government Expenditure without Interest Payment
VAR	Vector Autoregression
VECM	Vector Error Correction Model
WAMZ	West African Monetary Zone
Y	Generic government expenditure
X	Generic government revenue
XRATE	Exchange rate Depreciation

Abstract

The study examines the causal linkage and long run relationship between government revenue and expenditures of government of Ghana over a times series spanning the period 2000-2014. We employed several econometric approaches including Engle-Granger two step method, Johansen cointegration vector error correction models and ordinary least squares regression with breakpoints based on Bai-Peron techniques to carry out the analysis. We test for unit root using augmented Dickey-Fuller and Philips-Perron methods to assess the series properties as well as checking for Granger pairwise causality of the data variables. Our results of the ADF and PP unit root tests suggests that the time-series are not stationary at levels but stationary at the first differencing. The findings from Granger pairwise causality test suggests bidirectional causation from revenue to expenditure in the long run supporting the synchronization hypothesis which is in dissenting view with earlier researchers. Similarly, the result of the Engle-Granger cointegration test indicates that a significant long term equilibrium relationship exist between the government revenue and expenditure in excellent agreement with Johansen multivariate analysis. Finally, the manually imposed structural breakpoints on the system to represent the pre- and post-implementation of the single spine salary structure was found to be consistent with the case when the manual imposition was relaxed for the system to detect the breakpoints itself against the government fiscal profile in the spanned period under study. The results demonstrate that the long-term sustainability of the single spine salary structure would be in looming doubt if government do not take pragmatic steps to improve its revenue

generation assiduously.

Chapter 1

INTRODUCTION

1.1 The study Background

A suitable public sector policy on remuneration is essential for efficient delivery of service performance. They eliminate inequalities, motivate, and retain competent requisite staff. However, the reverse is also true, that a poor compensated and motivated public sector breeds, lack of professionalism, corrupt practices, cronyism, favoritism, ineptitude and nepotism. For that reason, a deeper approach to pay structure is critical in the attainment of a broader public sector pay reform.

Basic theory of Economics indicates that markets are often the most efficient system for the allocation of limited resources. They seek to moderate demand and supply as a consequence any opportunities in terms of rents would be taken by arbitrageurs. Notwithstanding in practice there are conflicts, unobservable characteristic, correction cost, different anticipation, and probably discrimination in markets. This tend to distort the market away from equilibrium and so doing achieving inefficient resources allocation. In a situation of proper working labour markets, the markets should match workers with the firms and then set appropriate pay to remove excess labour from the market. Normally, in developing countries, labour markets suffer from strife and other difficulties that opposes it from

achieving the equilibrium according to the Research department of Bank of Ghana (2007). Some studies have indicated that labour markets in developing countries especially Africa are inefficient when compared with other markets because of the features they possess.

According to Kingdon et al. (2006), they settled on the outcome of three labour market areas: structural unemployment in South Africa, search unemployment in Ethiopia and a large informal sector which serve as the employer of last resort in Tanzania, Uganda and Ghana.

Employment is considered as the consequence of interaction between demand and supply of labour. Labour supply is influenced by the growth and competence of the labour force and the demand is related to the growth of the economic activity. The favorable growth performance in relation to the economic restructure indicates inconsistency with the quality of employment corresponding to the economic growth in Ghana.

According to the Ministry of Employment and Social Welfare (MESW 2012) and in agreement with international labour organization (ILO), a little above the last two and a half decades, employment growth does not commensurate with economic growth and its revealed in the reduction of the elasticity of employment though marginal surge in the economy's employment generation ability was observed in 1990s.

From the Employment Ministry, before 1983, nominal wages were comparatively constant with large difference between the upper and the lowest paid regimes. In 1963 the compensation difference was about 34-fold and fell to about 14-fold in 1979. The wage squeeze continued in 1981 as happened to many African countries. The core policy objectives driving the squeeze were to optimize job creation and minimize income inequalities (MESW 2012) following the formation of the Mills Odoi commission 1967, Issifu Ali committee and Azu Crabbe Commission 1973-1983 accordingly. It is important to recognize that around the same time Trade Unions played significant part in the decision of arriving at the minimum wage and became binding legislated. As a consequence of the

labour and corresponding adopted wage policies, the public sector became heavily over recruited and under paid seriously . In the span 1983-2000, actual income earning in both the private and public sectors were more than quadrupled over any estimates of productivity growth during the said time frame. It was noted that with worker retrenchments in government and state-owned enterprises, the government wage bill persisted to increase in the period 1983 and 1987 as a result in the delay of the payment of severance awards, more retrenched workers were left on the payroll (initiation of ghost names and still persist today and a bane on the government wage bill) and some also managed to get their way back into the public sector even after receiving their lump sum packages.

Comparatively, the public sector incomes in Ghana are small compared with other Sub-Saharan countries. According to a study conducted by Kiragu and Mukandala (2003), Botswana paid its top and bottom public servants an estimated US\$45,639 and US\$1,523, similarly Uganda US\$13,300 and US\$523. Tanzania paid 12,337 and US\$701 and Ghana also paid US\$3,275 and US\$ 252 p.a. respectively in the year 2001. These figures are low to attract competent professionals to the public service in Ghana and a major factor of the reason for political tension.

The debate for appropriate pay to stimulate motivation, performance and integrity of public servants has been widely acclaimed and documented. Evidence exist around the world that government workers tend to either reduce their productivity or working hours when their remunerations are low. The decline in production is greatest as the reward reduces. Otherwise, they will persistently try to change jobs to the private sector where higher incentive is perceived. It is been established that low salary level results in absenteeism, alternative employment, rent-seeking (example, the per diem syndrome, sitting allowance) and low productivity as suggested by Kiragu and Mukandala (2003). These researchers further expounded a World Bank survey focusing on African countries indicates that, "As government rewards falls, both in absolute terms and relative to alternative compensation activities, public workers adjust to the new situation. Turnover rates of em-

ployees and absenteeism increases; moonlighting and delighting become more rampant, and the latter, more blatant, recruitment and retention of professionals even become more difficult". It is observed in African that, where Governments do not pay realistic minimum living wage to their workers, low compensation leads to institutionalized corruption, laxity and general lack of discipline. As a result public services have difficulty in attracting and retaining high-level staff according to Kiragu and Mukandala (2003).

All around the world pay reform activities is important thorny issue in public service management. Pay reward is an important feature in human resources management and these resources are the most central in the delivery of effective public services. It is therefore necessary for government to develop a fairly good pay structure system that reward base on work done. In the event where this is lacking, workers performance would be low and their attitude towards work would also be questionable and Ghana has not been an exception to this (Cooper-Enchia 2008; Gomes 2013; Kiragu and Mukandala 2003). Government of Ghana over the years understood this phenomenon of public servants behaviour with respect to pay compensation set up various committees and commissions in the past to address the problem but unfortunately the results were ad hoc and short lived.

According to Cooper-Enchia (2008), the complete pay structure reform ever undertaken by Ghana started in 1997 because there were grave discrepancies and concerns emanating between the pay of the civil servants and those in the larger public sector as financed the central Government. For that reason, in 2006, the Government of Ghana in it determination to enhance public sector pay and performance commenced pay reform to address perceived and obvious inequalities across the different institutions in the public service. The pay reform started by the Government, apart from the objective of fulfilling constitutional requirement Every person has the right to work under satisfactory, safe and healthy conditions and shall receive equal pay for equal work without distinction of any kind¹ but the fundamental reason was pay equity. A strong case was put forward to adopt single

¹1992 Constitution of the Republic of Ghana, Chapter 5 Article 24 (1)

spine pay structure for all employees on the government payroll since this will restore equity and transparency in the public service pay administration as this would enable the Government to manage the wage bill effectively according to the Government of Ghana White Paper (GOG) (2009).

A look from the past reveals that, the failure of pay reforms commendations accepted by the Government of Ghana indicate a primary weakness in the Governments ability to achieve the required result was the lack of pay administration mandated authority to implement the reform (Cooper-Enchia 2008) for that reason, a Fair Wage and Salaries Commission (FWSC) was subsequently established by law in 2007 with oversight responsibility to ensure that decisions related to public sector salaries, wages, grading, classification, job analysis, among others are properly managed and coordinated. The FWSC is to ensure the control and coordination of public sector wage and salary negotiation.

The single spine pay reform, which Government of Ghana accepted in principle, was to commence from 1st of January 2010 after corrections and technical problems had been resolved. The implementation was to be in phases over a five-year period according to the Government White papers (Cooper-Enchia 2008; GOG 2009 and 2013) to harmonized all public service remunerations.

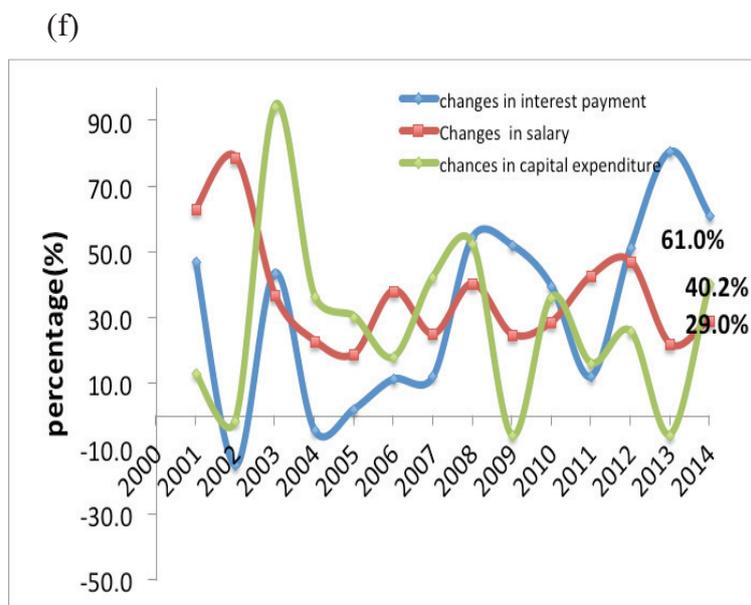
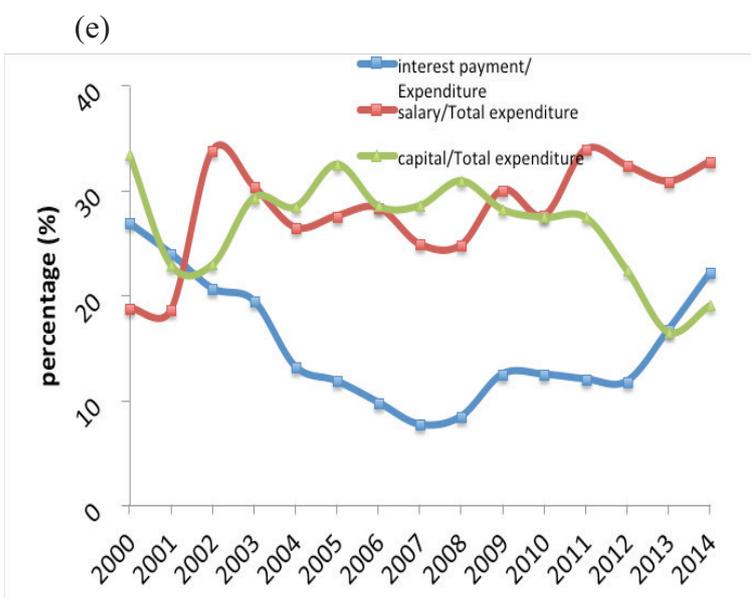
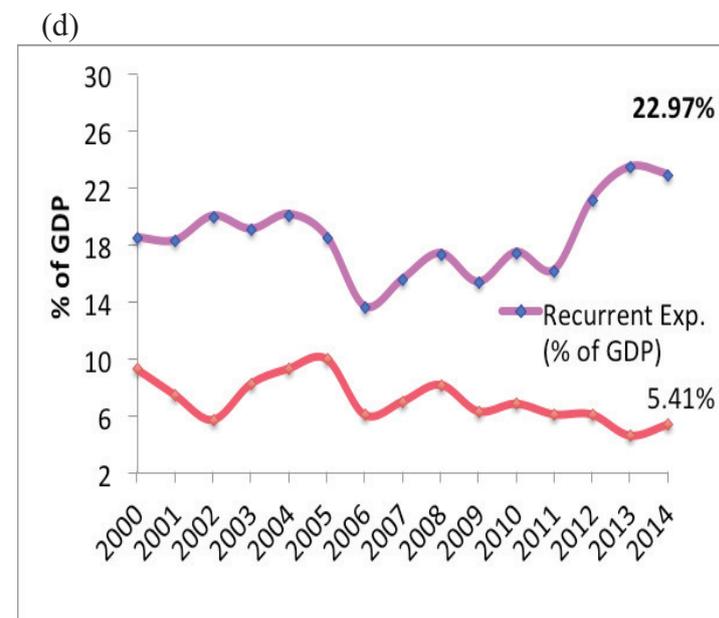
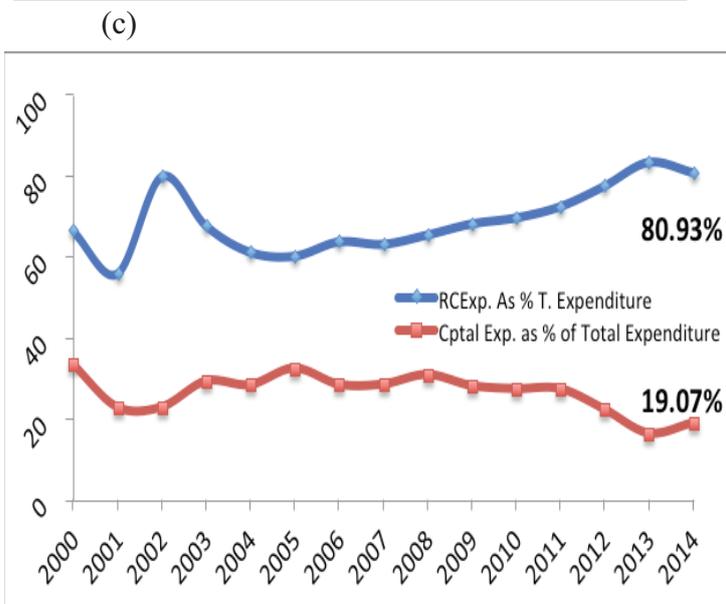
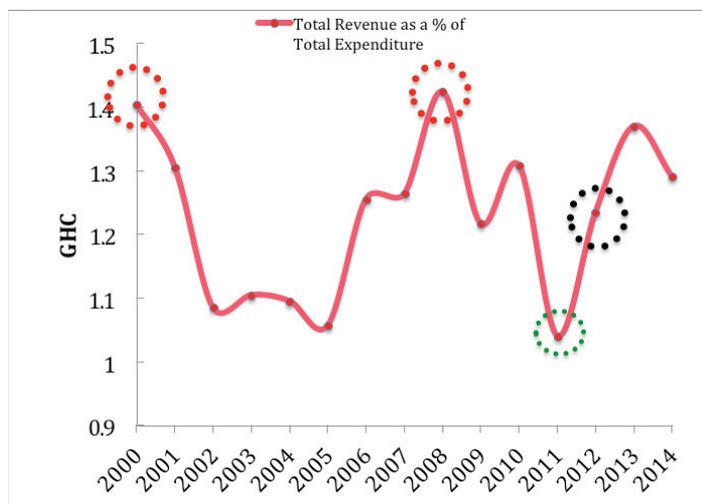
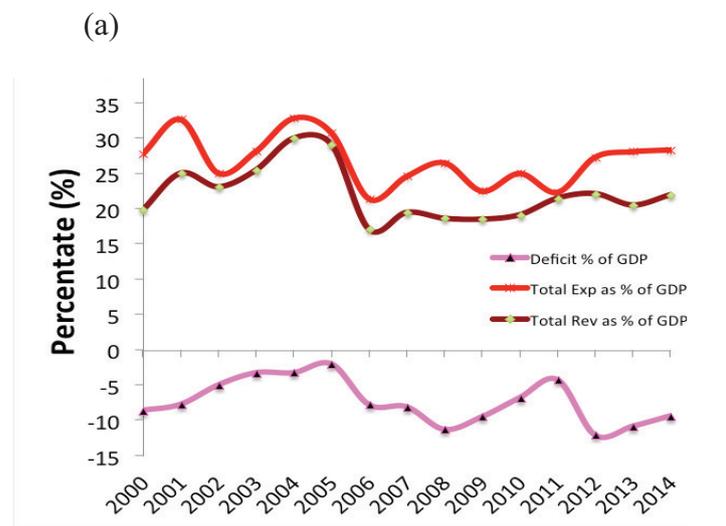
However, in the last few years, real implementation of the pay reform has suffered challenges resulting in several industrial disputes, strike actions and attendant consequences has been very detrimental to the state and it associated socio-economic upheavals. The recent strikes have had to do with the determination of the market premia paid for the public sector workers and that “the concern is therefore that the public sector pay disparities that the single spine pay reform seeks to reduce are likely to either never disappear or to reemerge after the first round of pay negotiations under the single spine” was first suggested by Cavalcanti (2009). Notwithstanding that, the agitation, which is characterized by the migration, is an indication of the inadequacy of the current reform to address the low pay syndrome argued by the following workers (Aliu and Fuesini 2014).

The expected road map for the implementation of the pay reform was to follow a logical sequence of (i) fair and standard job evaluation performance criterion (ii) establishment of fair wages commission and (iii) rolling out of the single spine structure. Regrettably, the second and third steps were rolled out without the first major component of the job evaluation criteria, therefore creating a line of monster that need to be killed for (Seniwoliba 2014) creating all the labour related tensions presently experienced by Ghana.

1.2 Overview of Ghana's fiscal profile

The main objective of Ghana's fiscal policy direction has been the efficient mobilization of more fiscal resources, allocation and prudent use of financial resources, reducing debt weight and strengthening of the private sector to pave the way for economic growth. For that reason, fiscal policy framework has been geared towards fostering macroeconomic stability in order to sustain economic growth and alleviate poverty. As a consequence, there have been several bilateral agreements with the International Monetary Fund (IMF) under the Extended Credit Facility (ECF) to among others to facilitate structural reforms that ensure efficient expenditure and debt management. Over the years, Ghana's public finance has been characterized by persistent budget deficits through recurrent expenditures coupled with weak revenue forecasting capacity. As a consequence, it has been almost consistently impossible to harmonized revenue and spending targets for a long period of period. The government challenges have been exacerbated by over reliance on donor support for planning fiscal estimates, lack of flexibility in fiscal management due to significant resource earmarking and statutory payments and uncontrolled spending during elections years. Unequivocally, the multilateral debt relief (especially in 2006) following the adoption of the Heavily Indebted Poor Countries (HIPC) initiative 2001 by the Government of Ghana significantly improved Ghana's fiscal profile.

As shown in Fig. 1.1, the fiscal profile of Ghana at a glance is presented in charts from



Source: Authors construct using data from Ministry of Finance, Bank of Ghana and Ghana Statistical service

Figure 1.1: Ghana's Fiscal Profile at a glance

(a) - (f). Ghana's fiscal outlook is generally characterised by persistent fiscal deficits with different degrees of variations as indicated in chart (a). The overall budget deficit declined from 8.6% of GDP in 2000 to 1.9% of GDP in 2005(-4.8% in 2006). In the same manner, the public debt stock, which stood at 187.3% of GDP in 2000, declined to 26.2% in 2006. This is largely driven by fiscal excesses followed by poor revenue generation with high expenditure as can be seen in chart (b). Clearly, every one 1GHC generated by government over the span, government disproportionately spent more than revenue, and this has been the government spending pattern over the years, except in 2005 and 2011 where government almost had a balance budget partly due to the HIPIC program inflows and the oil revenue respectively seemed to enhance the government revenue mobilization.

The bulk of government expenditure is purely recurrent with decreasing capital expenditure. Recurrent expenditure constitute about 80.9% of total government expenditure as shown in chart (c) in 2013 equivalent of about 23% of GDP and lowest capital expenditure of 19.1% constitute about 5.4% of GDP in presented in chart (d). The drop in 2010-2011 was due to GDP growth effect of the oil production and that was greater than wage bill.

Total interest payments as a percentage of total expenditure increased significantly from 2007 amidst decreasing capital expenditure and finally the two variables crossing each other at 2013 with increasing salary all in trend as shown in chart (e) and (f) is really a concern on the government borrowing behaviour. Changes in interest payments was all time highest at 80.5% with capital expenditure being -5.8% with wage bill even lowest since the single spine salary structure was introduced in 2013. The highest change in the wage bill since 2009 occurred in 2012 was 47% and numerically same as the interest payment.

However, from 2006 unfold the intrinsic structural weakness in Ghanas fiscal policy regime as government has been bugged down with ballooning budget deficit and debt levels. The rapid surge in government debt levels from 2006 onwards is purely linked with uncontrollable expenditure overruns in spite of governments determination to ag-

gressively pursue fiscal prudence as demonstrated in successive annual budget statements.

The slippages in the fiscal regime is a consequence of continuous rising public sector wage bill due to the implementation of the single spine salary structure (SSSS) in 2010 reforms as against the weakening revenue mobilization and rapid government debt accumulation. Ghanas debt stood as low as 26.2% of GDP in 2006 but has since deteriorated to an estimated 57.7% by the end of 2013, rapidly approaching the IMF's critical debt ratio threshold of 60% of GDP. At the time of writing, the government debt stock stood at 67.1% according to world bank economist, country director Herrera (2015) second quarter and described the economy of Ghana to be in crisis.

Budget deficit has sky rocketed from 2.0% in 2005 to 12.1% of in 2012 and moderated to 9.4% of GDP by the end of 2014 following post-election fiscal consolidation effort by the government. The rate of growth in public debt is arguably driven by consumption expenditures with the wage bill taking a signify proportion which is posing a risk to sustained economic growth.

The collective change in interest burden and public sector wage bill of ~94% of tax revenue at the end of the 2013 compelling government to source for additional funds to meet various statutory payments such education trust fund (GETFUND), National Health Insurance Scheme (NHIS) and others. As a result, the fiscal profile of Ghana has lately attracted considerable academic, political and international attention. In the midst of these discourses, the international rating agencies (including Moodys, Fitch and Standard and Poors) downgraded Ghanas sovereign rating to B- with negative outlook in 2014 (Akosah 2014; Akosah et al 2014).

1.3 Politics of call for suspension of the single spine salary structure implementation

There is conflicting political opinions on the causes of the rising wage bill of Ghana in the wake of the implementation of the single spine. In the spirit of the concept of the salary reforms, all political persuasion in Ghana, Organized Labour, Civil Society, Government of Ghana² and stakeholders all agrees in principle that Ghana must improve her public sector workers remuneration with respect to Ghanas peers. What is not universally accepted is the timing and mode of the implementation of the reforms. The decision to implement the single spine salary structure (SSSS) pay by the National Democratic Congress (NDC) government administration is often criticized by the New Patriotic Party (NPP) as ill-advised, rushed and lacked the ideas required in reversing the negative impact the policy implementation is having on the Ghanaian economy. However, the NDC also argues that, the reform was initiated by the NPP administration before exiting office in 2009 and that if they had remained in power, they would have equally implemented it anyway.

The Government is presently not comfortable over the continuous increase in public sector wage bill as a result of the policy implementation because it was not thought through within budgetary constraints to make the scheme sustainable at the time of implementation. For this reason, some key members have made divergent views with the call to suspend the policy. The following assertion was made by an unhappy NDC Member of Parliament Hon. Nii Amasah Namoale of Dede-Kotopon on Neat FM, *If you analyze the monies collected by the Ministry of Finance, it does not match up to our expenditure. This has led to governments inability to pay up statutory funds such as Ghana Education Trust fund (GETFund), Nation Health Insurance Scheme (NHIS), District Common Fund, Capitation Grant and others. Who is the government? The government is the*

²National Forum on Single Spine Pay Policy Communiqué organized under the topic "Building National Consensus on Sustainability of the Single Spine Pay Policy" at Ho 5th to 7th August 2013

Ministry of Finance. If you go to the Ministry of Finance they will tell you that there is no money because 70% of all the revenue goes into compensations, levies and other payments. So I will plead with government to put a freeze on the single spine salary structure, despite the fact it would be difficult to do. He is however not against the complete withdrawal of the policy in principle, as observed by Obimpeh (2013).

The above Law Makers frustration was equally shared by NPP ranking member of Parliament and former Minister of Finance, Hon. Anthony Osei Akoto, for immediate suspension and deferment of the implementation of the scheme because it is not sustainable, Vinorkor (2014). Several interest groups and stakeholders have made contributions regarding the sustainability of the scheme and others advocating for immediate suspension but the beneficiaries which are the public sector workers strongly oppose the idea.

However, the Governments seems to support the voice of Labor and insists that scrapping the policy is not the way to go, instead, a more pragmatic and effective approach of implementing the policy in other to reduce the financial strain the scheme has on government current expenditure is crucial and that is what needs to be pursued. According to the President, Mahama (2013), “We have come far and opting out of the single spine salary structure or cancelling the programme, is not an option for government” . This bold statement was made during the Senchi National Forum in Ho, Volta Region. The impression one gets in analyzing the continuous increase of the wage bill suggest that, government capital expenditure is seriously in distress with respect to the stagnant government revenue mobilization effort. This is evidence in the non-payment of government contractors; withdrawal of subsidies for farmers and basic utilities, fuel price hikes and so forth. The consequence is the general discontent among the Ghanaian populace and yet there is no independent scientific report as resource of reference to buttress the narratives. This research therefore, is meant to add to the discourse and also serve as reference to the literature.

The paper follows primarily an empirical technique to evaluate the sustainability of

Ghanaian public wage bill before and after the introduction of the single spine salary structure. The study focuses on the issue of whether Ghana's fiscal profile has a stable behavior in the long run. Especially, we probe the stochastic behavior of key fiscal indicators such as revenue, expenditure and interest payments and assesses their long run equilibrium properties and estimates the fiscal reaction function. This analysis is long over due since the management of the spine salary pay has public monetary policy and economic growth consequences. The study therefore provides some encouragement to underscore the expectations in favor of monetary policy for academics and stakeholders.

1.4 Problem statement

The Single Spine Pay Policy initiated by the government of Ghana and implementation started in July 2010 with the aim of restoring equity, transparency, fairness in condition of service and retention of requisite skills in the public sector over the last four years has suffered several challenges from organized labor and other stakeholders against the spirit and intent of the policy. Government is presently faced with financial challenges and attributed it partly due to the single spine policy implantation. The observed situation is that government recurrent expenditure far exceeds its budgets forecasts. It has been estimated that, the cumulative wage bill by government is more than 10% of Gross Domestic Product (GDP) raising concerns about the sustainability of Ghana's fiscal policy in the academia and international rating agencies. This has led to Ghana's credit rating being down graded and finally Ghana going to the International Monetary Fund (IMF) for assistance and policy credibility.

Following the implementation of the single spine policy, Subsidies on certain government intervention programs have been withdrawn such as fuel, electricity, mass cocoa spraying exercise and similar related projects have been withdrawn. In spite of these challenges, Economists and Financial Analysts think otherwise that the economic dis-

trous of the country cannot be attributed to by the single spine implementation but rather lack of proper fiscal discipline and management of the economy on the part of leadership (Bawumia 2014) and misguided policy direction.

This work aims to understand the effects the single spine pay policy have on the Ghanaian public finance and if it is prudent on the part of government to continue pursuing the scheme to ensure equity on public sector wage. It is expected that the outcome of the research will initiate further debate and add to the literature narratives of the single spine salary structure in Ghana.

1.5 Objective of the study

As a consequence of increasing public sector wage bill due to the implementation of the single spine salary structure by government of Ghana over the recent past years, it is imperative to investigate the effects on government developmental projects (capital expenditure) and statutory payments. In spite of sound motive regarding the introduction and implementation of the single spine salary policy is the concern of sustainability as economists and stakeholders are skeptical about the policy. How viable the implementation can stand test of time with respect to the continuing ballooning wage bill with poor revenue mobilization is critical. Owing to the continuous increase in the wage bill, several technocrats and international organizations such the International Monetary Fund (IMF) and the World Bank have suggested an immediate suspension of the policy because it is plausibly unsustainable but government insist otherwise and yet there is no independent research to confirm claims by the opposing views. For this reason, we seek clarification about the dynamics of government revenue mobilization and expenditure growth before the introduction of SSPP and after SSPP implementation with respect to government interest payments, capital projects and statutory payments. The following specific objectives are the basis of our investigation.

1. To study the trend and nature of the government revenue and expenditure before and after the implementation of the single spine
2. We need to ascertain the long-rung relationship of the government revenue and expenditure nexus before and after the implementation of the single spine policy.
3. Appraise Ghanas fiscal policy profile to ascertain whether revenue and expenditure response have long-run relationship following the implementation of the single spine salary structure.
4. Ascertain whether the fiscal policy of Ghana is sustainable before 2009 when single spine policy was initiated and after 2010-2014 when it was implemented.

1.6 Research question

The motivation behind the introduction and implementation of the (SSPP) is first and foremost to remove or completely reduce the disparities in reward compensation that exist within the Ghanaian public sector as against that of the private sector. Second, to be able to attract and retain high caliber manpower for the execution of government business. However, in spite of the initiative pundits and international institution like the IMF and World Bank, and experts believe the scheme should be suspended. But the government does not accept such a proposition, for that reason some questions needs answers to clarify the opposing views.

1. What is the nature of government expenditure and revenue trends before and after the introduction of the single spine salary policy?
2. Does Ghana's revenue and expenditure have a long-run relationship following the implementation of the single spine salary structure?

3. Is the fiscal policy of Ghana sustainable before and after the implementation of single spine salary structure pay?
4. What component in the government recurrent expenditure is responsible for its continuous increase?

1.7 Significance of the study

Following the implementation of the single spine salary policy has caused the wage bill to balloon hence one of the often cited factors attributed by the government to the present economic challenges facing the country. The major effect of these economic difficulties is the inability of the government to honor its statutory payments such as the NHIS, capitulation grants for school feeding programme, removal of subsidies from fuel, electricity and other social intervention programmes for the poor.

However, experts oppose the position of the government and insist that the challenges facing Ghana is purely lack of fiscal discipline and macro economic policy choices and not the single spine implementation, which was carefully planed and agreed upon by stakeholders before execution. For example they cite the quadrupling of the national debt in five years, payment of judgment, GYEEDA, SADA SUBAH payments are all poor policy choices according to Bawumia (2014), which are having economic tolls on the country. They think that poor expenditure management process coupled with weak revenue mobilization and forecasting capacity combined have resulted in a situation inherently impossible to synchronize revenue and spending targets by the government.

The ultimate aim of the single spine salary pay administration is to reduce actual and perceived wage inequalities within the public sector by paying more to middle ranged staff benchmarked below median pay for the public service. Workers whose median pay is already above the median do not benefit much; this has generated opposition to the

proposal. As a result generated agitations and industrial unrest characterized by the implementation, an indication of the inadequacy of the scheme albeit the good intention. One school of thought argues that, the quantum of emolument entitled alone to government appointees such as the Presidency, Ministers and Parliamentarians accounted for over 60% of government expenditure and consequently contributes to the budget deficit and not to mention an election year.

The findings of the research can help shape policy direction, serve as reference source to interested stakeholders, and above all add to the literature on the going discussions and elucidate the true state of the impact of the single spine on the Ghanaian public finance.

1.8 Scope of the study

The work span a time series data from 2000 to 2014 budget provisions as obtained from the Bank of Ghana, Ghana Statistical Service, and Ministry of Finance was employed. We also use econometric package E-view as a tool for the numerical analysis.

1.9 Limitation of the research

The credibility of the research depends solely on the reliability of the data obtained from the relevant government agencies and department. Since obtaining a primary data will be near impossible for this kind of research, all data sources would be solicited from the relevant state institutions such the Ghana Statistical Service (GSS), Ministry of Finance (MOF) and the Bank of Ghana (BOG) and required analysis would be carried out base on them using acceptable statistical tools.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

In this section, we shall discuss the fundamental meaning of public finance from the historical perspective, walk through the basic concepts including; definition of public finance, fiscal policy overview, give definition of the single spine salary structure, discuss why there is persistent increasing government wage bill. We shall consider and review the role of public wages in fiscal consolidation and commence the theory of political business cycle approach inline with political power pursuit by political actors and relate that to public wage bill and business cycle. Furthermore, we shall look at how best public wage bill can be sustainable in the long term. This will then lead us to a brief survey of previous literature works by other researchers from both the theoretical and empirical perspective and end the chapter with empirical exploration of sustainability of fiscal policy in Ghana.

2.2 Public finance: Brief overview and definition

The role of the state is to allocate (provide public goods and taking care of externalities), redistribution and stabilization of available resources for the interest and benefit of the

people. To ensure that the core function of a government and part of sovereign responsibility is carried out, government collect revenues in the form of tax from the public and must prudently use it for their own protection and well-being. The revenue expenditure process of government (taxing and spending) has been recognized as essential for realizing the objective of the state. Public Finance is therefore considered to be the science of income and expenditure of government (Kareem 2011).

In the past, government spending was mainly confined to police, defence and protection of the sovereign. Classical Economists such Adam Smith and Ricardo also limited the scope of public finance. They were ardent supporters of the philosophy of Laissez-faire; they opposed state intervention in the affairs of the public and declared minimum function of the government limiting it to police, arms and justice. They were of the view that if the state raises its expenditure by taxation, it would merely be a substitution for expenditure by a private person. They instead advocated private expenditure to public expenditure and opposed both taxation and public spending. They argued that the state should not interfere with the market forces but to provide the relevant administrative, defence, judicial and police setup for the free interplay of the market forces, which in turn would result in the attainment of market equilibrium, economic stability, growth and of full employment. This suggest that almost all economic decision should be guided by the market forces of demand and supply which would then act as an invisible hand. However, Hume Dalton opposed this narrow view of the state and its activities and rather proposed an alternative view called the principle of “maximum social advantage”, a principle underlying present science of Public Finance (Johnson 2004).

The practice of limiting the scope of public finance to police and arms continued with great enthusiasm till the dawn of the twentieth century. However, the global depression of the 1930s brought about some fundamental changes in the concept of the state and its functions, when the free market economy based on the philosophy of Laissez-faire, failed miserably to provide full employment, economic growth and stability. In the epoch-

making book “General Theory of Employment, Interest and money”, J. H. Keynes openly stressed that through fiscal activities of the state, it was possible to increase employment opportunities and to maintain it at a higher level. Keynes regarded fiscal policy, as a balancing factor, which would bring about an adjustment between propensity to consume and inducement to invest *ibid*. The theory in a sense, prescribed the death-knell of the classical version of Laissez-faire based on Sayers Law of Market-supply, which creates its own demand. Thus, with Keynes publication in 1936, the influence of government fiscal operation on the overall level of economic activity and the level of employment became an integral part of the study of public finance *ibid*.

2.3 Definition of public finance

Public finance is therefore a field of economics concerned with how a government raises funds, spends it and the effect of these activities on the economy and society in general. The word “Public Finance” is a collective whole made by joining two words Public and Finance. The “public” represents Government (Central, State and Local), while “finance” simply means income and expenditure. Therefore public finance comes to be called the science of income and expenditure of Government- State Finance. Public finance would be defined as the science, which deals with the activity of the state in obtaining and applying the material means necessary for the proper functioning of the state. The economics of public finance is fundamentally concerned with the process of raising and disbursement of funds-collection of revenue and its spending-for the functioning of the government. Thus it is the study of the principles underlying the spending and raising of funds by public authorities *ibid*.

Public finance deals with the finances of the state and public bodies-national, state or local for the performance of their tasks. The performance of these tasks leads to expenditure. The incurred expenditure is raised through taxes, fees, sale of goods and services

and others. These different sources constitute therefore revenue of the public authorities. Thus, public finance deals with the income and expenditure of public authorities and in principles, problems and policies relating to these matters (Kareem 2011). Several workers have sought to define public finance as concerned with income and expenditure of public authorities and with the adjustment of the other. Musgrave (cited in Kareem 2011) define it as the complex problem that centre around the revenue and expenditure process of the government; according to Taylor, it deals with the finances of the public in an organized group under the institution of government. Clearly public finance came into existence mainly to satisfy social want and consist of components such as public revenue, public expenditure, public debt, financial administration, economic growth and stability. Public expenditure is that part of public finance, which explains the objectives of the public expenditure, the classification of public expenditure, causes of increase in public expenditure, effects of spending funds in different ways.

Public debt is the part of public finance, which explains the classification of burden of public debt and the causes responsible for growth of public debt in modern economies. It also explain why government requires loans, debt management and the methods used by the government for debt redemption.

Following that is the financial administration, which is the practical part of public finance. It studies the procedure to be followed by the government in imposing taxes, collecting the taxes, spending the collected funds and getting the government income and expenditure audited by a competent independent authority. The final scope of the public finance is that part which takes us to maintain internal and external economic stability and to expedite the rate of economic growth and stability. The government has to maintain the balance between stability and economic growth as well as improving social order. In less developed economies, the economic growth of the country is given top priority after defence. The public finance has to provide adequate resources for investing in different sectors and bringing about economic prosperity.

With the objective of getting maximum satisfaction from the limited available resources, the government must distribute its income on different items of expenditure in such a way that the marginal utility of money spent on different items to the people must be highest and salary is one of them with expected equitable productivity on the part of labor in reciprocity.

2.4 Fiscal Policy

One of the factors that help determine a country's economic direction is fiscal policy. The government uses fiscal policy to influence the economy by adjusting revenue and spending levels. In the United States, both the executive and legislative branches of the government determine fiscal policy whilst in Ghana it is determined by the executive and approved by the legislature. Fiscal policy is based on the theories of British economist John Maynard Keynes (1883-1946)¹, which state that increasing or decreasing revenue (taxes) and expenditures (spending) levels influences inflation, employment and the flow of money through the economic system. Fiscal policy is often used in combination with monetary policy to influence the direction of the economy and meet economic goals. The two main tools of fiscal policy are taxes and spending. Taxes influence the economy by determining how much money the government has to spend in certain areas and how much money individuals have to spend. For example, if the government is trying to spur spending among consumers, it can decrease taxes. A cut in taxes provides families with extra money, which the government hopes they will turn around and spend on other goods and services, thus spurring the economy as a whole.

Fiscal policy involves the government changing the levels of revenue and spending in order to influence aggregate demand and the level of economic activity. Through that, regulators seek to improve unemployment rates, control inflation, and stabilize business

¹Source: <http://www.businessnewsdaily.com/3484-fiscal-policy.html>

cycles and interest rates in an effort to control the economy. Keynes believed governments could change economic performance by adjusting tax rates and government spending.

As a result, fiscal policy is crucial in governments' pursuit of sound economic objectives of seeking rising levels of prosperity for all members of the society by achieving high sustainable and equitable economic growth cannot be overemphasized. The complicated subject of the formulation and implementation of fiscal policy with eventual outcome of policy measures at times being marked differently from their short-term and even contrary to the very objectives that fiscal policy seeks to achieve (Qureshi 2010). Fiscal policy is one of the macroeconomic policy instruments that can be used to prevent or reduce short-run fluctuations in output, income and employment in order to move an economy to its potential level. This means a good understanding of the relationship between government revenue and expenditure is very essential, for instance, in addressing fiscal imbalances. The relationship between public revenue and public expenditure has been an issue that has resulted in strong debates universally over the years among economists and policy analysts alike (Emelogu and Ozughalu 2010).

There are two main types of fiscal policy: expansionary and contractionary. Expansionary fiscal policy, is designed to stimulate the economy, and most often used during a recession, times of high unemployment or other low periods of the business cycle. It entails that government spend more money, lower taxes, or both. The goal is to put more money in the hands of consumers so they spend more and stimulate the economy. Contractionary fiscal policy is used to slow down economic growth, such as when inflation is growing too rapidly. The opposite of expansionary fiscal policy, contractionary fiscal policy raises taxes and cuts spending.

In response to the worldwide economic and financial crisis since the Great Depression, government budgets and central banks around the world have provided substantial support. Fiscal budget deficits widened significantly in 2009, with advanced economies experiencing a harder and long period of deterioration.

In developing countries governments rely mainly on tariffs, trade receipts and direct taxes as their sources of revenue. However, these sources of revenue mobilization are largely inconsistent (except direct taxes) and are affected by such factors as terms of trade volatility. The variation in revenue generation has the potency of causing fiscal deficits and are generally arises from revenue shortages or excessive expenditure sources. Fiscal deficits in developing countries are usually caused by expenditures exceeding revenue receipts (Obeng 2012). This tendency is exacerbated during election period where incumbent governments are bent on winning through infrastructural developments like road constructions or electrification projects as an inducement to voters, this strategy often employed in Ghana by politicians. Fiscal deficits have the potential to cause mounting inflation and interest rates. Growing government spending causes fiscal deficits which ultimately leads to exchange rate depreciation, trade deficits and slowing down of economic growth. The problem with Ghana is that, government expenditure pattern currently favor recurrent expenditure as against capital expenditure.

2.5 Definition of Single Spine Salary Structure

According to Cavalcanti (2009), the the Ghanaian single spine salary structure seeks to place jobs onto a common structure with 25 grades levels that include, in turn, 7 to 15 steps. These propose structure does not fully conform to the standard definition of spine pay spine. In other countries, a single pay spine serves as a common pay reference for several grades scales, while allowing those separate grades scales to exist to meet the different career requirements of different occupation groups.

In the standard single spine pay model, after fixing the relative worth of all jobs in all grades, money values can be assigned to the single spine pay to determine pay for everyone. He emphasis that, this applies to every salary structure that form the basis and standard for pay in every organization. The salary structure is a grid of standard pay levels

that interrelate vertically by grades, zones, bands or steps, and horizontally by incremental jumps or indices that are usually expressed in percentile increments.

The objective of the scheme is to reduce pay disparities within the public sector, for that reason, its attempts to place all jobs onto a common structure. To avoid making the public structure pay a straight-jacket scheme, the spine concentrates only on the so-called base pay. Remunerations that are not explicitly included in the base pay includes the market premia to highly skill workers, including commissions and allowances specific to some staff level classification. These other entitlements are significant for certain categories of public workers collectively threatening the very sustainability of the scheme. The foregoing concern was first raised by Cavalcanti (2009) before the implementation of the policy in the following classic anti-thesis: “whether the fiscal costs of attempting to reduce pay disparities within the public sector through the adoption of a single pay spine will be too large, resulting in a fiscally unsustainable arrangement”. This unsustainability potential was evident in the initial first and second year of the scheme implementation, which threw the government fiscal budget off gear.

2.6 Persistent increasing wage bill and fiscal consolidation

Lindauer points out three categories of problems associated with increasing government wage bill in the public sector domain. First, there is fiscal imbalance, which originates from discrepancies between the government expenditure and tax revenue. The macroeconomic consequences is the continuous rising budget deficit most of which is attributable to the public sector wage bill inconsistent with sound fiscal management practice. Next problem is linked with spillover effects of government pay and employment policy as a result rising public sector wages impairs private sector employment and private invest-

ment spending as public sector employment becomes more attractive. This is potentially detrimental to economic growth according to William Easterly that: i) people respond to incentives and ii) the public sector is a non-responsive sector². The final type of problem involves relationship between government pay and employment determinant and the governments own performance as a producer of goods and service. This definitely has great impact on macroeconomic outlook that, an increasing public sector wage bill may not necessary reflect productivity improvement and resource allocation to meet current commitments. This will certainly undermine the effectiveness of public service and Governments ability to fulfill its mandate (Lindauer 1988).

In developing countries especially in Ghana, government employs larger proportion of labour force compared with the private sector. In the situation where the number of employees are deemed optimum where is the government going to consolidate as far as the wage bill is concerned? The only way they can consolidate is to attack capital expenditure, which means growth will then be stifled with detrimental effect on revenue. According to Asiana et al. (2014), almost two decades of implementing a Public Financial Management Reform Program (PURMARP) which culminated in the launching of the Ghana Integrated Financial Management and Information System (GIFMIS), efficient management system of public finance with the view of eliminating waste and getting value for money is still a challenge.

Ghana's fiscal operations are also susceptible to donors (both bilateral and multilateral) honoring their pledges to support the budget. There have been instances where due to perceived lack of domestic efforts and short falls in meeting some required conditions, donors failed to meet their pledges which usually result in a dire consequences of the economy.

During the economic crisis, governments across Europe faced soaring budge deficits

²Cited in from: Sustainability of the public sector wage bill
http://www.budgetspeechcompetition.co.za/download_files/winners-and-finalists/DylanSmithEssay.pdf
12th June 2015

and markedly increased public debt. Expenditure are being cut with increasing taxes so us to consolidate public finances. The category most affected in the expenditure cut process is usually expenditure on personnel (Zeilstra and Elbourne 2013). From the bigger picture of macroeconomic perspective for public policy, governments must ensure that both the level and rate of growth in their respective public debt are on the path of sustainability and that the debt can be serviced under a wide range of circumstances including economic and financial market stress while meeting cost and risk objective (Vinals and Lewis 2014). The quest to reduce public expenditure in theory is the wish of every government but the political will power to do so is often times challenging due to several other factors.

Gomes (2013) has proposed a reform of public sector wages that incorporates some optimality condition on the labour market in other to limit government discretionary powers to use public sector wages as panacea for political reasons. The idea hinges on two independent pillars. The first pillar consists of pay review of all public sector workers, with benchmark of wages equivalent to workers in the private sector. The second pillar aims to establish a rule to guide the annual increase of public sector wages. The motivation of this rule is that the average public sector wage should target an aggregate measure, such as GDP per worker or the average private wage. He argues that the reform offer several benefits including i) it guarantees the parity between the two sectors and that this parity is maintained over the business cycle; ii) it avoids the use of the public wage by politician as an electoral tool; iii) it requires low tax burden in the period of recession and iv) it is simple and offers more predictability in one of the most important decisions governments take every year. The key idea of the reform is to use private sector wages as the benchmark when deciding the pay in the public sector, across workers and over time.

Public sector wages have two characteristics distinctive from other types of government expenditures. Firstly, they do not directly affect the total supply of government services. Secondly, they are both a payment to a factor of production and a transfer from society to a specific group of citizens. As a consequences, make workers susceptible to the polit-

ical manipulation related to elections, rather than preferences argues Gomes *ibid*, in the spirit of Nordhaus (cited in) political cycles (Nordhaus 1975). He further points out that evidence exist in the United states, Germany and Portugal public and other place were workers experience significant pay rise during elections years. This is consistent with the theory of political business cycle approach (PBC).

2.7 Theory of political and public wage expenditure business cycle

The concept of political business cycle approach (PBC) states that, macroeconomic fluctuations are generated or reinforced by political system. In the pursuit of political agenda or improving chances of re-election, governments tends to intervene in the economy thereby creates business cycles, instead of pursuing a socially optimal stabilization policy. Political actors are therefore not seen as benevolent, but rather as self-interested individuals, as is generally assumed in economies for other individuals acting in the economy (Snowdon and Vane 2002). The PBC model builds on systematic interactions between the economy and the polity. Empirical evidence suggests that macroeconomic conditions have strong influence on the attitude of voters and the outcome of an election. Vote and popularity function (VP-function) estimate the effects of economic outcomes on voting or party popularity to the state of the economy. The basic premise of VP-function is that, voters holds governments responsible for economic condition (Ludvigsen 2010; Nannestad and Paldam 1994; Oganessian 2014).

In turn governments have the incentive to influence macroeconomic variables using fiscal and monetary instruments (policy function) argues Snowden et al (2002). They further elucidated that PBC model can grouped into four types, which differ along the lines of two main theoretical building blocks. The first being the preferences of policy makers:

the governments actions are assumed to be driven by either electoral consideration (vote maximizing or opportunistic models) or by ideological considerations (partisan models). The second block being refers to the real impact of government policy: the individuals in the economy can be assumed to have either adaptive or rational expectations.

The best known model of vote-maximizing model, which assume that the governments goal is to amass the largest possible popular support at an election time, subject to the constraints imposed by the economic system was carried out by the seminal work of Nordhaus (1975). He derived a political business cycle for a vote-maximizing government confronted with an exploitable Philips curve, one based on inflationary expectations adjusting over time. This allows the *government to manipulate the economy*³ in such a way that macroeconomic indicators are good before an election to attract vote, while the negative consequences appear only after the citizens have voted.

According to Snowden and coworker, the vote-maximizing models have been criticized on various grounds: i) That rational voters can be expected to react to the regular occurrence of electoral cycles produced by the government, ii) empirical studies on Nordhaus-type business fluctuations coinciding with election periods in the major industrial countries have found at best mixed results, iii) governments can be assumed not to be simply vote maximizers, but to have other goals, in particular putting their ideological ideas into practice (Snowdon and Vane 2002). On the contrary, economic voting in the developing world takes place within an asymmetrical framework of punishment and reward according to Oganesyanyan (2014).

Understanding the cyclical behaviour of public sector wage bill and its impact on public finances is crucial. From macro-fiscal point of view, since wage bill spending account

³*Nordhaus asserts the following in the introductory paragraph of his seminal paper as follows:* There are many ways in which today's political choices affect future well-being. Future capital stocks, structures and machinery and roads, depends on the extent to which present generations invest instead of consume. Stocks of natural resources depend on past conservation effort. There are perhaps more subtle ways in which we bequeath our tastes, consumption patterns, and folkways to the future and determine future welfare. Recently, economists have concluded that we also pass on the inflationary (or deflationary) consequences of current policies.

on a significant proportion of total public spending, its behaviour strongly affects the overall fiscal position, potentially offsetting attempts at counter-cyclical stabilization in other parts of the budget (automatic stabilizers). It is now known that fiscal multipliers associated with public wages and employment may be particular higher (cited in). This effect would hold during boom periods when wage and employment growth in the public sector may exacerbate economy-wide wage and inflationary pressures, as well as during downturns there is austerity measures exist. Understanding the behavior of overall wage bill and its response to the business and electoral cycle can also inform fiscal projections and forecast as pointed out by Eckardt and Mills (2014). They established that business cycles and electoral cycles strongly affect the behavior of aggregate public sector wage bill. They found that wage bill tend to behave pro-cyclical in relation to macroeconomic cycle, that the cyclicity of the wage bill spending is asymmetric: wage bills tend to adjust more strongly during period of economic downturns. Lamo and Schulknecht (2013), found similar results that lagged pro-cyclicity of public consumption, public wages and employment predominate for the euro area and that discretionary fiscal policies appear crucial. The foregoing cyclicity is much more consistent with what pertains in Ghana when observed from the patterns of the electioneering periods where governments spendings are high periodic budget deficits.

There are presently two main schools of thought on how public spending in general and public wage expenditure in specific should behave with respect to the business cycle. The more extreme demand management perspective suggests that the fiscal stance be inversely related to the cyclical position of the economy. As a result, increased government expenditure should mitigate downturn by partly compensating for falling private demand and investment during such periods. In upturns, expenditure cuts could curb economic dynamics so as to prevent the economy from overheating. By contrast, tax-smoothing prescriptions suggest passive stabilizing role for the public spending: fiscal policy response to changes in cyclical conditions should mainly be confined to free operation of

automatic stabilizers (Holm-hadulla et al 2010).

The behaviour of public employment and wages in the context of the business cycle is also essential from a medium and long-term outlook. Public wage consumption can impact on the growth potential of an economy through the effect on labour supply in the private sector and through its indirect effect on investment, human capital formation and economic dynamism and innovation. From a medium term perspective, public wages and employment may reinforce real disequilibria and competitiveness problems for countries in monetary union if private sector wages are rigid. If public wage consumption behaves pro-cyclical in an upswing it may re-enforce upward pressure on private wages und unit labour costs (Lamo and Schuknecht 2013).

2.8 Long-term sustainability of fiscal policy

The extent to which the public sector wage bill is sustainable depends strongly on the mismatch between productivity and wage paid. Meritocratic employment is the key determinant of an effective public service. It is prudent that the level of productivity be linked to performance-based remuneration, and the scope of productivity improvement be linked to the incentives offered by the Government. By doing so, one ensures that there is no misallocation of resources to more non-progressive segments, and that an efficient allocation of resources to the public sector wage bill does not create technical efficiency, or economic waste. According to William Easterly (cited in)⁴, people respond to incentives and not an increase in wages, and higher public sector wages is not suitable to ensure that public servants remain productive

⁴The work do not provide proper source to reference. The source information was obtained from goggle: 15th June 2015: http://www.budgetspeechcompetition.co.za/download_files/winners-and-finalists/DylanSmithEssay.pdf

2.9 Brief Literature Review

2.9.1 Theoretical Literature

The analysis of the nexus between government revenue and government expenditure has been carried out extensively in both theoretical and empirical literature works. The theoretical literature contains many hypotheses that have been proposed to describe the intertemporal causal relationship between public revenue and public expenditure. The direction of causality between tax revenues and expenditures is of primary interest in answering the hypothesis set forth in the literature. There are basically four categories of the hypothesis namely: tax-and-spend or revenue-spend hypothesis, spend-and-tax or spend-revenue hypothesis, fiscal synchronization hypothesis and finally fiscal independence or institutional separation hypothesis (Chang and Ho 2002). The tax-and-spend hypothesis states that changes in government revenue bring about changes in government expenditure proposed by Friedman (1978) and characterized by unidirectional causality running from government revenue to government expenditure. Friedman argues that increases in tax revenue lead to increase in expenditure and that an increasing amount of revenues provides governments with resources, which they could exploit. For this reason, increase in tax or revenue will lead to increase in public expenditure and may result in increase budget deficit (Chang and Chia 2009).

The next hypothesis, spend-tax as advanced by Peacock and Wiseman states that the direction of causality is from expenditures to revenue of government. That is expenditure bring about changes in public revenue (Peacock and Wiseman 1961). The expenditure decisions are made first followed by tax revenue adjustments to meet the demands. Expenditures financed by deficits ultimately lead to increases in tax revenue according to the Ricardian invariance theorem, (Barro 1979). Similarly, when financed by deficits will lead to increase in tax revenues. As a consequence, any increase in expenditure will lead in an increasing tax bill at some point in the future.

In this case, the way to reduce budget deficit is through expenditure cuts. Peacock and collaborators, further suggested that during crisis periods such as war, famine or large-scale disaster or political crisis will require an urgent increase in government expenditure and subsequently government revenue therefore higher temporary taxes that will be imposed in these times would ultimately can become acceptable. The people would then see this temporary increases in taxes over time as normal. Peacock and Wiseman called this phenomenon as 'displacement effect'. The citizens become self-aware of the problems during the crisis.

Fiscal synchronization hypothesis due Musgrave (1966 cited in)⁵ and Meltzer and Richard (1981) emphasis that revenue and expenditures are determined concurrently resulting in bidirectional causality. They posited that voters weigh the marginal benefits against the marginal costs of government programs when deciding the appropriate level of expenditures and revenues. It is therefore characterized by contemporaneous feedback between government revenue and government expenditure (Chang and Chiang 2009). It is posited that voters compare the marginal costs and marginal benefits of government services when making a decision in terms of appropriate levels of government expenditure and revenue. It is posited that voters compare the marginal costs and marginal benefits of government services when making a decision in terms of appropriate levels of government expenditure and revenue.

The final hypothesis is the fiscal neutrality or fiscal independence or institutional separation hypothesis, advanced by Baghestani⁶ and collaborator (cited in). The argument follows that revenue and expenditure decisions of government are independent from each other. It is characterized by non-causality relationship between government revenue and government expenditure (Chang and Chiang 2009).

⁵Musgrave (1966): Principles of Budget Determination, in Cameron, H., Henderson, W., (eds.), Public Finance: selected Reading. New York. Random House. Online: http://www.economics-ejournal.org/economics/journalarticles/2013-13/references/Musgrave1966/bibliography_entry_view

⁶Original source: Baghestani H and McNown R, "Do Revenues or Expenditures respond to Budgetary disequilibria" Southern Economic Journal, 61 (2), 1994, pp.311-323.

From the foregone, Narayan and Narayan (2006) have suggested three reasons why the nature of the relationships between government expenditure and revenue is important. They suggested that: (i) If the tax-spend hypothesis is supported, budget deficits can be avoided by implementing policies that stimulate government revenue. (ii) If the bidirectional causality is does not hold, it means that government revenue decisions are made independent from government expenditure decisions which can lead to serious budget deficits should the government expenditure increase more rapidly that government revenue. (iii) Finally, if the spend-tax hypothesis is supported, it means that the government spends first and then raises taxed later to offset the spending, this situation can induce capital outflow due to the anxiety of paying higher taxes in future.

2.9.2 Empirical Literature

The causal relation between government revenue and government expenditure has attracted a lot of interest among researchers because of its policy relevance, particularly with respect to budget deficits. There is vast literature work that has been carried to study the relationship between government revenue and government expenditure(Chang and Ho 2002; Narayan and Narayan 2006). The determination of which hypothesis characterizes an economy is an intellectual exercise and has implications about solutions to the problem of budget deficit. Therefore, understanding of the relationship between revenue and expenditure is important for effective fiscal consolidation process (Rahman and Wadud 2014).

Empirical literature indicates that there are mixed findings on the nature of the relationship or direction of causation between government expenditure and government revenue. Different studies have come up with findings that provides support for one form of the hypothesis or another for different countries (Chang and Ho 2002; Emelogu and Ozughalu 2010; Narayan and Narayan 2006; Obeng 2012; Rahman and Wadud 2014) that is spend-

tax, tax-spend, fiscal synchronization and fiscal neutrality.

According to Narayan (2005), literature of empirical evidence suggests two groups of approaches are often used. The first group uses the classical econometric methods based on vector autoregression (VAR). The second group uses modern methods based on cointegration and error correction models. Obioma and Ozughalu (2005) opined that, its become a norm in econometric treatment to consider issues of stationarity, cointegration and error correction techniques when dealing with models involving time series data. The check of stationarity is to ensure non-spurious regression models; two variables will cointegrate if they have a long-term equilibrium relationship between them; and error correction method is used to reconcile the short-run behavior of the economic variables under consideration with their long-run equilibrium variables (Gujarati 2003).

The component of the government expenditure that constitutes a significant proportion of the government budget (outturn) leading to a budget deficit has grossly been missing in the literature because researchers tend to lump all component together as expenditure. For that reason, it is extremely difficult to uniquely identify what drives the relationship between government expenditure and revenue. Therefore, just establishing a causal relationship between government revenue and government expenditure is not sufficient to elucidate which area of the government expenditure needs careful examination in terms of policy direction. Again, the identification of such driving component can also be helpful when studying the sustainability of the government budget deficit either in the long run or short. Testing for stationarity usually precedes testing for cointegration and it may be said to provide the theoretical underpinning for error-correction mechanism.

2.9.3 Empirical Methodology

We explore the test of causality against the four hypothesis: tax-spend, spend-tax, fiscal synchronization, fiscal neutrality or fiscal independence in the framework of Engle-

Granger cointegration model. We examine group of countries from the Balkan South East Asia, OECD, ECOWAS⁷

countries and finally focused on Ghana. The choice of selected region is purely based on the available literature and to establish that the support for a particular hypothesis is very dynamic and depends on data set in question. The relationship between government revenue and government expenditure is of much interest to governments because its an indicator of the performance of policy direction espoused, particularly with budget deficits and or primary balance. Within the context of economic growth there seem to be a general understanding that persistent budget deficits have negative effects on a countrys purse which stagnant potential growth. Recently, the question has been rift with rising government budget deficits in developing countries where government expenditure plays a significant role in an economy. Government expenditure is the driving force of economic development and enhances the standard of living of the people as a consequence, understanding the relationship between spending and taxation is important in evaluating the governments role in the efficient distribution of a nations available resource.

In order to see whether or not socio-political characteristics influence political economy of budgetary decision, we explore some interesting findings in the empirical literature based on classification of the hypotheses already examined (tax-spend, spend-tax, fiscal synchronization and fiscal neutrality). The use of Engle-Granger bivariate cointegration method to test several hypotheses regarding the causal relationship between revenues and expenditure of government relative to real GDP of five Latin American countries with Chile and Paraguay showing support for fiscal synchronization and Colombia, Ecuador and Guatemala indicating tax-spend hypothesis Ewing and Payne (1998) has been done. However, when Narayan and collaborator studied twelve (12) developing countries, their result indicated evidence of tax-and-spend hypothesis for Mauritius, El Salvador, Haiti, Chile, Paraguay and Venezuela; the spend-and-tax hypothesis is valid for Haiti, while

⁷OECD: Organization for Economic Co-operation and Development, ECOWAS: Economic Community of West African States.

evidence of neutrality exists for Peru, South Africa, Guyana, Guatemala, Uruguay and Ecuador according to Narayan and Narayan (2006). Clearly the researchers of the two groups findings are completely in a mixed state an indication of the fact that, government revenue and government expenditure are dynamic variables not subject to any one particular hypothesis at all times. Similar studies carried out on the 15 OECD countries over the period 1992-2006 by Chang and Chia (2009) supported the fiscal synchronization hypothesis same as China with tested annual series data over the period 1977 to 1999 according to Chang and Ho (2002). Again, Granger causality test was carried out by Konukcu-Önal and Tosun (2008) for four transitional economies indicate evidence supporting tax-and-spend hypothesis in Belarus and Russian Federation and fiscal synchronization in Kazakhstan and Kyrgyz Republic. Mehrara et al. (2011) studied 40 Asian countries for the period of 1995-2008 applying Kao panel cointegration test confirmed fiscal synchronization hypothesis. Cointegration and Causality investigation carried out on Qatar from 1980-2011 shows support for tax-spend hypothesis (Al-Khulaifi 2012).

A bivariate cointegration on Ghana support the hypothesis that revenues and expenditures are cointegrated with evidence to suggest tax-spend hypothesis in the short-run and spend-tax hypothesis in the long-run as studied by Amoah and Loloh (2008) in the period 1983-2007. A study conducted on 15 ECOWAS countries with yearly data for the period 1980-2011 suggest weak long-run relationship with mixed results for the hypotheses. In this study, Ghana exhibited absence of any causal relationship (neutrality hypothesis) according to Magazzino (2013), however similar work by Aregbeyen and Insaah (2013) seems to suggest that their conclusion is in support of the fiscal synchronization hypothesis in dissension with views held by earlier workers and corroborated by Takumah (2014) whose time series period span from 1986-2012 reaffirmed it. A very recent work by Obeng (2015) finds evidence of tax-spend hypothesis after Granger causality test had been carried out.

From the literature readings, we recognize that the literature is replete with the nexus

of government revenue and government expenditure research work undertaken by several researchers and exploring all of them is beyond the scope of this thesis. Notwithstanding, it suggests that, since there are many countries in the world, in like manner there are many research conducted on them to test for these four hypotheses. The results may lend mixed supports of hypotheses for the same country. In this work, using Ghana as a test case, the literature survey results buttress the mixed support theory for one country. The reason for this potential mixed results is clearly due to the difference in data sets used and not necessarily the econometric methods employed.

2.9.4 Empirical studies on sustainability of fiscal policy

The concept of sustainability of public finance is a key element for the West African Monetary Zone (WAMZ)⁸ fiscal framework, fiscal discipline is an important component for the implementation of monetary policy. The analysis of fiscal sustainability focuses on the ability of the government to generate an adequate level of primary budget surplus in order to stabilize its debt ratio. The general intuition of fiscal sustainability is obvious: that sustainable policies are those that can be continued on current trends, while unsustainable policies necessarily needs to be modified. The sustainability of fiscal policy of WAMZ countries excluding Liberia using cointegration and Granger causality methods has been carried out using annual time series for the period 1980-2008 according to Oshikoya and Tarawalie (2010). The researchers found that, fiscal policy for member countries were weakly sustainable except Sierra Leone whose fiscal policy was evidently unsustainable. Similarly, Mohamed (2012) studied WAMZ countries over the period 1985-2013 by applying unit root cointegration method to analyze their fiscal sustainability. He concluded that fiscal policy was sustainable for all the countries except Liberia which is unsustainable. By using error correction model Oyeleke and Adebisi (2014) investigated the fiscal policy sustainability of Nigeria government whether the intertemporal budget con-

⁸The WAMZ countries include: The Gambia, Ghana, Guinea, Nigeria, Sierra Leone and Liberia

straint over the period 1980-2010 has been violated or not and found that fiscal policy was weakly sustainable consistent with Oshikoya *ibid*. Furthermore, Ndoricimpa (2013) similarly examined the structural breaks and fiscal deficit sustainability of the East Africa Community (EAC)⁹ countries by testing for cointegration between government spending and revenue based on long-run relationship for the period 1985-2012 and applying procedures suggested by Gregory and Hansen (1996)¹⁰ and Hatemi-J (2008) model to account for one and two endogenous breaks. He found that cointegration coefficients indicated budget deficits are weakly sustainable in the long run for Burundi, Kenya, Tanzania and Uganda and strongly sustainable for Rwanda.

By using a time series data spanning the period of 1960-2007 Doh-nani (2011) examined the fiscal sustainability of Ghanas budget by assessing the long run relationship between government revenue and expenditure. The work concluded a stable long run relationship based on cointegration test. Again, Kwakye (2012) assessed the profile and sustainability of Ghanas debt for the period 2000-2012 using Debt Sustainability Analysis (DSA) and found Ghanas debt to be unsustainable during the period 2000-2003 but sustainable during the period 2004-2012 consistent with those obtained for Ghana by the IMF and World Bank under the HIPC and new Debt sustainability framework (DSF). Using Autoregressive Distributed Lag (ARDL) and Ordinary Least Squares (OLS) with breaking point techniques to assess Ghanas fiscal sustainability for the period 1990-2013 Asiama et al. (2014) forecast Ghana's debt dynamics for the period 2014-2016. They employed adjusted rates from the projections of total interest payment and real GDP growth in 2014 fiscal budget of Ghana. The worked showed that public finance is weakly sustainable as significant pressure remains in the issuing year in excellent agreement with Akosah (in preparation) who studied Ghana's fiscal profile over the period 1983-2012. He analysed the long-run mean-reverting properties of debt dynamics using unit root techniques

⁹EAC consist: of Burundi, Kenya, Tanzania, Uganda and Rwanda

¹⁰Unfortunately, A. Ndoricimpa indicated to have used such method in his work, but failed to provide the original source for appropriate citation

and estimated the fiscal policy reaction function. The examination of the sustainability of fiscal policy in Ghana over the period of 1980-2010, to determine whether or not the economy has achieved the criterion required for membership in (WAMZ) has been done by Oyeleke and Adebisi (2014). By using error correction method of analysis, they concluded that variables have long run relation which indicated sustainability, although weak, which shows an indication that the country might not qualify for WAMZ membership and that 29% of disequilibrium between government revenue and expenditure generated in the economy was adjusted yearly following shocks. to the economy.

Chapter 3

METHODOLOGY

3.1 Introduction

The chapter presents methodology of the empirical model of the study in the bigger picture. The actual experiment begins with testing for units roots, lag structure, Granger causality tests and followed by diagnostic test as a preliminary investigation on the data properties. We outline cointegration approaches to understand our economic structure linkages and corresponding actual numerical estimation by employing both Granger two-step and Johansen cointegration methods. We end the chapter with cointegration shifts and regression with breakpoints to investigate the effects of changes in policy direction in the span of our time series data.

3.2 Econometric Techniques

3.2.1 Study Variables

The main variables employed in the study includes: government revenue X and government expenditure Y are used generically to describe our models. We also introduce infla-

tion and exchange rate depreciation as part of the exogenous variables. The government revenue and government expenditure consist of the following break down:

1. Government revenue sources consist of all tax revenue, direct taxes, company taxes company oil taxes, taxes on domestic goods and services, international trade taxes; import duties, export duties, social contributions and grants
2. Government expenditure and net lending involves spending by government includes; compensation of workers emoluments including wages and salaries, Interest payments (Domestic and External), social subsidies, sapital expenditure (domestic financed and foreign financed)

3.2.2 Test of Unit Root

The advances in time series econometrics, normally in the testing for the non-stationarity and cointegration between time series data have provided new insights to empirical economic analysis. This is because a unit root is often a theoretical implication of models which postulate the rational use of information that is available to economic agents. Included in examples but not limited to: various financial market variables such as futures contracts stock prices, dividends, spot and forward exchange rates and even aggregate variables like real consumption. Formal statistical tests of unit roots hypothesis are important in economics because they help to evaluate the nature of the non-stationarity that most macroeconomic data exhibit. They help in determining whether the trend is stochastic, through the presence of a unit root, or deterministic, through the presence of a polynomial time trend (Philips and Perron 1988). As a consequence, testing for the existence of unit roots and cointegration have become standard procedures. Hence, they are indispensable in modern empirical research because cointegration required some economic parameters to be constant or stationary over time.

The starting point for our empirical analysis is an investigation of the unit root property

of variables. Unit root tests are essential to ensure that we do not get spurious regression. A time series that contains a unit root is said to be non-stationary otherwise the time series is stationary. The problem with non-stationary or trended data is that the standard OLS regression procedures can easily lead to incorrect conclusions. It can be shown that in these cases the norm is to get very high values of R^2 (sometimes higher than 0.95) and very high values of t -ratios (sometimes higher than 4) while the underlying variables used in the estimation have actually no interrelationship at all (Asteriou 2007), (like trying to relate oranges and mangoes, it does not add up).

The null hypothesis of a unit root cannot be rejected at the conventional levels of significance. In conducting stationarity tests of our variables, we apply the Augmented Dickey-Fuller (ADF) unit root test, which is derived from (Dickey and Fuller 1979: 1981). It tests the null of the unit root¹. It is important to state that when the number of observations is low, unit root tests have little power (Chebbi and Lachaal 2007). For this reason we complement the ADF unit root test with different tests such as Kwiatkowski Philip Schmidt and Shin (KPSS)(1992) stationarity unit test, which tests the null of stationarity². Also, the Philip-Perron unit root test (which comes from Philip and Perron 1988: 1990) is also used. Augmented Dickey Fuller procedure is meant to treat possible parametric serial autocorrelation in the error terms by adding the first lagged difference terms of the regressand.

KPSS stationarity unit test tests the null of stationarity. Also, the Philip-Perron unit root test (Philip and Perron 1988 : 1990) *ibid* is also used. Augmented Dickey Fuller procedure is meant to treat possible parametric serial autocorrelation in the error terms by adding the first lagged difference terms of the regressand. The ADF is estimated by the following regression. In order to examine the stationarity of the respective time series in this work, the following ADF test is performed on each series: s

¹In the ADF test, the null hypothesis is that the variable in question has a unit root (i.e., it is not stationary)

²KPSS are used for testing a null hypothesis that an observable time series is stationary around a deterministic trend

$$\Delta X_t = \alpha + \beta t + (\rho - 1)X_{t-1} + \sum_{i=1}^k \rho_i \Delta X_{t-1} + \epsilon_t \quad (3.1)$$

where ΔX_t is the first difference of X_t series, α and βt constant deterministic terms, t is a linear time trend variable, k is the number of lag differences included to capture any autocorrelation, ρ which are included to allow for serially uncorrelated residuals and is determined by the Akaike Information Criterion or the Schwartz Bayesian Criterion and ϵ_t is the residual term.

The null hypothesis is that X_t is a nonstationary series and accounted for by a t -test of $(\rho - 1 = 0)$. The alternative hypothesis of stationary requires that $(\rho - 1 < 0)$ be significantly negative. If the absolute value of the computed t -statistics for $(\rho - 1)$ exceeds the absolute critical value, then the null hypothesis, that the series X_t is nonstationary must be rejected against its alternative hypothesis. That is, if on the other hand, it is less than the critical value, it is concluded that the X_t series is nonstationary.

The Philips-Perron unit root test makes use of non-parametric statistical methods to take care of the serial correlation without adding lagged difference (Gujarati 2003). Due to the possibility of structural changes that might have occurred during the period under consideration, the ADF test might be biased in identifying variables as being integrated. However, the Philips-Perron test is expected to correct this anomaly.

The Philips-Perron test is estimated by the following regression:

$$\Delta X_t = \alpha + \beta t + \rho X_t + \epsilon_t \quad (3.2)$$

where the second equation includes a trend variable t . The PP test is verified by the t -value associated with the estimated coefficient of ρ . The series are to be stationary if ρ is negative and significant. The test is to be performed for all the variables where both the original series and differences of the series are to be tested for stationary.

The KPSS test for unit root differs from the ADF and PP test in that the series is assumed to be (trend-) stationary under the null. The KPSS test reverses the null and the alternative hypothesis. The KPSS statistic is based on the residuals from the OLS regression, which takes the following form:

$$\Delta X_t = \alpha_t + b_t + \epsilon_t \quad (3.3)$$

where t is a linear deterministic trend, ϵ_t is a stationary error and b_t is a random walk; $b_t = b_{t-1} + \mu_t$, where μ_t are i.i.d($0, \sigma_\mu^2$). The initial value of b_0 is treated as fixed and is interpreted as an intercept. The test is conducted by first regressing X_t on a constant and a trend, allowing one to obtain the residuals.

The KPSS test statistic is defined as:

$$\eta(\mathbf{u}) = V^2 \sum \frac{q_t^2}{q^2(k)} \quad (3.4)$$

where $q_t = \sum s_t$, s_t is the partial sum of the residuals, $q^2(k)$ is a consistent non-parametric estimate of the disturbance variance and V is the sample size. Kwiatkowski et al.(1992) show that the statistic $\eta(\mathbf{u})$ has nonstandard distribution, and critical values are provided therein. If the calculated value of $\eta(\mathbf{u})$ is larger than the critical values, then the null of stationary for the KPSS is rejected.

The test involves testing the null hypothesis of non-stationarity of government expenditure and government revenue series against the alternative hypothesis of stationarity of the variables. We use the natural logarithms of government revenue, government expenditure for as relative values. The tests will verify the stationarity properties of government revenue and expenditure series.

3.2.3 Lag Structure Testing

To avoid a model to be mis-specified due to the omission of relevant variables, the onus lies in specifying an optimal lag length for a model that is not too small, too small is detrimental to the loss of relevant information and too large means potential loss of possible number of degrees of freedom. In short, a model with relatively large number of lags is most likely to produce residuals that approach white noise process, but might not be parsimonious. Similarly, a model with smaller lag lengths is more likely to be parsimonious, but might not produce residuals that are random enough to approach a white noise process. This technical problem suggests that there is the need to select an optimal length. The Schwartz Bayesian information Criteria (SIC) and the Akaike information Criteria (AIC) are identified in literature as appropriate tools for selecting optimal lag lengths which produces errors that approach a white noise process, subject to the constraint that the smallest number of lag terms was selected for parsimony. These approaches are jointly employed to determine the optimal length of variables for this work.

3.2.4 Granger Causality Test

The connections with macroeconomic variables are examined by using Pairwise Granger-Causality test. Let us assume a variable X is caused by Y if X is better predicted from past values of Y and X together rather than from past values of X alone. The use of Granger causality tests helps to identify and address the potential simultaneity biases, especially in fitting a single-linearly specified model for government expenditure and government revenue. The simultaneity bias emerges when the OLS estimation violates the strict exogeneity assumption of the right hand side variables. That is, the explanatory variables do not correlated well with each other or with the residual terms and also there is no feedback effect from the left hand side variable.

We examine the direction of causality between the variables based on the following

distinguished patterns a) unidirectional causality from X to Y , denoted by $X \rightarrow Y$, b) unidirectional causality from Y to X , denoted by $Y \rightarrow X$, c) feedback or bidirectional causality $X \leftrightarrow Y$, and d) no causality. The simplest Granger test that define causality is that, a variable Y_t is said to Granger-cause X_t , if X_t can be predicted with greater accuracy by using past values of the Y_t variable rather than not using such past values, all other terms remaining unchanged.

Classically, Granger causality test works on the assumption that the series are stationary. Therefore, in this study, the series that were non-stationary were differenced to achieve stationarity before applying the Granger-causality test. The test involves the estimation of the following pair of regressions in equations (3.5) and (3.6) shown below.

$$X_t = \alpha_0 + \sum_{i=1}^k \alpha_{1i} X_{t-i} + \sum_{i=1}^p \alpha_{2i} Y_{t-i} + \epsilon_t \quad (3.5)$$

$$Y_t = \beta_0 + \sum_{i=1}^k \beta_{1i} Y_{t-i} + \sum_{i=1}^p \beta_{2i} X_{t-i} + \mu_t \quad (3.6)$$

where X is the government revenue represented by; Y is vector of explanatory variables including exchange rate depreciation and consumer price index.

The Granger causality can be tested through the null hypothesis in equation (3.5) as this; Y does not cause X , that is $\alpha_{2i} = 0$ for all i and for equation (3.6) the null hypothesis is X does not cause Y , or $\beta_{2i} = 0$ for all i . If $\alpha_{2i} = \beta_{2i} = 0$ for all i , we conclude that there is no causality between X and Y . If both null hypotheses are rejected, then $\alpha_{2i} \neq 0$ and $\beta_{2i} \neq 0$, then bidirectional relationship exists between the two variables X and Y . This simple causality is valid only for a stationary series $I(0)$.

3.2.5 Diagnostic Testing

The concern of theoretical econometrics researchers regards disturbance in the structure of econometric models. Kramers and collaborators offer recommendation for test for the residual normality, homoscedasticity and autocorrelation of the errors in the equation as well as procedures to rectify adverse inconsistency in convectional regression output (Kramers 1985). Finally, models were taken through the Ramseys Reset test, Normality test and stability tests for parsimony. The test for normality of the variables uses Jarque-Bera test. This is based on OLS residual and the test statistic follows the chi-square distribution with two degrees of freedom. It jointly tests skewness ($S = 0$) and kurtosis ($K = 3$) of the residuals. The null hypothesis that the residuals are normally distributed is tested against alternative that the residuals are not normally distributed. In testing for heteroskedasticity ensures that the OLS assumption that the variance of each of the disturbance term is same. In this case, if we insist in using the usual testing procedures despite heteroskedasticity, whatever conclusion is drawn or inference arrived at could be very misleading (Gujurati 2003). We tested for heteroskedasticity on the hypothesis:

H_0 : *There is no heteroskedasticity.*

H_1 : *There is heteroskedasticity.*

The hypothesis is carried out by employing the white heteroskedasticity test. For accuracy of the estimates, the study tested for autocorrelation since the classical regression models assumes the existence of no autocorrelation in the residual term. This is crucial because, in the absence of the assumption, the OLS estimator may no longer have minimum variance among all linear unbiased estimators. In this case, the estimates may not be as accurate as other linear unbiased estimators and that the t , F and χ^2 test may give misleading conclusions as suggested by Gujurati (2003) [?]. In testing for autocorrelation,

the following hypothesis was stated:

H_0 : *There is no autocorrelation in the residual term.*

H_1 : *There is autocorrelation in the residual term.*

The test for autocorrelation in this work uses the Durbin-Watson $d - test$ because it is the best for our samples.

3.3 Cointegration approaches

The basic requirement that for any econometric model using non-stationary time series data to be useful must be cointegrated. That is, If the variables involved are not cointegrated then we have the problem of spurious regression and the econometric modeling being meaningless. Cointegrated variables are therefore prerequisites for detecting relationships linking among economic structures. The crux is that if there is a true long-run relationship between the variables, although the variables would rise over time (because they are trended), there will be a common trend that would link them together; that is there may be a long-run co-movement between the time series data with a common equilibrium relation. For an equilibrium relationship to exist, linear combination of Y_t and X_t must be stationary. In a more formal way, time series Y_t and X_t are said to be cointegrated of order d, b where $d \geq b \geq 0$, written as $Y_t, X_t CI(d, b)$ if (a) both series are integrated of order d , (b) there exist a linear combination of these variables, $\beta_1 Y_t + \beta_2 X_t$ which is integrated of order $d - b$. The vector $\{\beta_1, \beta_2\}$ is called the cointegrating vector.

In short, the rationale for using cointegration is that if government spending and revenue are non-stationary but there exists linear combination of the two series which are stationary, then in the long-run these series do not drift apart. In this way, we can infer the level

of sustainability of government wage bill. Cointegration is therefore a vehicle to correctly test a hypothesis concerning the relationship between government revenue and government expenditure having unit roots. Clearly, Cointegration is a powerful tool to treat a limited econometric time series data. Again, if the variables are cointegrated, a test of causality can be carried out between them. For example, if the series of the government revenue and government expenditure are cointegrated, an error correction representation of the cointegrated series can be estimated to examine the causality between the variables as a consequence cointegration is viewed as statistical expression of the nature of the long run equilibrium relationship (Doh Nani).

3.4 Estimation methodologies

In this section, we carry out both bivariate and multivariate cointegration analysis to identify long run and short run relationship between government revenue and expenditure. The type of econometric technique used to identify the cointegration relationship will depend largely on the results of the unit root test. In this case, if the unit root test suggests that, all the variables of interest are of order one (nonstationary at levels), we would apply Granger two-step method for the bivariate analysis to estimate long run models using ordinary least squares which provided reliable coefficient and Johansen method for the multivariate analysis. However, if the unit root tests suggest different order of integration for the variables (i.e., some variables stationary and others are not) then we apply autoregressive distributed lag method (ARDL). Again, if the variables are stationary at levels, then we apply an OLS regression. The subsequent section briefly outline the methods experimented.

3.4.1 Order of integration and hypothesis definition

Two variables; government expenditure and government revenue are cointegrated if they have a long-run or equilibrium relationship between them. In the case, the two variables Y_t and X_t , are integrated of order d , $I(d)$, If there exists a linear combination such that the disturbance term ϵ_t from regression is of a lower order of integration, $I(d - b)$ and $b > 0$ then Engle and Granger (1987) defines Y_t and X_t as cointegrated. Thus if Y_t and X_t were both $I(1)$ and residual ϵ_t are $I(0)$, the two series would be cointegrated, in this case, equation (5) is longer spurious. The Engle and Granger (1987) two-step procedures for modeling the relationship between cointegrated government expenditure and government revenue is as follows:

First, the order of integration of the government revenue Y_t and government expenditure X_t is determined by employing the unit root test. We then run the OLS regression on what is called the cointegrating regression based on the model below:

$$X_t = \alpha_0 + \alpha_1 Y_t + \epsilon_t \quad (3.7)$$

which will not yield a satisfactory estimates of $\hat{\alpha}_0$ and $\hat{\alpha}_1$, we follow by testing whether the residual ϵ_t from the regression are stationary. If Y_t and X_t are not cointegrated, any linear combination of them will be non-stationary, and hence the residual will be non-stationary. If the time-series included in the analysis are $I(1)$ and cointegrated, by definition the residual term $\epsilon_t \sim I(0)$, the simple Granger causality test should not be used Khulaifi (2012).

From equation (3.7), we formally state the hypothesis to be tested in support of the objective of this study as follows:

H_0 : government revenue and government expenditure are not cointegrated

H_1 : government revenue and government expenditure are cointegrated

This result is possible if the series of residuals ϵ_t is stationary and display no unit root. Hence we apply the estimated cointegration relationship to generate residual errors. The estimated OLS residuals are then also tested for unit root and corresponding hypothesis for stationarity is stated below:

$$H_0 : \epsilon_t \text{ is no stationary}$$

$$H_1 : \epsilon_t \text{ is stationary}$$

We also test linear restriction for statistical significance of $\alpha_1 = 1$, which means, we test whether the coefficient of the independent variable in the long-run cointegration model is statistically different from one. The value of α_1 should not necessarily be one in absolute terms instead statistical terms. As long as government revenue and expenditure are cointegrated, if the coefficient α_1 is statistically equally one, it demonstrates the case of strong sustainability of government wage bill. On the contrary, government financing of the public sector wage will be weakly sustainable if government revenue and government expenditure are cointegrated in a relation as $0 < \alpha_1 < 1$. If $\alpha_1 \leq 0$ then irrespective of the cointegration relationship between X and Y government wage will be sustainable (Quintos 1995). For sustainability of the government wage will, the following hypothesis is test to establish the statistical significance of the cointegrating vector.

$$H_0 : \alpha_1 = 1$$

$$H_1 : \alpha_1 \neq 1$$

The short run relationship between government expenditure and government revenue is estimated by either using error correction model (ECM) of Engle-Granger or vector error correction model (VECM) of Johansen. These two models would be examined in the subsequent sections.

3.4.2 Granger two-step cointegration estimation

As a result of intrinsic dynamic interrelationship between macroeconomic variables, the thesis initially develop Vector Autoregressive (VAR) frameworks based on equation (3.8) below

$$X_t = \alpha_0 + \sum_{i=1}^k \alpha_i Y_{t-i} + v_t \quad (3.8)$$

where X_t indicates endogenous matrix, α_i are the parameters to be estimated in the system and v_t is the error term. The system in equation (3.8) permits the testing for effect of past values of X on current values. Accordingly, the study specifically assumed exogeneity of certain variables in equation (4). In the same vein, each element of the error vector, v_t is assumed to composed of own error term (ϵ_t) and contemporaneous correlation with other errors. The robustness of VAR results by employing Bound Testing ARDL method to explore both the short run and long run determinants of government revenue and government expenditure nexus. Especially, the ARDL approach is indifferent of the data generation process (i.e., stationarity or otherwise) of the variables under consideration and hence, suitable for variables with different order of integrations. The ARDL cointegrating (long run) model for government revenue and government expenditure in the following form would be used:

$$X_t = \beta_0 + \beta_i Y_{t-i} + v_t \quad (3.9)$$

where β_i is a vector coefficient of the macroeconomic variables and Y represents the vector of the aforementioned explanatory variable. Additional explanatory variables such consumer price index (CPI) and exchange rate depreciation. Importantly, if the long run of government revenue function in equation (3.9) is a valid cointegration function, it will also have an equivalent short run error correction model (ECM). The short run ECM is

shown in equation (3.10) as follows:

$$\Delta X_t = \alpha_0 + \sum \alpha_{1i} \Delta X_{t-i} + \sum \alpha_{2i} \Delta Y_{t-j} - \alpha_3 ECT_{t-1} + v_t \quad (3.10)$$

which has the advantage of including both long-run and short run information. where ECT_{t-1} is the error-correction term lagged one period. This is the feedback effect or the adjustment effect, which indicate how much the disequilibrium is being corrected in the previous effects. Adjustment might take place within a period or instantaneous (100%) or adjustments place in a period (50%) or no adjustment at all. The ΔX and ΔY are differenced time-series of X and Y respectively with v_t being noise error terms. The independent variable is said to cause the dependent if the error term (ECT_{t-1}) is significant, or the coefficients of the lagged independent variable are jointly significant. In this model, α_{2i} is the impact multiplier (the short-run effect) that measures the immediate impact that a change in Y_t will have on change in X_t . Negative and statistically significant values of the coefficients (α_3) of the error correction terms indicate the existence of long run causality and must be less one. Causality test should be based on the basic equation (3.10) of the error correction model when the series is found to be cointegrated. The spurious regression problem arises when we are using non-stationary data but in equation (3.10) everything now is stationary because change in X and Y stationary because they are assumed to $I(1)$ variables and the residual from level regression are stationary by assumption of cointegration.

3.4.3 Steps for testing cointegration in a single equation: Engle-Granger approach

By definition, cointegration suggests that the variables be integrated in the same order.

1. First step is to test each variable to determine the order of integration. ADF test

would be applied in order to infer the number of unit roots in each of the variables.

Three cases are distinguished that will lead us to the next step or stop:

- If both variables are stationary $I(0)$, it means we do not need to continue, standard time series techniques of classical regression analysis is applicable to stationary variables.
 - If the variables are integrated of the different order, it is possible to conclude existence of cointegration.
 - If both variables are integrated of the same order we proceed with the second check.
2. Second step is to estimate the long-run possible cointegration relationship. If the results in step (1) above indicate that Y_t and X_t are integrated of the same order, this means we must estimate the long-run equilibrium relationship of the form of equation (3.7) to obtain the residual. If no cointegration exists, the result obtained will be spurious and must be discarded. However, if the variables are cointegrated, the OLS regression yields perfect estimators for cointegrating parameter $\hat{\alpha}_1$.
 3. Third step, we check for the order of integration of the residuals. In order to determine the variables are cointegrated, we denote the estimated residual by the symbol $\hat{\epsilon}_t$ in equation (3.7). This is the series of the estimated residuals of the long-run relationship. If these deviations from the long-run equilibrium are found to be stationary then clearly Y_t and X_t cointegrated. It mean that, the estimated residual is integrated of order zero ($\hat{\epsilon} \sim I(0)$), we therefore accept the null hypothesis that and cointegrated.
 4. The final step, if the variables Y_t and X_t are cointegrated, the residual from the equilibrium regression can be used to estimate the error-correction model to analyze the long-run and short-run effects of the variables as well as to see the adjustment coefficient, which is the coefficient of the lagged residual terms of the long-run

relationship identified in step 2. At the end, we check for the adequacy of the model by performing diagnostic test.

3.4.4 Johansen Cointegration and Vector Error Correction Model

Since using only the government revenue and government expenditure variables to do bivariate analysis could suffer from missing variable bias, we carry out multivariate analysis by including other variables such as inflation and exchange rate and other relevant variables. The choice of these variables was under pinned by the fact that Ghana has a high inflationary environment and perennial exchange rate depreciation. Rising inflation and exchange rate depreciation induces interest rate hikes by the commercial banks, which tend to dampen private sector investment and in turn constrain economic growth and government tax revenue. Therefore, to identify any economic relationships between these multivariables, it would be appropriate to abandon the Engle-Granger single equation approach and incorporate the more general Johansen formulation for multivariate system.

We therefore guess a set of p - economic variables that are cointegrated and that are $I(1)$. The process can be assumed to have X_t sequence, which is independent and identically distributed with Gaussian random variables and mean zero and variance of one. We define a VAR with k lag such that they are endogenous as follows.

$$X_t = \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} + \mu_t + \Phi D_t + \epsilon_t, (t = 1, \dots, T) \quad (3.11)$$

where $(\epsilon_t, \dots, \epsilon_t)$ are $\Pi N_p(0, \Delta)$ and X_{-k+1}, \dots, X_0 are fixed. The variables D_t are seasonal dummies and cancels up in a year. The unrestricted parameter $(\mu, \Phi, \Pi_1, \dots, \Pi_k, \Delta)$ are estimated on the basis of T observations from a vector autoregressive process. Since economic time series are non-stationary process, we parameterize (3.11) into vector error correction model (VECM) consistent in intuition as the case of ECM (3.10) as follows:

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-k} + \mu + \Phi D_t + \epsilon_t \quad (3.12)$$

where $\Gamma_i = -(I - \Pi_1 - \dots - \Pi_i)$, ($i = 1, \dots, k-1$),

and $\Pi = -(I - \Pi_1 - \dots - \Pi_k)$.

The rank of the matrix Π is r , which determines the number of cointegrating vectors and if there are p variables in the equation, it implies that there can be a maximum of $p - 1$ cointegrating vectors [?].

Equation (3.12) has been expressed in first difference model except for the term ΠX_{t-k} which contains the long-run relationship information between the variables in the data vector. At equilibrium all the ΔX_{t-i} will be zero, and if we set the residual terms to their expected values of zero, then we are left with $\Pi X_{t-k} = 0$.

The Π is defined as the product of two matrices α and β' of dimension $p \times r$ and $r \times p$ respectively. When the Π matrix is decomposed, the component β gives the long-run coefficients of the cointegrating vectors and gives the adjustment speed, which is similar to an error correction term and the relationship between them is give by $\Pi = \alpha\beta'$. When the coefficients are investigated for information of long run relationship, three scenarios are possible, first case; that the matrix Π may have full rank indicating a stationary X_t process, second case that the matrix is a null which corresponds to differenced vector series model and finally matrix has rank r less than the vector series dimensionality p indicating a number of cointegration vectors with $\Pi = \alpha\beta'$ according Johansen (1988) [?].

The test for cointegration between Xs is calculated by examining the rank of Π matrix via its eigenvalues. There are two test statistics for cointegration under the Johansen maximum likelihood estimator framework which are the trace test and maximum eigenvalue test. Both are used to determine the number of cointegration vectors present. Usually, they do not both indicate the same number of cointegrating vectors. The trace test is

based on the trace of the matrix Π given by

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^p \ln(1 - \hat{\lambda}_i) \quad (3.13)$$

and the next similar test is the maximal eigenvalue statistics given by

$$\lambda_{max}(r, r + 1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (3.14)$$

where $\hat{\lambda}_i$ is the estimated characteristic root of the i^{th} ordered eigenvalues of the matrix. The test shows how many numbers of the characteristics root are significantly different from zero. Clearly, as $\hat{\lambda}_i \rightarrow \infty$, $\ln(1 - \hat{\lambda}_i) \rightarrow -\infty$ and larger will be the test statistic. A given cointegrating vector is the same as an associated eigenvector of a given eigenvalue. Therefore, a significantly non-zero eigenvalues is an indication of a significant cointegrating vector.

The trace test λ_{trace} is a joint test where the null hypothesis is that, the number of cointegrating vectors is less than or equal to r against a general alternative hypothesis that there are more than r . The procedure starts with p -eigenvalues and successively adding more eigenvalues beyond the r^{th} eigenvalue that exceeds the displayed critical values. The trace will be zero ($\lambda_{trace} = 0$) if $\hat{\lambda} = 0$ for all i when the rank is zero for no cointegration.

The maximal eigenvalue test is conducted on each eigenvalue. The null hypothesis is that there are r cointegrating vectors present against the alternative that there are $(r + 1)$ cointegrating vectors present. Johansen and Juselius (1990) [?] provided a set of critical values for the two separate tests. According to them, the test statistic distribution is non-standard and therefore the critical values depends on the value of $p - r$, the number of non-stationary components and whether constraints are imposed in each of the equations. Intercepts maybe included either in the cointegrating vectors themselves or as additional terms in the VAR to form the dynamic model of the multivariate system.

The estimated test statistic is compared with the critical values from Johansen tables, if the estimated test statistic is greater than critical values, the null hypothesis is rejected that there are r cointegrating vectors in favour of the alternative that there are $r + 1$ (for the trace λ_{trace}) or more than r (for maximum eigenvalue λ_{max}). The testing procedure is conducted in a descending order under the null, $r = 0, 1, \dots, p - 1$ so that the hypothesis for λ_{max} are

$$H_0 : r = 0 \text{ versus } H_1 : 0 < r \leq p$$

$$H_0 : r = 1 \text{ versus } H_1 : 1 < r \leq p$$

$$H_0 : r = 2 \text{ versus } H_1 : 2 < r \leq p$$

$$\vdots$$

$$H_0 : r = p - 1 \text{ versus } H_1 : r = p$$

(3.15)

Mensah(2008). The first line indicates a null hypothesis of no cointegrating vectors (equivalent to Π matrix rank of zero). If this null were not rejected, it would mean that there are no cointegration vectors and the testing would end here. On the contrary, $H_0 : r = 0$ if is rejected, then the null hypothesis that there is one cointegrating vector $H_0 : r = 1$ would be tested and so on. Thus the value of r is continually updated until the null is no longer rejected.

3.4.5 Steps for testing cointegration in a multiple equation: Johansen approach

The test for cointegration in Johansen approach proceeds as follow:

1. The first step is to test for the order of integration of the variables under investigation. The most desirable is when all variables are integrated of the same order

and then proceed to test cointegration. In most cases, the order is mixed $I(0)$ or $I(1)$ among the variables present in the model. We need a non-stationary variables in order to detect among them stationary cointegrating relationship and avoid the problem of spurious regression.

2. The second step is set the appropriate lag length of the model to get better Gaussian error terms which do not suffer from non-normality, autocorrelation and heteroskedasticity problems. Often time dummy variables are included to account for short-run shocks as in political events which affect macroeconomic conditions.
3. The third step involves choosing the appropriate model regarding the deterministic components in the multivariate system. That is whether the formulation, should include intercept or a trend in the short-run model or the long-run model or both.
4. In step four, we determine the number of cointegrating vectors or rank of the matrix according to Johansen and Juselius (1990) prescription based on the number of variables in our system.
5. In the fifth step, we test for which variables are weakly exogenous. If a variable is found to be weakly exogenous, we drop it an endogenous part of the system. This means we can drop the whole equation for that variable although it will continue to feature on the right-hand side of the other equation.
6. Finally we test for linear restrictions in the cointegration vector. This will allow us to test for specific hypotheses regarding various theoretical prediction from economic point of view.

3.4.6 Equilibrium Correction and Cointegration shifts

Supposing that there exist a long run relationship among our variables under consideration, then the correction mechanism must exist in order to moderate the variables to

their long term relationship such that temporary shocks from the equilibrium would be corrected. This mechanism is achieved through equilibrium correction model. The coefficient of the error correction term represents speed of adjustment to long run equilibrium following shocks to the system.

It is possible, in reality, that the long-run relationship between government expenditure and revenue can change, which will shift the cointegration vector. Thus, though times series with unit root has long term component that is purely unpredictable, Gregory and Hansen and have argued that rejection of cointegration may be due to shift in cointegration vector during the sample period (break points) according to (Gebhard and Silika 2006, Dolado, Jesús). This means movement towards the long run equilibrium need not occur in every cycle especially when the sample period is long. In otherwards, structural breaks and regime shifts within the time series data may lead to rejection of cointegration.

According to Doh Nani, Ghana has experienced changes in fiscal policy directions as result of changes in government programmes. In 1983, Ghana commenced the Economic Recovery Programme and the Structural Adjustment Programme to mitigate the severe economic downturns in the 1980s. Again, 2001 Ghana opted for Heavily Indebted Poor Countries initiative for debt relief. There had also been several political changes since the 1960 made up of both constitutional and military regimes. These events can be considered as regime shifts which indicates specific sources of structural breaks in the parameters of government revenue and government expenditure series. However, with respect to this study, structural break could be thought of as events before the introduction of the single spine and after.

3.4.7 Regression with Break-points

In a series of important papers, Bai and Perron(1998, 2003a and 2003b) hence forth (BP) developed a scheme of finding multiple structural breaks in a time series and testing for

their statistical significance. In general, Bai and Perron method can be decoupled in two separate independent components. First, one can identify any number of breaks in a time series regardless of statistical significance, second once the breaks have been identified; BP proposes a series of statistics to test for the statistical significance of these breaks, using an asymptotic critical values. The advantage of the BP framework is its capability of allowing for autocorrelation and heteroskedasticity in time series.

Let us consider the following multiple linear regression with breaks ($m + 1$ regimes):

$$x_t = x_t' \beta + z_t' \delta_j + \epsilon_t, \quad t = T_{j-1} + 1, \dots, T_j, \quad (3.16)$$

for $j = 1, \dots, m + 1$. In this model, z_t is the observed dependent variable at time t ; $x_t (p \times 1)$ and $z_t (q \times 1)$ are vectors of covariates and β and δ_j are the corresponding vectors of coefficient; ϵ_t is the disturbance at time t . The indices $(T_{1=1, \dots, T_m})$ or break points are explicitly treated as unknown (the convention that $T_0 = 0$ and $T_{m+1} = T$). This is a partial structural change model since the parameter vector β is not subject to shifts and is estimated using the entire sample. When $p = 0$, we obtain a pure structural change model where all the coefficients are subject to change. The variance of ϵ_t need not be constant. Indeed, breaks in variance are permitted provided they occur at the same dates as the breaks in the parameters of the regression.

The multiple linear regression system (3.17) may be expressed in matrix form as

$$X = Y\beta + \bar{Z}\delta + \xi, \quad (3.17)$$

where $Y = (y_1, \dots, y_T)'$, $X = (x_1, \dots, x_T)$, $\xi = (\epsilon_1, \dots, \epsilon_T)'$, $\delta = (\delta'_1, \delta'_2, \dots, \delta'_{m+1})'$, and \bar{Z} is the matrix which diagonally partition Z at (T_1, \dots, T_m) , i.e. $\bar{Z} = \text{diag}(Z_1, \dots, Z_{m+1})$ with $Z_i = (z_{T_{i-1} + 1}, \dots, z_{T_i})'$. The purpose is to estimate the unknown regression coefficients together with the break points when T observations on (x_y, y_y, z_t) are available.

The method of estimation considered is based on the least-squares principle. For each m -partition (T_1, \dots, T_m) , The associated least-squares estimates of β and δ_i are obtained by minimizing the sum of squared residuals.

$$(X - Y\beta - \bar{Z}\delta)'(X - Y\beta - \bar{Z}\delta) = \sum_{i=1}^{m+1} \sum_{t=T_{i-1}+1}^{T_i} \left\{ x_t - y_t'\beta - z_t'\delta_i \right\}^2. \quad (3.18)$$

To carry out asymptotic analysis, we imposed some restrictions on the possible values of the break dates. In particular, each break date must be asymptotically distinct and bounded from the boundaries of the sample. The breaks are determined sequentially and globally optimized.

The term “break” in this work is defined as the first date of the subsequent regime. The LSB model allowed for a maximum of five breaks at 95% confidence interval with a trimming percentage of 15 (minimum sample size for estimating a break). Unlike Bai-Perron (1998) test which use common error distribution, this work allow the error distribution to differ across breaks³. The rational for allowing heterogeneous error distribution is to pin down the exact periods of stability or otherwise of fiscal policy in Ghana. This is also deemed very crucial as it would enable the determination of fiscal sustainability for the immediate past policy, preferably, the HIPC and the introduction of the single spine policy. The hypothesis to be tested is:

H_0 : *The is no structural break in government revenue and government expenditure series.*

H_1 : *There is structural break in government revenue and government expenditure series.*

³Setting this option will provide robustness of the test to error distribution variation at the cost of power if the error distributions are the same across regime (Bai-Perron, 2003). However, the estimated model was robust as it minimized the residual sum of square in equation (3.18) and optimized the log-likelihood when compared to the model that assumed common error distribution. The standard errors and covariance matrix computed by heteroskedasticity and autocorrelation consistent (HAC) estimation using Bartlett kernel and Newey fixed bandwidth. That is, the estimation allows for serial correlation that differs across regimes through the use of HAC covariance estimation

3.5 Research Approach and Design

A quantitative approach was followed. Burns and Grove (1993) define quantitative approach as a formal, objective, systematic process to describe and test relationships and examine cause and effect interactions among variables. Quantitative research involves counting and measuring of events and performing the statistical analysis of a body of numerical data (Smith 1988). The assumption behind the positivist paradigm is that there is an objective truth existing in the world that can be measured and explained scientifically. The main concerns of the quantitative paradigm are that measurement is reliable, valid, and generalizable in its clear prediction of cause and effect (Cassell and Symon 1994). A descriptive survey was selected because it provides an accurate portrayal or account of the characteristics, for example behavior, opinions, abilities, beliefs, and knowledge of a particular individual, situation or group. Descriptive research involves gathering data that describe events and then organizes, tabulates, depicts, and describes the data collection (Glass and Hopkins 1984).

Chapter 4

EMPIRICAL ANALYSIS AND INFERENCES

4.1 Introduction

In this section, we present the empirical results and inferences of the research. First, we show the results for the unit root test to demonstrate that our data set remains invariant in the long run. Following this, we proceed to do a bivariate cointegration estimates of government revenue and government expenditure and establish the direction of their causal relationship and subsequently investigate the long-run and short run relationship. Subsequently, we proceed to do multivariate analysis to corroborate the results of the bivariate analysis since there could be the possibility of missing variables in the former technique. Finally, we instigate the structural breaks for more reliable and robust estimates.

4.2 Empirical Results

This section will outlines the empirical results, Trends in government revenue and government expenditure would be analyzed, the stationarity of the variables were established,

cointegration analysis was carried and the extend to which revenue mobilization and expenditure movements were examined and compared with other previous work.

4.2.1 Stationarity and Unit Root Test

A non-stationary time series behaviour cannot be generalized to other time periods except for the particular period under consideration, hence for the purpose of forecasting, it has little practical value. However, a stationary time series data properties remains invariant no matter what point it is measured in the long run. Such time series tends to return to its mean and fluctuations around this mean would broadly be constant. That is shock s will be temporary and over time their effects will be eliminated as the series revert to their long-run means values.

We start the empirical analysis by examining the variables to establish the existence of unit root by verifying their non-stationarity properties. This is essential to avoid the failure of accounting for appropriate specification according to Dolado et al.(1999). The order of integration of the variables was determined by the standard Augumented Dickey-Fuller (ADF), Philip-Perron (PP) tests. The ADF and PP tests are applied since they provide more convenient procedures to determine the properties of the time series data and simple to understand.

However, because the power of ADF and PP tests to distinguish between series that are purely non-stationary process and those with near unit roots is limited, we also performed the Kwiatkowski, Philips, Schmidt, and Shin (KPSS) test which examines the null hypothesis of the stationarity of the time series. We performed these different procedures because their results are sensitive to the use of the long-run variance estimators if the time series are highly autocorrelated according to Gebhard and Silika (2006). The tests have been performed using E-View 9 software Demo. As shown in Table 4.1¹ the results of

¹Note: *,**,*** denote 1%, 5% & 10% significant levels respectively; values in [] are probability values while values in () are LM test statistics. Again variables beginning with “L” means logarithm of it

the ADF and PP tests on each variable in levels and in first differences. Its evident in the levels of the series that the null hypothesis of the non-stationarity in ADF cannot be rejected for any of the series. Similarly, the PP results could not reject the null hypothesis of the presence of unit roots in the series at levels, but could not accepted the null after the first difference. In KPSS test, we reject the null of stationarity for the levels of the variables but do not reject it for their first differences. Therefore, we conclude that our variables are integrated of the first order $I(1)$ and we can then proceed with the Granger causality test using the variables in its stationary forms (i.e. their first differences) without incurring in the problem of the spurious regression.

Table 4.1: Results of the Unit Root Tests for Levels and First Differences of the Variables: 2000 to 2014

		ADF			
		None	Intercept	Intercept & Trend	First Difference
	LTRG	[1.000]	[0.754]	[0.000]*	[0.000]*
	LTEXP	[1.000]	[0.891]	[0.000]*	[0.000]*
	LCPI	[0.992]	[0.701]	[0.585]	[0.038]*
	LXRATE	[0.919]	[0.992]	[0.864]	[0.000]*
		Philip-Perron Test			
		None	Intercept	Intercept & Trend	First Difference
[t]	LTRG	[1.000]	[0.663]	[0.000]*	[0.000]*
	LTEXP	[1.000]	[0.822]	[0.000]*	[0.000]*
	LCPI	[1.000]	[0.001]*	[0.006]*	[0.000]*
	LXRATE	[0.728]	[0.895]	[0.555]	[0.000]*
		KPSS Test			
		Intercept	Intercept & Trend	First Difference	
	LTRG	(-0.966)*	(0.124)	(0.203)	
	LTEXP	(-0.970)*	(0.095)	(0.500)	
	LCPI	(0.959)*	(0.225)*	(0.130)	
	LXRATE	(0.947)*	(0.189)**	(0.156)	

4.3 Bivariate Analysis

This section discuss the long and short run relationship between government revenue and government expenditure. In this this case we test for the direction of causality using

pairwise Granger causality test and cointegration relationship using Granger two step method for nominal and real variables tests were carried out.

4.3.1 Pairwise Granger Causality Test

After we have established that the variables are stationary from our unit root test, it indicates that a long-run relationship exist between government revenue and expenditure in the Ghana. Therefore in order to determine which variable causes the other, the logical step was to test for the direction of causal relationship between them through the Pairwise Granger causality test.

We test for null hypothesis that there is no Granger causality between the variables as against the alternative hypothesis of existence of Granger causality. Actually, the Granger causality test is a technique for predicting how much government revenue and government expenditure can be predicted based on their previous and if the prediction can be improved when some of their lagged are included is essential. Table (4.2) presents the results of the pairwise Granger causality test between government revenue and government expenditure for both real and nominal values.

Table 4.2: Pairwise Granger Causality Tests for Revenue and Expenditures: 2000 to 2014

	Null Hypothesis (H_0)	F-Statistic	Prob.
Real	LRTEXP does not Granger Cause LRTRG	3.190	0.049
	LRTRG does not Granger Cause LRTEXP	6.258	0.004
Nominal	LTEXP does not Granger Cause LTRG	3.072	0.055
	LTRG does not Granger Cause LTEXP	4.850	0.012

Table (4.2) shows existence of causal relationship between government revenue and government expenditure. With respect to the Real values in this study, the null hypothesis of government expenditure TEXP does not granger cause TRG and the reverse is statistically significant at 5% level. This means, higher expenditure would lead to higher government revenue and vice versa. Clearly, the causality is bidirectional between the government revenue and government expenditure ($TRG \longleftrightarrow TEXP$). However it ap-

pears, the causality from revenue to expenditure appears to be stronger than the reverse causation. This seems to indicate that even though the government revenue and expenditure pattern generally support the synchronization hypothesis, there is also a strong evidence of the existence of tax-spend hypothesis in Ghana. This partial support of fiscal synchronization hypothesis implies that revenue decisions are not made in isolation from expenditure decision.

It should be noted that the Nominal values follows similar trends. This is in excellent agreement with the evidence of a bidirectional revenue-expenditure nexus running from revenue to expenditure found by previous studies including (Oshikoya and Tarawalie 2010; Doh-Nani 2011; Doh-Nani and Awunyo-Vktor 2012; Aregbeyen and Insah 2013; Takumah 2014). On the other hand, Wold-Rafae (2008), Amoah and Loloh (2008) and Obeng(2015) found support for unidirectional causality for Ghana running from revenue to expenditure in previous work. Notwithstanding, Magazzino (2012) found evidence of fiscal neutrality for Ghana.

It must be noted that the level of economic activity is strongly influenced by both revenue and expenditure. Therefore, the presence of Granger causality does not actually differentiate the direct causality between revenue and expenditure and vice versa and the indirect causality effects through Gross Domestic Product. It is therefore plausible that a non-linear relationship might even exist between government revenue and expenditure and other variables which are not explicitly accounted for in the model since Granger causality only tests linear relationships (Obeng 2015). As a consequence, the results cannot be taken in the face value.

4.3.2 Granger two step cointegration analysis (ECM)

Having identified a bidirectional causality relationship between government revenue and expenditure, we proceed to ascertain the long run relationship between them. However,

due to the results from the unit root tests we apply Granger two step method. In this regard, we initially estimate regression at levels and generate residuals. Secondly, we estimate a another regression in difference but include the lag of the residuals generated from the initial regression. Table (4.3) presents the results of the bivariate Granger two step estimation results for revenue and expenditure using the nominal values while Table (4.4) presents results from real values. In general, the results from the Granger two step method confirm the bidirectional causality between revenue and expenditure. In terms of direction of impact, we observe a positive link between government revenue and expenditure in both the short run and long run. This confirms that the synchronization hypothesis is prevalent in Ghana's fiscal policy. In terms of magnitude of impact, however, the result shows that government revenue has much greater influence on expenditure than the reverse causation. We establish that a 1% increase in government revenue leads to more than a proportionate increase in government expenditure (1.01%) in the long run (both nominal and real terms). In contrast, a 1% increase in government expenditure leads to an increase in government revenue by 0.97% in nominal terms and 0.91% in real terms. In general the results suggest the link between the government revenues and spending appears to be one-to-one as suggested by the Wald Restriction test for the full sample.

For robustness, we further evaluated the impact of pre- and post SSSS implementation on the link between government revenue and expenditure. In this regard carrying out two subsample analysis and the results is show in the above two tables. With respect to the government revenue and expenditure before the introduction of the single spine salary structure (2000Q1-2009Q4), 1% increase of government expenditure led to a corresponding 0.96% increase in revenue in nominal terms. From post single spine salary implementation (2010Q1-2014Q4), revenue increased to 0.81% for every 1% increase in government expenditure increase. However, the Wald restriction test showed mixed results for the Sub-Sample analysis. As shown in Table 4.3, the Wald restriction test rejects the null hypothesis that, the coefficient of expenditure is one (in revenue equation) for the

period 2010-2014. In contrast, the Wald restriction test accepts the null hypothesis that, the coefficient of revenue is one (in expenditure equation) for the period 2010-2014. This suggests that the link between total government expenditure and total government revenue are not one-to-one since the implementation of single spine salary structure (SSSS) in 2010. Particularly, Government expenditure has risen since 2010 but revenue generation effort does not commensurate expenditure reflecting the huge budget deficit.

In addition, the ECM term is negative, significant and less than one, confirming the existence of long run relationship between revenue and expenditure. The coefficient of the ECM term showed that, it takes approximately one-half quarters (5-months) for government revenue to revert back to its equilibrium following any deviations through shocks. Expenditure also takes approximately four-months to return to its equilibrium point after any deviation from caused by revenue.

Table 4.4: Bivariate Granger Two Step Cointegration Method: Real Estimates

Dependent Variable	LRTRG	LRTEXP
1st Step (Long run Equation)		
Intercept	0.06[0.54]	0.16[1.39]
LRTEXP	0.91[25.43]*	
LRTRG		1.01[25.75]*
2nd Step (Short Run Equation)		
Intercept	0.03[1.93]***	0.01[0.51]
Δ LRTEXP	0.38[4.11]*	
Δ LRTEXP _{<i>t</i>-1}		-0.04[-0.41]
Δ LRTRG		0.70[5.18]*
Δ LRTRG _{<i>t</i>-1}	-0.28[-2.67]**	
ECM _{<i>t</i>-1}	-0.53[-4.46]*	-0.69[-4.21]
Unit root test		
Residuals (from 1st Step)	[0.000]*	[0.000]*
Wald Restriction Test		
H ₀ : β =1	[0.134]	[0.669]
Breusch-Godfrey Serial Correlation LM Test:	[0.498]	[0.546]
Heteroskedasticity Test: Breusch-Pagan-Godfrey	[0.499]	[0.552]
Ramsey RESET Test	[0.258]	[0.302]
Normality Test	[0.649]	[0.486]

Note: *, **, *** denote 1%, 5% & 10% significant levels respectively; values in [] are probability.

4.4 Multivariate Cointegration Analysis

Since the above bivariate analysis ignores other macroeconomic factors, there results could be suffering from omitted variable bias. As a results, we assessed plausibility of the bivariate results using Johansen multivariate cointegration techniques that incorporate other variables such as inflation and exchange rate depreciation. The inclusion of these other variables was based on the premise that, Ghana has high and persistent inflation alongside rapid depreciation of the domestic currency which are more likely to affect overall domestic economic activity and hence government revenue generation.

4.4.1 Optimal Lag Selection

As expected, we identified the optimal lag length using a number of information criteria prior to the estimation of the Johansen cointegration analysis. Table (4.5) presents the results of the lag selection test. As shown in Table (4.5) four out of five information criteria selects two as the optimal lag length.

Table 4.5: Lag Selection Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	42.24663	NA	2.70E-06	-1.471024	-1.320929	-1.413481
1	281.2813	432.1012	5.09E-10	-10.04928	-9.298803	-9.761566
2	313.8837	53.91925*	2.72e-10*	-10.68783	-9.336972*	-10.16994*
3	326.3773	18.74046	3.20E-10	-10.55297	-8.601729	-9.804912
4	341.7773	20.73081	3.47E-10	-10.5299	-7.978271	-9.551664
5	362.0901	24.21913	3.23E-10	-10.69577	-7.543766	-9.487369
6	376.3927	14.85267	4.01E-10	-10.63049	-6.878097	-9.191911
7	400.6787	21.48375	3.67E-10	-10.94918	-6.596406	-9.28043
8	428.0227	19.98215	3.34E-10	-11.38549*	-6.432331	-9.486564

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

4.4.2 Johansen Cointegration and Vector Error Correction Model (VECM)

Having identified lag two as the optimal lag length within the VAR framework, we ascertain the long run relationship among government revenue, government expenditure, inflation and exchange rate depreciation using Johansen cointegration test. Here we use both trace and eigenvalue statistics assuming an intercept in the cointegration equation. Table 4.6 exhibit the results of cointegration test. The results shows at least one cointegrating equation among the variables. This confirms a long run relationship between government revenue and expenditure as demonstrated in the bivariate analysis.

Table 4.6: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.56	87.06	54.08	0.000
At most 1 *	0.26	39.19	35.19	0.018
At most 2 *	0.24	21.84	20.26	0.030
At most 3	0.10	5.92	9.16	0.197

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized	Max-Eigen		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.56	47.87	28.59	0.000
At most 1	0.26	17.35	22.30	0.213
At most 2 *	0.24	15.92	15.89	0.050
At most 3	0.10	5.92	9.16	0.197

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

To quantify the magnitude of effect, we further carried out VECM to validate the results from the bivariate analysis. Table (4.7) show the VECM estimates for government revenue equation whiles Table (4.8) shows the VECM estimates for government expenditure. In general the VECM estimates corroborates with the bivariate results. In particular, as shown in Table (4.7) and (4.8) there is robust evidence of positive bidirectional causality between government revenue and expenditure in the long run. Again, this further lends

support for the synchronization hypothesis.

Table 4.7: VECM Estimates for Government Revenue (TRG)

Long Run Cointegrating Equation				
LTRG _{t-1}	1			
LTEXP _{t-1}	-1.139			
	[-7.941]			
LCPI _{t-1}	0.343			
	[1.407]			
LXRATE _{t-1}	0.032			
	[0.177]			
Intercept	-0.191			
Short Run Error Correction Model				
	Δ LTRG _t	Δ LTEXP _t	Δ LCPI _t	Δ LXRATE _t
ECM_{t-1}	-0.228	0.534	-0.080	-0.085
	[-1.794]	[3.601]	[-2.995]	[-2.883]
Δ LTRG _{t-1}	-0.485	-0.374	0.076	0.028
	[-3.774]	[-2.501]	[2.840]	[0.935]
Δ LTEXP _{t-1}	0.014	0.116	-0.093	-0.062
	[0.112]	[0.775]	[-3.477]	[-2.102]
Δ LCPI _{t-1}	0.778	2.193	0.163	-0.291
	[1.346]	[3.257]	[1.346]	[-2.170]
Δ LXRATE _{t-1}	-0.045	0.434	0.042	0.562
	[-0.125]	[1.029]	[0.552]	[6.689]
Intercept	0.075	-0.006	0.030	0.024
	[2.515]	[-0.181]	[4.844]	[3.447]
R-squared	0.375	0.408	0.296	0.568
Adj. R-squared	0.315	0.351	0.229	0.527
Sum sq. resids	0.892	1.211	0.039	0.048
S.E. equation	0.131	0.153	0.027	0.030
F-statistic	6.230	7.162	4.383	13.693
Log likelihood	38.755	29.900	129.586	123.494
Akaike AIC	-1.129	-0.824	-4.262	-4.051
Schwarz SC	-0.916	-0.611	-4.048	-3.838

Table 4.8: VECM Estimates for Government Expenditure (TEXP)

Long Run Cointegrating Equation				
LTEXP _{t-1}				1
LTRG _{t-1}				-0.878
				[-5.428]
LCPI _{t-1}				-0.301
				[-1.142]
LXRATE _{t-1}				-0.028
				[-0.169]
Intercept				0.168
Short Run Error Correction Model				
	Δ LTEXP _t	Δ LTRG _t	Δ LCPI _t	Δ LXRATE _t
ECM_{t-1}	-0.609	0.260	0.091	0.097
	[-3.601]	[1.794]	[2.995]	[2.883]
Δ LTEXP _{t-1}	0.116	0.014	-0.093	-0.062
	[0.775]	[0.112]	[-3.477]	[-2.102]
Δ LTRG _{t-1}	-0.374	-0.485	0.076	0.028
	[-2.501]	[-3.774]	[2.840]	[0.935]
Δ LCPI _{t-1}	2.193	0.778	0.163	-0.291
	[3.257]	[1.346]	[1.346]	[-2.170]
Δ LXRATE _{t-1}	0.434	-0.045	0.042	0.562
	[1.029]	[-0.125]	[0.552]	[6.689]
Intercept	-0.006	0.075	0.030	0.024
	[-0.180]	[2.515]	[4.844]	[3.447]
R-squared	0.408	0.375	0.296	0.568
Adj. R-squared	0.351	0.315	0.229	0.527
Sum sq. resids	1.211	0.892	0.039	0.048
S.E. equation	0.153	0.131	0.027	0.030
F-statistic	7.162	6.230	4.383	13.693
Log likelihood	29.900	38.755	129.586	123.494
Akaike AIC	-0.824	-1.129	-4.262	-4.051
Schwarz SC	-0.611	-0.916	-4.048	-3.838

4.5 Regression with Break points

It should be noted that the preceding section, imposes a linear relationship between government revenue and expenditure and the we assumed a structural break after 2010 due to the implementation of the SSSS. In this section, we allowed the model itself to detect any potential breaks in the government fiscal profile since 2010 using Bai-Perron (2003) OLS regression with beak points. Here we allowed maximum of three breaks and the

heterogenous error distribution across breaks. Table (4.9) presents the results of the OLS with breakpoints. Consistent with our initial assumption, the OLS with breakpoints detected a break point at 2010Q4 validating the results in the bivariate sub-sample analysis. The coefficient of government expenditure is positive as observed in both the preceding estimates (bivariate and multivariates). Moreover, the results in Table (4.9) shows that the magnitude of impact of changes in government expenditure on revenue has declined after the implementation of SSSS 2010Q4. Whilst revenue response to government expenditure was observed to be approximately one-to-one prior to 2010Q4, the response of revenue has declined to 0.65% per 1% increase in government expenditure after 2010Q4. The results from the OLS with breakpoints further affirm that, government revenue generation does not commensurate the pace of its expenditure after the implementation of the single spine salary structure and hence threatening the long term sustainability of Ghana's fiscal policy. Therefore, the economic challenges confronting Ghana can partly be attributed to the increased wage bill without corresponding increase in revenue mobilization in our opinion. This is contrary to the view of Bawumia (2012) who asserts that misguided policy direction on the part of government is detrimental to budget and fiscal outlook on the economy.

Table 4.9: OLS with Breakpoint

	LTRG	LTR
	Coeff[T-Value]	Coeff[T-Value]
	2000Q1 - 2002Q4 – 12 obs	2000Q1 - 2010Q3 – 43 obs
C	-0.265[-0.43]	0.525[3.26]*
LTEXP	1.007[9.17]*	
LTEXPP		0.883[35.74]*
	2003Q1 - 2010Q3 – 31 obs	
C	1.004[4.14]*	
LTEXP	0.830[24.17]*	
	2010Q4 - 2014Q4 – 17 obs	2010Q4 - 2014Q4 – 17 obs
C	2.753[4.44]*	1.971[2.31]*
LTEXP	0.656[9.06]*	
LTEXPP		0.756[7.44]*
Adjusted R-squared	0.989	0.984
Sum squared resid	0.752	1.307
Log likelihood	46.240	29.673
F-statistic	1109.623	1209.942
Prob(F-statistic)	0.000	0.000
Akaike info criterion	-1.341	-0.856
Schwarz criterion	-1.132	-0.716
Durbin-Watson stat	2.291	2.004

Chapter 5

SUMMARY AND CONCLUSION

5.1 Preamble of the study

The key objective of this work is to study the long term sustainability relationship of government total revenue and government total expenditure before and after the introduction and implementation of the single single spine salary structure pay system in Ghana which became effective in 2010. This study is relevant because, before the introduction of the policy, the public sector worker and stakeholders taunted government of poor remuneration which resulted in continuous labour unrest and agitation and consequently affected productivity because of perpetual lackadaisical attitude on the part of labour which in fairness was justified.

For sanity in labour front and fairness in productivity to prevail, Government introduced the single spine policy to help streamline the disparity in labour compensation but this was at a cost not previously thought through by government based on the relative speed with which government implemented the policy. For this reason, government suffered the brunt of continuous ballooning wage bill resulting in throwing the successive national budget off gear in the preceding years. This culminated in the call for immediate suspension of the policy by financial experts and non-experts alike because approximately 57% of

total government revenue generation was being used to finance wages and salaries alone, equivalent to 15.3% of GDP in 2013 being the highest. However, government seem not to be detracted by the call of the policy suspension in spite of the obvious challenges of persistent runaway budgets without any independent research to ascertain if governments stance is economically prudent with respect to resource allocation. The summary of the work is outlined below.

5.2 Summary of what has been done

The thesis studied the causal relationship between government revenue and government expenditures by using the fiscal policy data set of Ghana spanned between the period 2000-2014 and broken down into quarters was obtained from Bank of Ghana, Ministry of Finance and Ghana Statistical Service for the estimation and analysis. The estimation uses total government revenue including grants to reflects all sources of income and total expenditure to include interest payments which eventually reduces deficit financing through growth of accumulated debt. Sustainability means it behoves on government to service its debt without large future correction to the budge, this is to avoid debt with interest in perpetuity.

The units root test shows that variables are stationary at 1% significance at levels and after first differencing. This suggests government revenue and government expenditure are integrated of order one ($I(1)$) process implying they have invariant properties in the long run. Following that , we carried out Granger causality tests which supports bidirectional causation between the variables confirming synchronization hypothesis. Therefore, past and present values of government revenue provides important information to predict potential future government expenditure values. We investigated the Engle-Granger two step cointegration test, in which we estimated a 1% increase in total government revenue led to a disproportional increase of 1.01% in the long term in both the nominal and real

terms. This is in sharp contrast, of a 1% increase in government expenditure leads to an increase in government revenue by 0.97% in nominal terms and 0.91% in real terms.

For completeness, we estimated the impact of pre- and post- single spine implementation link between the government revenue and expenditure and this was done by examining two subsample analyses. With respect to the government revenue and expenditure before the introduction of the single spine salary structure (2000Q1-2009Q4), 1% increase of government expenditure led to a corresponding 0.96% increase in revenue in nominal terms. However, from post single spine salary implementation (2010Q1-2014Q4), revenue increased to 0.81% for every 1% increase in government expenditure increase.

The error correction model was successful in achieving the expected standard negative sign and less than one to confirm the existence of long run relationship between government revenue and government expenditure. The coefficient of ECM takes approximately in one and half quarters (five -months) of disequilibrium to adjust following any shocks. This is relatively large indicating faster rate of convergence towards equilibrium.

Since the bivariate estimation might lack other relevant macroeconomic factors in the analysis, the result could be suffering from omitted variable bias, followed bivariate result with Johansen multivariate cointegration analysis to incorporated other variables such inflation and exchange rate depreciation. These variables are important because Ghana continuously to experience persistent inflation and fast depreciation of domestic currency. We carried out VECM to validate the bivariate analysis and found that results to be in excellent agreement. The diagnostic tests showed that government expenditure and revenue of Ghana showed no heteroscedasticity and autocorrelation pattern.

Finally, we relaxed our imposed structural breaks and allowed for the system to detect its own potential breaks in the government fiscal profile since 2010 based on Bai-Perron OLS regression with break points. In line with our previous assumption, the OLS with breaks detected a break point at 2010Q4 consistent with results the bivariate sub-sample.

Therefore, the economic challenges confronting Ghana can partly be attributed to the increased wage bill without corresponding increase in revenue mobilization in our opinion but Bawumia (2012) rather holds an alternative view of misdirection of policy choices on the part of authorities which impacts negatively on budget and general fiscal outlook.

5.3 Conclusion and Policy recommendation

We have demonstrated that, there is a robust positive bidirectional causality between government revenue and government expenditure in both short run and long run horizon. However, the results established that, government revenue mobilization does not commensurate the pace of its expenditure after the implementation of the single spine salary structure and hence threatening the long term sustainability of Ghana's fiscal policy. As a consequence, Tax Authorities should implement more efficient techniques based on scientific and technological know-how to mobilize government revenue from all individuals who fall within the tax bracket. This can be achieved, first by investing heavily in scientific technology to build the requisite tax collecting infrastructure then followed by building reliable database of 'taxable' people especially those in the informal sector of the economy. The Authorities should engage the citizenry through massive education on the need to fulfilling tax obligation as part of civic responsibility. Similarly, the need of paying tax should be included in school curriculum at all levels of the education system as a means to inculcating this awareness into the pupil before they enter into any job placement be it private, public or self-employment. Tax evasion through connivance with corrupt officials should be made unattractive by rigourously enforcing the laws to the later against those found culpable and also closing all potential loopholes that breeds such opportunities. This requires commitment and determination by leadership and eschewing all mediocrity.

Any policy to increase government expenditure should consider past and present values of government revenue. This is because expenditure and revenue take temporal prece-

dence over each other. Therefore past and present values of government revenue would provide important information to forecast future values of expenditure.

Policy recommendation for Ghana can be recapitulated as follows. In order to achieve both long and short fiscal sustainability, government expenditures should be comprehensively be studied with the objective to ascertain (i) how efficient resources should be allocated base on national priority and interest rather than political expediency. (ii) the probable way to grow the economy through spendings on such an activity as research and development, infrastructure int its entirety, education and health, creating the necessary legal framework structures that protect investors who bring in their funds to support government. (iii) Loopholes in the system would be tightened. Next the government must re-organized the relationship between expenditures and revenues generation mechanism that is based on scientific methods such way to streamline revenue mobilization drive consistent with state's ability. This will indeed creates sound and efficient medium-term budgeting foundation to support government efforts to manage expenditures. This approach is instead better than increasing fiscal revenues and thereby establishing fiscal prudence. Indeed, it will also ensure that other transient insurgencies will be controlled hence affecting the state long run potential growth prospects and above all competence and state loyalty being critical.

REFERENCES

- Aliu M. and Fuesini M. (2014), "Appraisal of implementation of the single spine pay policy in Ghana: A case of the University for Development Studies". *Int. J. Eco. Comm. and Mgt.*
- Al-Khulaifi A. S. (2012) "The Relationship between Government Revenue and Expenditure in Qatar: A Cointegration and Causality Investigation". *International Journal of Economics and Finance* 4 142.
- Al-Zeaud A. H. (2012), "Government Revenues and Expenditures: Causality Tests for Jordan". *Interdisciplinary Journal of Contemporary Research in Business* 4, 193.
- Amoah B. and Loloh F. W. (2008) "Causal Linkages between Government Revenue and Spending: Evidence from Ghana". Bank of Ghana Research Working Paper ,WP/BOG-2008/08.
- Aregbeyen O. and Insah B. (2013), "A Dynamic Analysis of the Link between Public Expenditure and Public Revenue in Nigeria and Ghana". *Journal of Economics and Sustainable Development* 4, 18.
- Asima J. ,Akosah N. and Owusu-Afriyie E. (2014), "An assessment of fiscal sustainability in Ghana". Bank of Ghana Research Working Paper,WP/BOG-2014/09.
- Asteriou D. and Hall S. G. (2007) "Applied Econometrics: A Modern Approach". New York: Publisher ,Palgrave Macmillan, pp. 279-340.
- Bai J. and Perron P. (2003) "Computation and Analysis of Multiple Structural Changes Models". *Journal of Applied Economics* 18, 1.

- Bai J. and Perron P. (1998) “Estimating and Testing Linear Models with Multiple Structural Changes”. *Econometrica* 66 - 47.
- Barro R. J. (1979). “On the Determination of the Public Debt”. *Journal of Political Economy* 87 - 940.
- Bawumia M. (2012) “Restoring the Value of the Cedi”. Distinguished Speaker Series Lecture, Central University College.
- Bawumia M. (2014), “Restoring the value of the Cedi”. Distinguished Speaker Series Lecture, Central University College.
- Cavalcanti C. (2009), “Estimating the Fiscal Cost of Implementing Ghana’s Single Pay Spine Reform”. Policy Research Working Paper, The World Bank, WPS 5150.
- Chang T. and Ho Y. (2002) “A Note on Testing Tax and Spend, Spend-and-Tax or Fiscal Synchronization: The Case of China”. *Journal of Economic Development* 27-151.
- Chang T. and Chiang G. (2009), “Revisiting the Government Revenue-Expenditure Nexus: Evidence from 15 OECD Countries Based on the Panel Data Approach” *Czech Journal of Economics and Finance* 59, 165.
- Chebbi H. E. and Lachaal L. (2007) “Agricultural sector and economic growth in Tunisia: Evidence from co-integration and error correction mechanism”. A paper presented at the Mediterranean Conference of Agro-Food Social Scientist, Barcelona, Spain, April 23-25.
- Cooper-Enchia V.J. (2008), *Pay Reform in Ghana*, African Assoc. for Public Admin. And Mgt. 30th AAPAM Annual RoundTable Conference, Accra, Ghana.

- Dickey D. A. and Fuller W. A. (1979) "Distribution of the Estimators for Autoregressive Time Series with a Unit Root". *Journal of the American Statistical Association* 74, 472.
- Dickey D. A. and Fuller W. A. (1981) "Likelihood ratio statistics for autoregressive time series with a unit root test". *Econometrica* 49, 1057.
- Doh-Nani R.(2011) "Is Ghana's Budget Deficit Sustainable? A Cointegration Analysis", Master Thesis, KNUST.
- Doh-Nani R. and Awunyo-Vitor D. (2012), "The Causal Link between Government Expenditure and Government Revenue in Ghana". *Asian Economic and Financial Review*, 2.
- Dolado J. J., Gonzalo J. and Marmol F. (1999) "Cointegration". Universidad Carlos III de Madrid.
- Eckardt S. and Mills Z. (2014) "What Goes Up Must Come Down Cyclicalities in Public Wage Bill Spending". Research Working Paper, The World Bank, WPS 6760.
- Engle R. F. and Granger C. W. J. (1987) "Co-integration and Error Correction: Representation, Estimation and Testing".
- Ewing B. T. and Payne J. E. (1998) "Government Revenue-Expenditure Nexus : Evidence from Latin America". *Journal of Economic Development* 23, 57.
- Friedman M. (1978) "The Limitations of Tax Limitation". *Policy Review* 5, 7 (1978).
- Gomes P., (2013). "A Reform of Public Sector Wages. Conference Proceeding, Organized by the European Commission, [7] Government White Paper, WP. No. 1/2009, Government White Paper on the Single Spine Pay Policy.

- Government White Paper, (2013). Government White Paper on Guidelines for the determination of Market Premium under the Single Spine Pay Policy, WP. No. 1/2013.
- Gujarati D. N. (2003) “Basic Econometrics”, fourth edition, International Edition, New York: Publisher, Gary Burke, pp. 792-824 (2003).
- Hatami-J A. (2008) “Test for cointegration with two unknown regime shifts with an application to financial market integration”. *Empirical Economics* 35, 497.
- Herrera S. (2015), “Ghana is not on debt meltdown like Greece”- WB Economist. <http://www.ghanaweb.com> retrieved on 06th August, 2015.
- Hold-Hadulla F., Kamath K., Lamo A., P´erez J. J. and Schuknecht L. (2010), “Public wages in the Euro are towards securing stability and competitiveness”. Occasional Paper Series, European Central Bank, No. 112.
- Johansen S. (1988), “Statistical analysis of cointegration vectors”. *Journal of Economic Dynamics and Control* 12, 231.
- Johansen S. and Juselius K. (1009) “Maximum Likelihood Estimation and Inference on Cointegration-with Applications to the Demand for Money”. *Oxford Bulletin of Economics and Statistics* 52, 169.
- Johnson V. (2004), “Management of Public Expenditure: A study with Special Reference to Government of Kerala”, Ph.D Thesis, Mahatma Gandhi University.
- Kingdon G., Sandefur F. and Teal F. (2006), “Labour Market Flexibility, Wages and Incomes in Sub-Saharan Africa in the 1990s”, *African Development Review*, 18.

- Kiragu K., and Mukandala R. (2003), "Tactics Sequencing and Politics in Developing Countries: Lessons from Sub-Saharan African" (Draft Reort).
- Kirchgaessner G. and Prohl S. (2006) "Sustainability of Swiss Fiscal Policy". CESifo Working Paper, No. 1689.
- Konukcu-O'nal D. and Tosun A. (2008) "Government revenue expenditure nexus: Evidence from several transitional economies". *Economic Annals* 53, 145.
- Kramer W., Sonnberger H., Maurer J. and Havlik P. (1985) The Review of Economics and Statistics, Diagnostic Checking in Practice 67, 118.
- Kwakye J. K. (2012), "Ghana's debt profile and sustainability". Institute of Economic Affairs (IEA), Ghana, 34.
- Kwiatkowski D., Philips P. C. B., Schmidt P. and Shin Y. (1992) "Testing the null hypothesis of stationarity against the alternative of a unit root". *Journal of Econometrics* 54, 159.
- Lamo A. and Schuknecht L. "The behaviour of public wages and employment in the euro area: pro-cyclical or counter-cyclical". European Central Bank.
- Lamo A.,P'erez J. J. and Schknecht L. (2013), "The cyclicality of consumption, wages and employment of the public sector in the euro area". *Journal of Applied Economics* 45 - 1551.
- Lindauer D.L. (1998), "Government Pay and Employment Policies and Government Performance in Developing Economies", Research Working Paper, The World Bank, WPS 42.

- Ludvigsen S. S (2010). Post-mortem of the VP-function : Meta-regression analysis of economic voting in the United Kingdom-an anthology, PhD. Thesis, Aarhus University.
- Magazzino C. (2012), “Revenue and Expenditure Nexus: A Case Study of ECOWAS”. Discussion Paper, No. 2012-57.
- Mahama J. D. (2013), National Forum on The Single Spine Pay Policy, [The Residency, Ho-Volta Region, August. 6].
- Mehrara M., Phalvani M. and Elyasi Y. (2011) “Government Revenue and Government Expenditure Nexus in Asian Countries : Panel Cointegration and Causality”, *Int. Journal of Business and Social Science* 2-199.
- Meltzer A. H. and Richard S. F. (1981). “A Rational Theory of the Size of Government”. *Public Choice* 89, 914.
- Mensah F. G. (2008), “Cointegration and Error Correction Modeling of the Determinant of Stock Princes: A Case Study of the London Stock Exchange”. Master Thesis, Nottingham Trend University.
- Ministry of Employment and Social Welfare (2012), The Republic of Ghana, National of Employment Policy (2012-2016)
- Mohamed A. H. (2014), “Fiscal Policy Framework in West African Monetary Zone (WAMZ): The Matter of Debt Sustainability”. *International Journal of Economics and Finance* 6, 60.
- Nannestad P. and Paldam M. (1994). The VP-function: A survey of the literature on vote and popularity functions after 25 years, *Public Choice*, 79, 213.

- Narayan O. K. (2005). "The Government Revenue and Government Expenditure Nexus: Evidence from Nine Asian Countries". *Journal of Asian Economics* 15, 1203.
- Narayan P. K. and Narayan S. (2006), "Government revenue and government expenditure nexus: evidence from developing countries". *Journal Applied Economics* 38, 285.
- Ndoricimpa A. (2013) "Structural Breaks and Fiscal Deficit Sustainability in EAC Countries: Empirical Evidence". *International Journal of Economics, Finance and Management Sciences* 1, 391.
- Norhaus W.D. (1975), The Political Business Cycles. *Review of Economic Studies* -169.
- Obeng S. (2015). "A Causality Test of the Revenue- Expenditure Nexus in Ghana", *ADDRI Journal of Arts and Social Sciences*, 11.
- Obimpeh P. (2013), Single Spine Salary Structure (SSSS) Be Suspended, Peacefmonline.com/Ghana,
- Obioma E. C. and Ozughalu U. M. (2010). "An Examination of the Relationship between Government Revenue and Government Expenditure in Nigeria: Cointegration and Causality Approach", *Economic and Financial Review*, 48/2, 35.
- Oganesyan R. (2014). *Economic Voting in the Developing World*, M. A. Thesis, University of Nevada.
- Oshikoya T. W. and Tarawalie A. B. (2010) "Sustainability of Fiscal Policy: The West African Monetary Zone (WAMZ) Experience". *Journal of Monetary Economic Integration* 9.

- Oyeleke O. J. and Adebisi D. G. (2014) “Econometric Analysis of Fiscal Deficit Sustainability of Ghana”. *Journal of Economics and Sustainable Development*, 5, 34.
- Oyeleke O. J. and Ajilore O. T. (2014) “Analysis of fiscal deficit sustainability in Nigeria economy: An error correction approach”. *Asian Economic and Financial Review* 4, 199.
- Peacock A. T. and Wiseman J. (1961), “The growth of public expenditure in the United Kingdom”. Princeton University Press, Princeton.
- Perron P. (1990) “Testing for a Unit Root in a Time Series with a Changing Mean”. *Journal of Business & Economic Statistics* 8, 153.
- Philips P. C. B., Pierre Perron and Biom´etrika (1998), “Testing for a unit root in time series regression”, *Journal of Economics and Sustainable Development* 75, 335.
- Qureshi M. A.(2010), Pakistan Fiscal Policy Statement 2010-11, Ministry of Finance.
- Rahman S. M. A. and Wadud Md. A. (2014) “Tax and Spend, Spend and Tax, Fiscal Synchronization or Fiscal Neutrality: Evidence from Bangladesh”. *International Journal of Applied Economics and Finance*.
- Research Department, Bank of Ghana (2007), Issues on Wages and Labour Market Competitiveness in Ghana.
- Seniwoliba J.A (2014), “The Single Spine Pay Policy: Can Ignorance Derail The Benefits It Has On The Ghanaian Public Service Worker?” *Euro. Sci. Journal*, 10, 437.
- Snowdon B. and Vane H. (2012), An Encyclopedia of Macroeconomics, Business Cycles: Political Business Cycle Approach.

Sri. A. Kareem (2011), Public Finance, Study Material, University of Calicut, School of Distance Education, Department of Economics.

Takumah W. (2014) “The Dynamic Causal Relationship between Government Revenue and Government Expenditure Nexus in Ghana”. Munich Personal RePEc Archiv.

Vĩnals J. and Lewis J.D. (2014). Revised Guidelines for Public Debt Management. International Monetary Fund Policy Paper.

Vinorkor M. A (2014), Daily Graphic, Akoto Osei sets record straight on Single Spine.

Wolde-Rufael Y. (2008) “The Revenue-Expenditure Nexus: The Experience of 13 African Countries”. African Development Review, 20 273.

Zeilstra A. S. and Elbourne A.C (2013), Public and private wages in the Netherlands. Scientific American, Follow the leader? 309.