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GOVERNMENT EXPENDITURE VARIABLES AND ECONOMIC GROWTH IN ZAMBIA

A Dissertation

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By

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DECLARATION:

‘’ I declare that the work that I have submitted is my own and that the work of others has been acknowledged and referenced.’’

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Acronyms

AE – Agriculture Expenditure

ARDL – Auto-Regressive Distributed Lag

ADF – Augmented Dick Fuller

CSO – Central Statistical Office

PP – Phillips Perron

EBF – Extra Budgetary Funds

EE – Educational Expenditure

ECM – Error Correction Model

ELGH - Export- Led Growth Hypothesis

FNDP – Fourth National Development Plan

FNDP – Fifth National Development Plan

HAC - Heteroscedasticity- and Autocorrelation- Corrected (HAC)

LM – Langrage Multiplier

SNDP – Sixth National Development Plan

7NDP – Seventh National Development Plan

HE – Health Expenditure

HIPC –Highly Indebted Poor Countries

IRF - Impulse Response Function

LLC – Lin Liu Chin

IMF – International Monetary Fund

GFCF – Gross Fixed Capital Formation

SE – Security Expenditure

TE- Transport Expenditure

NEXPTS – Net Exports

GDP – Gross Domestic Product

PwC – Pricewaterhouse Coopers

PMRC – Policy Monitoring and Research Commission

USD – United States Dollars

SSA – Sub Saharan Africa

UNCTAD – United Nations Conference on Trade and Development

VECM – Vector Error Correction Model

WB – World Bank

ZACCI – Zambia Chamber of Commerce and Industry

ZAM – Zambia Association of Manufacturers

ZIPAR – Zambia Institute of Policy and Research

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ABSTRACT

The government sector forms a significant part of the economy. As such, it is important to examine the impact of government activities on the economy. This study investigates the impact of several components of government expenditure on economic growth between 2001Q1 and 2014Q4 using the vector error correction model. The study found that only expenditure on transport and gross fixed capital formation had a significant positive impact on economic growth in the short-run. In the long-run, only expenditures on transport and education had a significant impact on economic growth. However, expenditure on health has a negative, although insignificant, impact on economic growth. This result may be due to the heavy concentration of health expenditure on disease treatment rather than disease preventive measures. Spending on defense has no significant impact on economic growth. Expenditure on agriculture was found to have no significant impact on economic growth both in the short- and long-run, partly due to a heavy concentration of expenditure on price-distorting agriculture input- and output-price support programs. The findings of the study suggest that there is need to focus expenditure on increasing agricultural productivity, improving the quality of education, improving road infrastructure and expanding disease prevention measures.

Keywords: Government expenditure, economic growth, vector error correction, Zambia.

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Gratitude is also extended to my employers – Zambian Breweries Plc. and the then SABMiller Plc (prior October 2016) and now ABInBev (after October 2016) for their consideration in allowing me to attend - on campus - tuition at UCT and thereafter proceed with the minor dissertation by granting annual leave days whenever need arose.

DEDICATION

In all my life, my mother, now the late, Victoria Malama M'pishi Sekele, stood support for me. She encouraged me to '*'soldier on''* and never to give up despite the scale of challenges that lay ahead. In February, 2015 when I commenced the Masters in Development Finance at the University of Cape Town, she encouraged me to concentrate and rise to the challenge. In her own words, education was more of a true '*'mother and father*'' – a permanent parent.

A few months down the line, in November 2015, sadly, she passed on. At the time of her death, I was due to submit an assignment paper in Project Finance. The UCT administration team gave me permission to submit later in December 2015 / January 2016. At that time, I knew that my mother's blessings were with me.

For some reason that I do not still understand at this time, Project Finance is the paper in which I scored the highest marks of a distinction.

This dissertation paper, I, therefore, dedicate it to my Mother and all those who extended the support of a '*'Mother-like''* in nature, to me.

To my siblings, Mirriam, Kunda, Tom and their lovely children were a true blessing to me. They encouraged me '*'to soldier on''* despite the huge family commitments and challenges that I had to look at following the death of our dear mother. Studying at UCT and compiling the minor dissertation has been a life changing experience. If I have learnt one thing – it is to never give up in life and to be humble. For this, I am truly grateful.

CHAPTER ONE - INTRODUCTION

1.1 Background of the Study

What drives the growth of an economy? Is it increased public spending that pushes the upward shift in the economy? Or does the positive momentum on the total national economy depend, solely, on the size and growth in public spending or vice versa? Based on a number of prior studies, on this subject matter, there is still a lack of complete evidence on what, really, drives increased public spending or the growth of the economy (Gisore, Kiprop, Kalio, Ochieng, & Kibet, 2014). It is encouraging, though, to note that some guidance has been provided by two conflicting schools of thought on the subject. The first school of thought argues that lower government spending may lead to an upsurge in the national economy and whilst the second argues that increased government spending increases the growth of the economy. Lower government spending limits the public sector's ability to enforce contracts between private parties, protect property rights, and provide public and merit goods. Mitchell (as cited in Gisore et al., 2014) argues that increased government spending is associated with greater promotion of the rule of law.

Suanin (2015) noted that the effect of government spending on the economy was essentially either a substitute or complement to private investment (crowding-out or crowding-in). The later was noted as impacting, positively, on the growth of the economy over the long-run. The main driver of this process was noted as the promotion, by the government, of technological capability advancements in firms through investing in capital infrastructure.

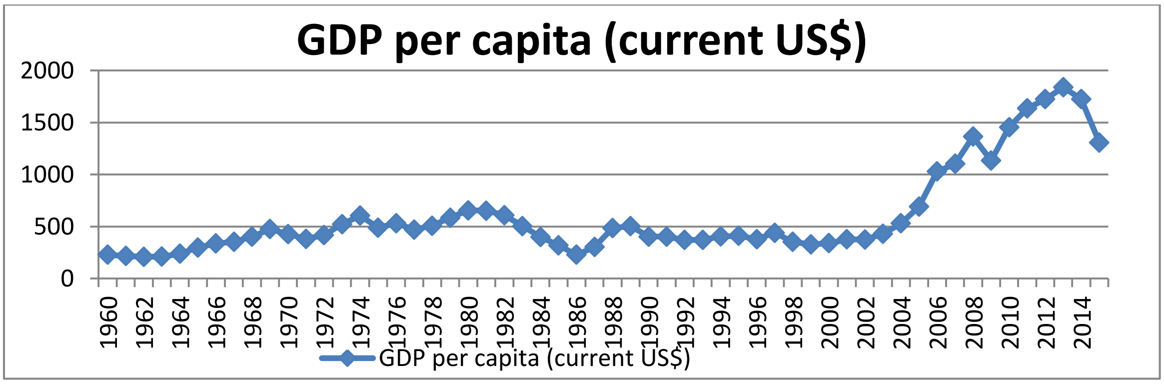
Gisore et al. (2014) highlighted two separate approaches on the role of government in economic activity. The first was the neo-classical approach or view. The first role is that of reducing the Private sector through the crowding – out effect. This means that the Government takes a greater prominence in economic activity. This situation leads to increased borrowings and public debt, bank interest rates goes up and whilst on the other hand the benefit is that of a reduction in inflation and a surge in national output. This position, in itself, may not be viewed as good by the Private sector; given the reduction in their share of national economic activity. On the other hand, one may argue that it is dependent on the government to determine the direction of the policy; for example in shaping the levels of inflation, and which may be a detriment to commerce. Therefore, the crowding-out effect may be seen to be positive on this front and whilst having the downside of rising borrowing costs. A balancing act of various conflicting priorities is therefore, ideal, in this instance.

The second approach or view is called the Keynesian. This explained that increased government expenditure led to increased demand and ultimately economic growth. It was, further, noted that the reduction of poverty and driving sustainable economic development is at the core of most of the developing country's economic development plans. Khan, Khan and Zaman (2012) noted fiscal policy is important to the government's role in growing the economy. Fiscal policy when applied correctly has the benefit of enhancing the growth of the economy and also social development. This is achieved through a carefully executed balancing act between the government expenditure, total borrowings and taxation.

Kakar as cited in Gisore et al. (2014) explained economic growth as the annual rate of increase in the nation's real GDP. This measure is also applied as an important indicator of poverty reduction. The study, on whether public spending was motivated by the increased growth of the national economy, or versa, has continued and whilst some researchers have concluded that the relationship was not significant but was also negative (Akpan as cited in Gisore et al., 2014), whilst others have indicated that the relationship was positive and significant (Korman & Bratimaserene as cited in Gisore et al., 2014). As noted, above, this, indeed, is an interesting debate that has continued for some time now.

This paper, therefore, examines the relationship between government expenditure variables and the growth of the Zambian economy based on quarterly data collected for the period from 2001 to 2014. The growth of the economy can be measured as the percentage change in the real Gross Domestic Product (GDP). Another proxy for economic growth is the growth in the GDP per capita. Figure 1, below, shows that Zambia's GDP per capita in current US$ for the period 1960 to 2015 was, generally, increasing. The World Bank report (2016).

Figure 1: GDP per capita for Zambia, 1960 to 2015 (current US$)



Source: World Development Indicators database. Accessed: 12/04/17. Retrieved from: http://data.worldbank.org/data-catalog/world-development-indicators

Initially, the study was meant to cover the years from 1980 until 2015, but due to a lack of data prior to 2000, the study was then tailored to cover quarterly data sets over the period as stated earlier.

A disaggregated study was done and following, among other, prior examples as undertaken by Gisore et al. (2014), and whose study was done on East African countries in 2014. The objective was to gain a better understanding of the impact of various components of public spending on economic growth and how this can be channeled for the benefit of improved national policy formulation.

Samudram, Nair and Vaithilingam (2009) noted that, during the years from 1980 to 2016, structural adjustments and revenue growth challenges were faced by a number of developing countries. Critical to the whole process of adjustments was the need to improve the fiscal discipline of the governments and making positive changes to the public sector. It was noted that a high level of national debt led to high fiscal deficits. These existed in the presence of structural imbalances. It is, therefore, important for the national governments to ensure adequate fiscal policy that balanced the expenditure side of the government and the revenue raising mechanism. The study of government expenditure and economic growth is important for both fiscal policy formulation and, ultimately, economic development.

Given this understanding, this paper, will therefore focus on two specific objectives and which are to: (a) examine the response of the GDP to the government expenditure variables in Zambia; (b) examine the impact of government expenditure variables on economic growth in the short-run and long-run.

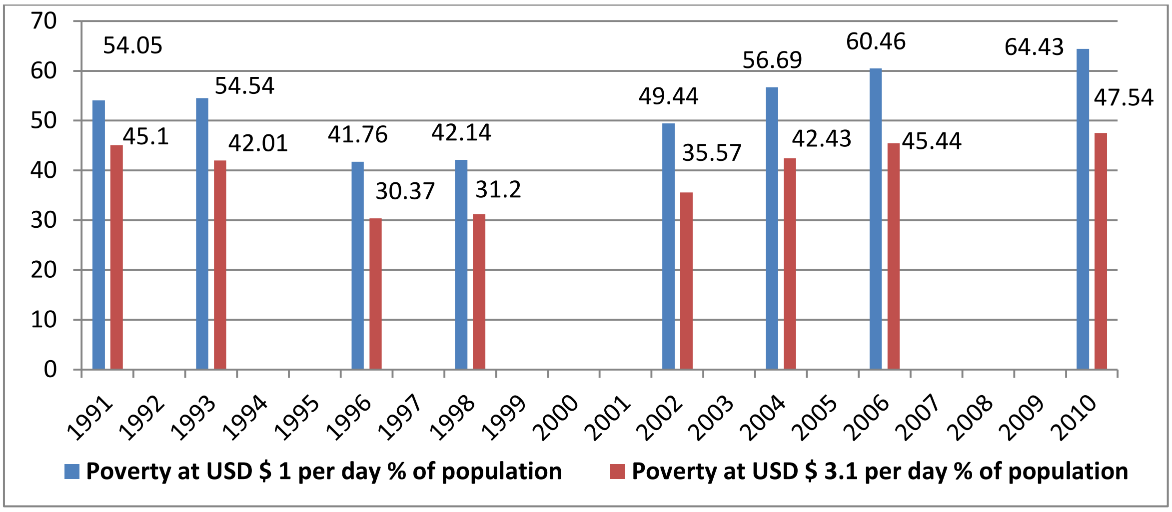
In finding responses to the above objectives, the research design was formulated in such a way as to apply quantitative analysis and econometric tools in form of multiple regression models, unit root tests and co-integration analysis. This formed the basis of the research data compilation and analysis section.

It is important to highlight, from the onset, that improved knowledge of the impact of government expenditure variables and economic growth, is key for purposes of developing the country's policy direction and aides in the comprehension of overall public finance over the medium to long term (Arpaia & Turrini, 2008).

This position is important for a developing country like Zambia. PricewaterhouseCoopers (PwC) (2014) acknowledged that Zambia had many developmental and economic challenges to overcome. Poverty levels were reported to stand at 60% and whilst a young population placed increased pressure on the limited job market.

It is important to note that despite growing government expenditure, and increasing GDP, Zambia still lags behind in reducing poverty levels (BMI, 2007). During the 1980's and much of the 1990's, Zambia experienced economic mismanagement and high levels of corruption (BMI, 2007). Between 1990 and 2010 the incidence of poverty , still, stood high at around 60% and with households classified as poor still survived with an income of less than USD $ 1 per day and whilst those who survived for less than US $ 3.1 per day represented an average of 40% of the population (figure 2). This is despite a growing GDP per capita from USD $ 229 in 1960 to USD $ 1,307 in 2015 (figure 1).

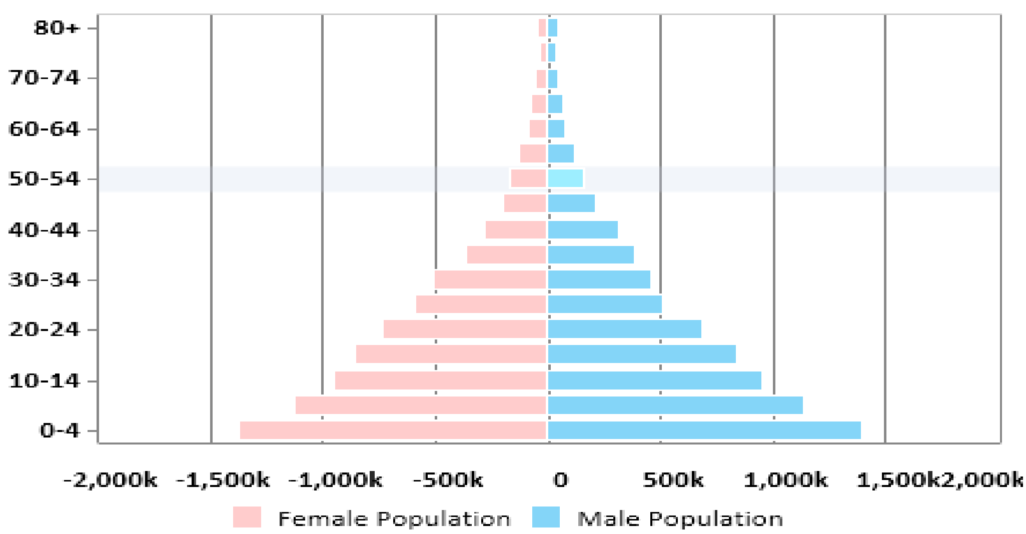
Figure 2: Poverty rate (measured as % of population below US$ 1 or US$ 3.1 per day)



Source: *World Development Indicators database. Accessed: 12/04/17. Retrieved from: http://data.worldbank.org/data-catalog/world-development-indicators*

By 2015, about 80% of the Zambian population was below the age of 40. Figure 3 shows the population pyramid for the Zambian population as of 2015.

Figure 3: Zambia – Demographics Pyramid (2015)



Source: Zambia Central Statistical Office (2015)

A PwC (2015) report noted that the Zambian economy faced headwinds in the form of a subdued global economy, lower copper prices and agriculture commodity prices. Against this background, the report highlighted that Zambia was the second largest Copper producing country in Africa, just behind Democratic Republic of Congo, and Copper accounted for over 70% of the country's exports by value. In addition, Ford (2016) revealed that public debt as a percentage of GDP stood at 42.5% in 2015 and was expected to rise to 60% by 2018.

Given this background; the research will examine the relationship between government expenditure variables and economic growth over the short-run and long-run. The next section, of the paper, discusses the problem statement.

1.2 Problem Statement

The purpose of this study is to investigate the impact of government expenditure variables on the economic growth in Zambia. Several economic growth theories have emphasized the important role that government expenditure plays in stimulating economic growth. For example, Wagner's theory, supports the view that government expenditure has a positive impact on economic growth; through its productivity enhancing potential (Alshahrani and Alsadiq, 2014).

In Zambia, government driven infrastructure development has been instrumental in driving economic growth (Africa Development Bank, 2012, p. 5). However, according to the researcher's best knowledge, no formal evidence exists on how government expenditure on health, defense and security and education affect economic growth in Zambia.

This research, therefore, focuses on finding out which of the government expenditure variables are negatively or, positively correlated with economic growth or remained unchanged over the short- and long-run. Government expenditure variables, in this instance, refer to the different expenditure components incurred by the government on health, defense, education, public safety and security, social welfare, agriculture, infrastructure such as roads, railway, housing and water.

1.3 Research Objectives

1.3.1 General Objective

This study will investigate the effect of government expenditure on the economic growth, in Zambia, over a period of 56 quarters from 2001Q1 to 2014Q4.

1.3.2 Specific Research Objectives

The research has two specific objectives:

(1) To examine the response of the GDP to government expenditure variables.

(2) To examine the short- and long-run effects of government expenditure variables on economic growth.

1.4 Research Questions

The research questions are as follows:

(1) What is the response of the GDP to government expenditure in Zambia?

(2) What are the short- and long-run effects of government expenditure variables on economic growth in Zambia?

1.5 Hypotheses

The study will consider the following hypotheses:

H_0: Government expenditure variables have no impact on economic growth in both the short- and long-run

H_1: Government expenditure variables have a, statistically, significant impact on economic growth in the short- and long-run.

1.6 Justification of the study

Based on the literature review undertaken on the research topic, it was noted that whilst there was a high incidence of research material on the relationship between the aggregated government expenditure and the growth of the economy; on the other hand there was a lower number on the case studies done for disaggregated expenditure variables.

For example, in Zambia, there was no prior research work done on the latter subject matter and as of this research, this is where, the gap exists. The study is important as the recommendations will be forwarded to the public and private institutions mandated with national policy formulation. This will also act as a body of knowledge to the professional bodies and academics in Zambia.

1.7 Limitations of the Study

Given the nature of the research, the study will rely on secondary data. This in itself creates a limitation on the quality of the data. Jerven (2010) highlighted the poor quality of data derived from a number of African countries. In a study carried out, in selected African countries in parts of West, East, Central and Southern region and in the period of, 2007 to 2010, it was noted that many statistical offices were using outdated base years and a situation which led to Ghana revising its GDP estimates upwards by 60.3% in November 2010. Furthermore, the absence of consistent compilation of data creates gaps and impacts, negatively, on the end results.

1.8 Organization of the Study

The rest of the study is organized as follows:

Chapter two outlines the literature on government expenditure and economic growth. Chapter three discusses the quantitative methodology employed to examine the effect of government expenditure variables on the growth of the economy. Chapter four discusses the findings of the study while chapter five concludes and provides policy implications of the research findings.

CHAPTER TWO - LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of literature on the subject of government expenditure and economic growth. The first part commences with an overview of the Zambian economy and whilst the second section reviews some theories linking economic growth and government expenditure, which include the Wagner and Keynesian theories and Musgrave economic model. The third and concluding section presents a review of empirical case studies from developing and emerging economies.

2.2 Overview of Zambian Economy

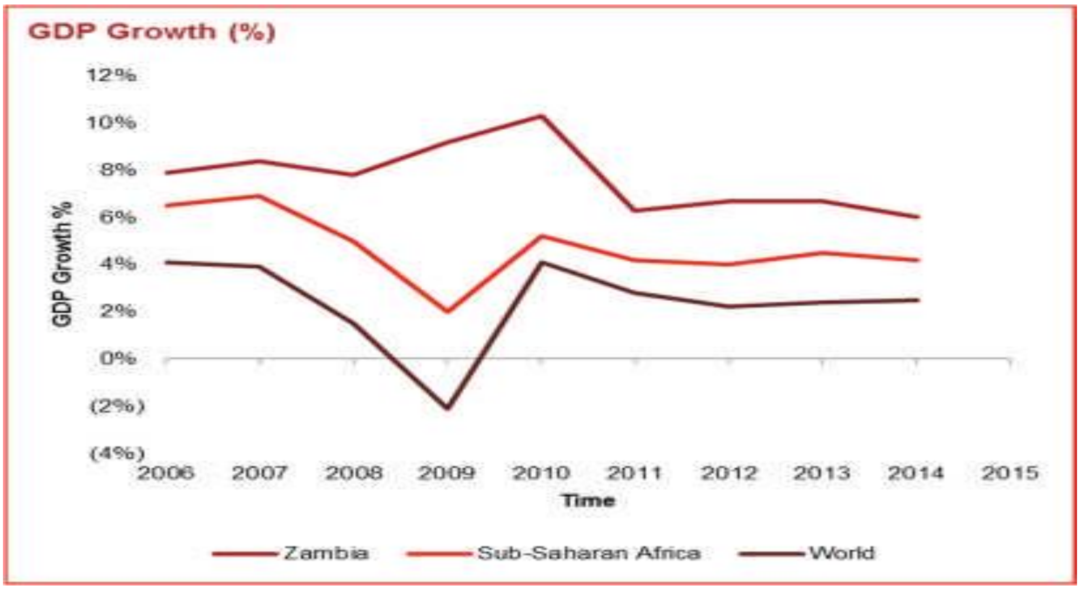
Zambia is a country with a population of 16 million people, landlocked, situated in South Central Africa and the country's economy is, significantly, copper-dependent with over 70% of its foreign earnings coming from copper exports (Ford, 2016). This explains why the changes in the copper prices have a huge bearing on the fluctuation of the country's local currency exchange rate (PricewaterhouseCoopers, 2015).

Zambia is surrounded by eight (8) neighboring countries in the name of Democratic Republic of Congo, Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia and Angola. This geographical position means that the country has a lot of potential to be a transport hub for the region as well as be a top tourist destination. The name, Zambia, is derived from the largest river in Zambia called the Zambezi River and which flows from the north western province to the southern province bordering with Zimbabwe. (US Department of State, 2009; Zambia Tourism Agency, 2017).

Murshed (as cited in Du Plessis & Du Plessis, 2006) noted that Zambia is a typical example of a country dependent on rich natural resources such as Copper and had not suffered disastrous economic decline by the start of the 21st century. However, in the recent past, low global commodity prices placed significant pressure on the economy. The slump in copper prices negatively impacted the exchange rate and economic growth (Ford, 2016).

The World Bank (2010), report, highlighted that Zambia's GDP per capita moved from US $ 229 in 1960 to US$ 1,307 by 2015. This is a significant growth. Further, PriceWaterhouseCoopers (2015) noted that the country's GDP growth was above that of Sub-Saharan Africa (SSA) and that of the World Average between 2006 and 2015. Figure 4, below, shows that Zambia's GDP growth rate was between 6% and 10% over the 2006-2015 period; significantly higher than the SSA (4% - 6%) and the world (2% - 4%) average.

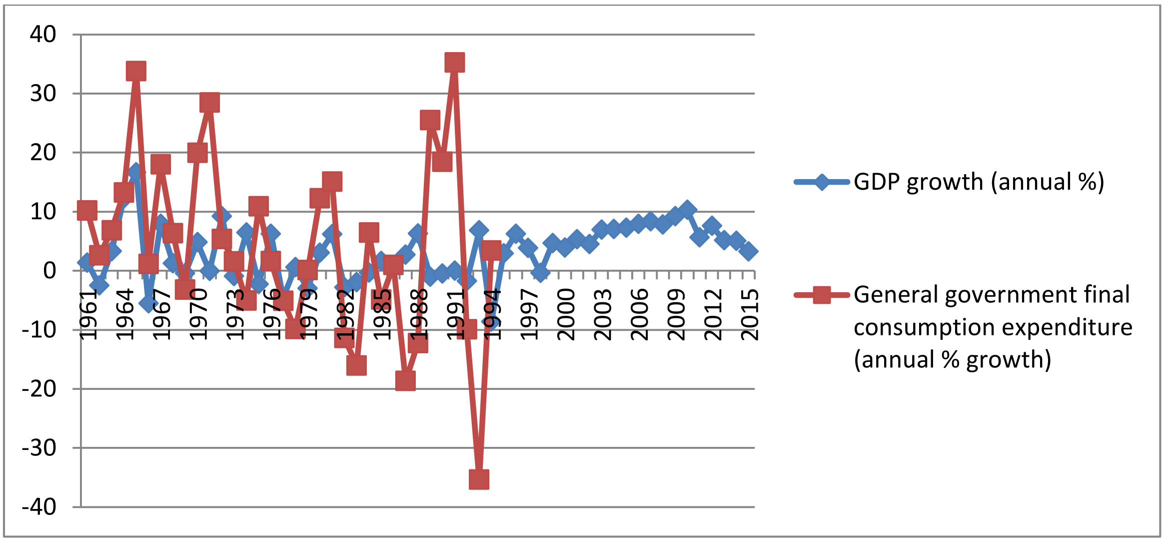
Figure 4: GDP growth rates 2006 - 2015 (Zambia, SSA and World)



Source: World Development Indicators (2010)

Further, the World Bank – World Development Indicators (2016) report revealed that Zambia's GDP grew from USD $1.7 billion in 1986 to USD $21 billion by 2015, with the highest level for GDP being USD $28 billion in 2013. Between 1986 and 2000, the country experienced a flat performance in the change of the GDP and with a steep-change recorded from 2000 to 2015. In addition, the report revealed a faster annual growth rate of government final consumption expenditure when compared to the GDP annual growth between the period 1961 to 1994, and where the comparative data was available.

Figure 5: GDP growth (annual %) vs. general government final consumption expenditure (annual % growth)



Source: World Bank report (2016)

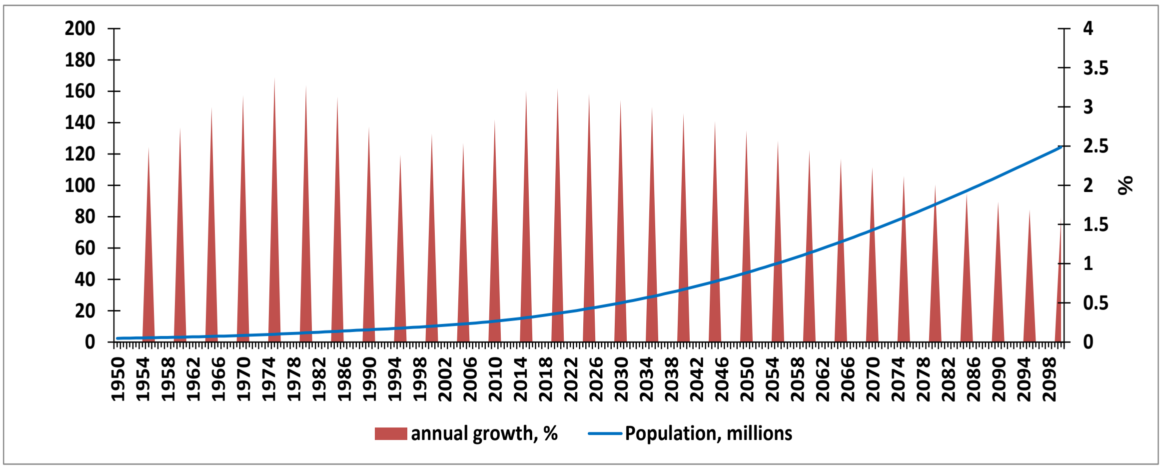
During the period from 1961 to date, the country introduced economic development programs. Zambia has a national development strategy which is underpinned by the national long-term Vision 2030 introduced in 2006. This Vision is focused on transforming the country into a prosperous middle-income country by 2030. The plans are translated into five-year development plans. Since political independence, in 1964, the country has embarked on seven national development plans. The first national economic development plan (Republic of Zambia, 1966) was in 1961–1965, the second (1972-1975) (Republic of Zambia, 1971), the third (1979–1983) (Republic of Zambia, 1979), the fourth (1989-1993) (Republic of Zambia, 1989). The Fifth National Development Plan (FNDP) (Republic of Zambia, 2006) which ran from 2006– 2010, focused on the creation of employment and wealth for the people. The Sixth National Development Plan (SNDP)

(2011 – 2015) (Republic of Zambia, 2011) focused on sustained economic growth and poverty reduction. The Seventh National Development Plan (7NDP) (Republic of Zambia, 2017) which is scheduled to run from 2017 – 2021 will focus on continued economic development (Zambia Weekly, 2017).

Despite the growth of the GDP, in Zambia, on the other hand poverty and unemployment numbers have remained, largely, unchanged. The World Bank (2016), report, reviewed that unemployment in the year 2000 stood at 13% and more than a decade later remained at 13%, by 2014. Further, the World Bank (2016) report revealed that the poverty gap stood at USD $ 1.9 per day in 1998 and rose to 32% by 2010. In terms of population size, about 60% of the people lived with incomes of less than US$ 1 per day between 1990 and 2010 (BMI, 2007).

Furthermore, among the other key challenges facing the country include: a growing population and a rapidly widening budget deficit. Figure 6 below, shows the growth of the national population (in millions) between 1950 and 2098. The Zambian population has been growing at an average 2 – 3% on annual basis and this will continue to place pressure on the resources (International Monetary Fund, 2014; World Bank, 2012).

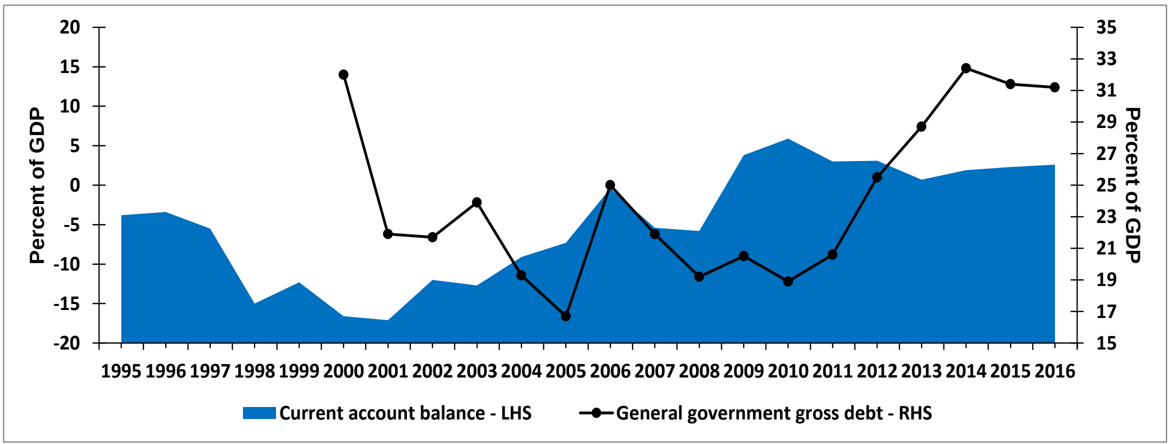
Figure 6: Zambia's Population and Population Growth Rate (1950 to 2098)



Source: World Bank (2012)

Other key features of the Zambian economy include persistent current account and public debt deficits. Please see figure 7, below, extracted from the IMF (2014) report.

Figure 7: Zambia - Current Account Balance and Gross Debt, 1995 to 2016 (as % of GDP)

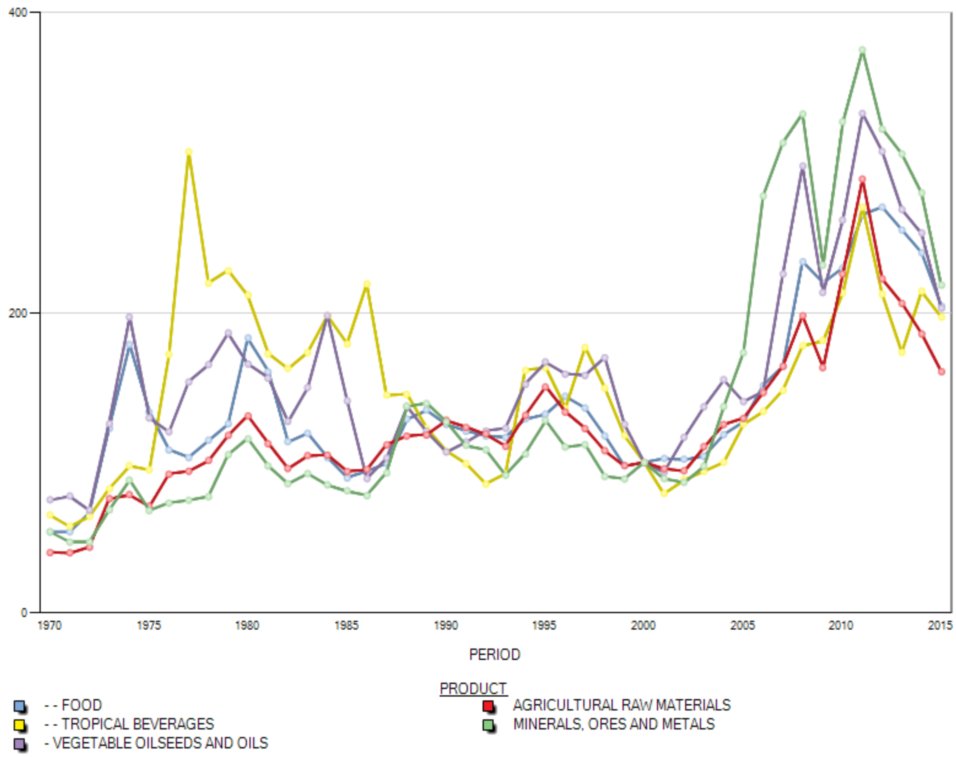


Source: IMF (2014)

A widening government gross debt and current account deficit may be indicative of inconsistent economic policies and an underlying government expenditure pattern that is at variance with economic growth. Capital Economics (2015), report, highlighted that the country experienced fiscal policy challenges, between the years of 1995 and 2016 and this was seen through worsening government borrowings and increasing deficits.

According to the PricewaterhouseCoopers (2015) budget paper, there is a strong correlation between the price of copper, on the London Metal Exchange, and the exchange rate of the local currency – the Zambian Kwacha. This is given the fact that over 70% of the country's foreign earnings are generated by copper. The UNCTAD (2015) report for commodity prices revealed a general decline in commodity prices, copper included, between 2012 and 2015. The decline in copper prices, during this period, had an impact on the economy and the exchange rate (Ford, 2016).

Figure 8: Commodity Price Indices, 1970-2015 (100 = 2000)



Source: United Nations Conference on Trade and Development – UNCTD (2015) (http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_referer=&sCS_ChosenLang=en)

2.3 Theoretical review

2.3.1 Wagner's theory

Alshahrani and Alsadiq (2014) noted that a fundamental question in growth theory sought to find out whether increasing government expenditure contributed to economic development. According to Alshahrani and Alsadiq (2014), this theory sought to explain the growth of a country's economy over the long term and applied the percentage change as the base indicator for the growth of the country's total economy or GDP.

Alshahrani and Alsadiq (2014) ,further, explained that government expenditure on areas such as health and education, may impact favorably on labor productivity and whilst public spending on roads and communication may tend to positively impact on the private domestic investment and which ultimately result in economic growth. On the basis of this, explanation, it may be noted that various components of public spending may impact differently on the economy. Government expenditure on health and education may impact positively on employees' productivity as they are healthy, fit to work and possess the right knowledge to undertake their work responsibilities. It is, therefore, appropriate to state that through increased productivity, the country's GDP is positively impacted overtime. Whilst on the other hand, public spending on infrastructure such as roads and railway impacted positively on domestic investment and this resulted in the growth of the national economy. Improved transport network, has the benefit of opening up both new and old markets and thereby expanding the country's trading boundaries and with the, positive, end result of growing the country's economy.

A different view was, however, put forward by Barro (1991) who explained that government consumption had no impact on private productivity, but simply reduced savings and distorted government consumption programs. On the other, government expenditure on defense and security and education were more of public investment and not public consumption and tended to impact positively on private sector productivity and ultimately contributing to economic growth. Barro (1991) further provided insights on the types of government expenditure framework when he outlined that there were two main types of government expenditure: the first being current and the second one being the development expenditure. The current government expenditure included the basic commitments required to meet the needs of the public work force and this was represented by payment of salaries to public service workforce. Development expenditure, referred to the expenditure made by government to build basic infrastructure such as roads, railway, bridges, ports and airports, in order to allow movement of goods and services.

Whilst it was noted from Alshahrani and Alsadiq (2014) that higher Government expenditure may impact favorably on the economic performance, it is also true that higher government spending may be detrimental to economic growth, if this came at a cost of increased taxes or government borrowings and which were not matched to the country's ability to generate revenues.

The level of government spending and the impact over the long term growth of the economy has been discussed and investigated for many years now. In this debate there are two schools of thoughts that have since emerged. The first argues that it is the growth of the economy that drives the government spending. This view is referred to as the Wagner's Law. The second school of thought argues that it is the level of government spending that in turn drives the growth of the economy. This view is called the Keynesian Law (Loizides & Vamvoukas, 2005). Based on this explanation, it is noted that these schools of thought stands on the exact opposite of each other in terms of explaining what drives the growth of the country's economy from a government spending perspective.

Ansari et al. (1997) explained that according to the law put forward by Wagner, it is the growth of the country's economy that provides the motivation for increased government spending and not vice versa. According to Ansari et al. (1997), Wagner introduced the notion that a rise in public expenditure was indicative of a progressive society and, thereby, good in itself. On the exact opposite was the Keynesian view that highlighted that government spending was an enabling input towards driving the increase in the growth of the country's economy.

Wagner (1983)'s Law, explained that the growth of a nation's economy was the main driving force to increased government expenditure. This, follows, therefore that economic growth is instrumental in driving the growth of public or government expenditure. Once the economy grows this, then, builds momentum for the growth of public expenditure. As the economy grows the government will require allocating more resources towards public infrastructure and social welfare and which in turn will drive the government expenditure upwards.

According to Wagner's Law, increased government spending is important for three reasons; the first objective is to improve social activities of the state such as retirement, pensions, insurance and environmental protection measures, the second reason is to enhance the development of science and technology and the third objective is when the state resorts to issuing of government loans for purposes of funding contingencies. Certainly, increasing government expenditure on social activities such as retirement, pensions and insurance has a way of unlocking liquidity in the economy and which, in turn, leads to extra incomes for the affected individuals and ,ultimately, leading to increased spending and growing of the national income or GDP.

Wagner (1893), further, explained that the relationship between government spending and the growth of the economy was largely influenced by the private sector increasingly investing more than the public sector. This can happen when the private sector invests further in the economy through, for example, Foreign Direct Investment, FDI. This will in turn stimulate the growth of the economy and in turn motivate the government to spend more on the public sector to facilitate further growth.

There are many arguments as to why government spending grows in line with the growth of the national economy over the long term. Individual utility maximization and public choice were some of the reasons put forward by previous studies. For example, Meltzer and Richard (1981) and Persson and Tabellini (1990) explained that government expenditure was made during elections period to satisfy the average or median voter in a multi-party electoral system. During such periods there will be a noticeable increase in government spending in areas such as rural transport infrastructure, health and education centers.

Gruber (2013) in relation to public finance and public policy' highlighted that, "the core of theoretical analysis in public finance is the assumption that individuals have well defined utility functions, a mathematical mapping of individual choices over goods into their level of well-being". People want to maximize individual well-being and this, in part, gives weight to the expansion in government spending and ultimately growth of the national wealth. Though this, again, may not be sustainable if the macroeconomic policies are not founded on strong economic foundations. The growth of public sector may in turn result in inefficiencies and ultimately diminishing marginal utility.

Meltzer and Richard (1981) explained that the way in which the country's political environment operated had a huge bearing on how the national taxation system operated and ultimately driving the allocation of the arising taxed revenues. Depending on how the political process was designed alongside the electoral system, this impacted significantly on how the government expenditure was applied.

2.3.2 Keynesian theory

Whilst Wagner's Law (1883) explained that the growth of the economy was a primary factor for increased government spending, on the other hand, the Keynesian school of thought noted that public spending was an input towards the growth of the economy and it was an important ingredient in the formulation of the fiscal policy in driving further the growth of the national income and ultimately government spending accelerating economic growth (Samudram et al., 2009).

An extension of this is that government expenditure, according, to the Keynesian school of thought is seen as an input and not an output in driving national economy. (Loizides & Vamvoukas, 2005). According to the Keynesian view, increased public spending resulted in economic growth over the long term. Kwok (2007) linked growth theory to the Keynesian theory by examining the ''pros and cons'' of either saving or consuming. It was noted that in a neoclassical growth theory, savings resulted in increased output per capita. On the other hand, taking account of the Keynesian model, increased savings lead to lower consumption and which may lead to a recession. The question then is? Should people save or consume? Conventional wisdom, however, postulates that those who save end up being well-off as against those who do not save. However, bankers and at times, government officials may worry about savings as it may impact, negatively, on the consumption and may lead to recession. These concerns emanate from the Keynesian model. An increase in the saving rate initially led to a short term recession, but was followed by a long term growth (Kwok, 2007).

2.3.3 Musgrave theory

Nearly sixty years ago, Musgrave (2008), further, contributed to the field of public finance when he considered two approaches. The first approach or concept was based on the model introduced by Musgrave in 1959 called the *"Theory of Public Finance*". This noted that the national budget represented the place of the public sector in the total economy; and the various components of government spending may be noted as allocation, distribution and stabilization and finally the national budget was to be prepared in a manner that aligned to these three key components. In a way, this model provided guidance in the way in which national budgets were to be prepared and managed. The added knowledge, as postulated by Musgrave on the classification of the government budget is important as it guides the understanding of how the national budget was allocated, distributed and whether it was stabilized in terms of matching the inflows to the outflows and provided visibility on the size of the national budget deficit.

Musgrave (2008) noted that the third branch of stabilization when seen through the Keynesian theory focused on aggregate demand and with emphasis placed on the expenditure side of the budget. Consideration was targeted towards growth-enhancing government expenditure which included education, health and research.

2.4 Review of Empirical Studies

The theories discussed, earlier, have been widely used to examine the relationship between government expenditure and economic growth. For instance, Singh and Sahni (1984) noted that whereas the views of Wagner and Keynesian have impacted significantly on modern thinking on public spending and the growth of the economy, systematic investigation on the causal relationship began with the pioneering work of Granger (1969) and Sims (1972).

In a study to examine the theories by Keynes and Wagner in Malaysia and using data from 1970 to 2004, Samudram et al. (2009) explained that over the long-run there was a relationship between government spending and economic growth. The relationship was bi-directional for administration and health with the growth of the economy. This position supported both the Wagner and Keynesian views. It is important to indicate that for other government spending areas, the long-run relationship was from the GDP to government expenditure. This finding was in support of the Wagner law.

There are prior studies where the causality test does not hold. For example, in the study by Ansari et al. (1997), it was noted that the Keynesian view was not supported for three African countries studied (South Africa, Ghana and Kenya). Under the Wagner Law, Ansari et al. (1997) explained that government spending did not influence the growth of the economy and was therefore not suited for use in the formulation of fiscal policy. On the other hand, when applying the Keynesian view, Ansari et al. (1997) reported that government spending was an input towards motivating the growth of the economy. Given this development, public expenditure then becomes an important input to positively driving increased national economy activity. Ansari et al. (1997), further, cautioned that the Wagner law and Keynesian views were not held true ,all the time, and that it was not necessary for that position to be achieved for all situations. In any case, what was important was for the governments to ensure a smoother expenditure framework existed. For example, where there was a need for external borrowing by the government, the size or impact of public spending may likely be reduced.

In examining the relationship between the growth of the country's economy and the level of government spending and poverty alleviation, Sasmal and Sasmal (2016) revealed that the growth of the country's economy was an important ingredient towards driving the reduction of poverty. It was, further, noted that public spending on infrastructure development such as roads and hospitals stimulated the growth of the economy. This position is attained due to the fact that public spending on areas such as roads, opens up the country to new markets and allow for expansion in commerce, trade and industry and all this contributing, positively, to the growth of the economy.

Gounder, Narayan and Prasad (2007) in the study on Fiji, explained that it was important to understand the relationship between government expenditure and economic growth for purposes of formulating the appropriate fiscal policies. Monteiro and Turnovsky (2008), on the other hand, provided further guidance on the need to achieve a trade-off or a balance when undertaking government spending on areas such as physical and human capital expenditure. This is important, as the increased public expenditure on one area more than the other may negatively impact on one and to the detriment of the overall economy. Further, Senjur (1996) outlined that the objective of public spending was twofold and which can either be positive or negative to the country's economy. Depending on the level of public spending in comparison to the national economic growth, the former can either enhance the growth of the economy or can have a negative impact and widen the budget deficit position. Therefore, it is important to align the level of public spending to economy activity and being aware of the specific areas to focus public spending.

The following section is a review of empirical case studies in developing and emerging economies. At the end of the empirical case study review, a summary list table of the authors, key findings of the study, research methodology applied and recommendations is presented.

2.4.1 Empirical review on Developing Countries (SSA and rest of the Africa)

Ansari et al. (1997) investigated the relationship between government expenditure and economic growth in three African countries that included Ghana, Kenya and South Africa.

Two economic theories were at the core of the study: Keynes' theory and Wagner's law. The findings were that the research data used in the study did not support the view that public spending drove the growth of the economy. This view did not support the Keynesian theory. The tools applied included time series analysis and cointegration or VAR specification was applied to model the relationship. Finally to examine for causality, both the Granger and Holmes-Hutton procedures were used.

The study by Ansari et al. (1997) also reported a number of empirical case studies conducted in various countries at different levels of economic development. For example, some countries were from emerging markets and whilst some were already developed markets. The findings of the research were mixed and some revealed that the relationship was unidirectional; others revealed no causal relationship while some found a bidirectional causal relationship between the two aggregates (p. 543). cited empirical case studies included Oxyley (1994); Ram (1986) ; Singh and Sanhi (1984); Beck (1979); Bird (1970); and Gandhi (1971).

Odhiambo (2015), over the period from 1960 to 2014, investigated the relationship between government spending and the growth of the economy in South Africa, using the auto-regressive distributed lag model (ARDL) – bounds testing approach. The findings were that over the short-run there was a bidirectional relationship between the government spending and the growth of the economy and whilst over the long-run it was the growth of the economy that drove public spending and thus confirming Wagner's law.

Gisore et al. (2014) investigated empirically how government expenditure contributed to economic growth in East Africa. The study focused on disaggregated expenditure from 1980 to 2010. The objective of the study was to establish the effect of expenditures on economic growth using the balanced panel fixed effects model. The study tested for panel unit root and revealed that only GDP was stationary at level. The findings showed that public expenditure on health and defense was positive and statistically significant on economic growth. On the other hand, expenditure on education and agriculture were insignificant. The study recommended that for East Africa, increased public expenditure on health and defense was appropriate for economic growth and whilst reducing spending on other sectors. However, caution was provided to consider further disaggregating the expenditure on education and agriculture so as to understand the underlying factors that resulted in the expenditure not being significant. One of the possible causes suggested, as a root cause for the insignificant result, was the low budget allocation to the two sectors.

Ebong et al. (2016) undertook a study on Nigeria, from 1970 to 2012, through a disaggregated government expenditure analysis. A multiple regression model based on a modified endogenous growth framework was applied to examine the interrelationship between capital expenditures on agriculture, education, health economic infrastructure and economic growth. Deriving from the error correction and cointegration analysis, the ordinary least squares (OLS) technique was applied in analyzing the annual time series. The findings were varied. Capital expenditures on agriculture were not significant in both the short-run and long- run. Education and expenditures on economic infrastructure had significant positive impact on economic growth. The results showed that government expenditure on human capital development through the social services sector tended to promote economic growth rather than agriculture. Given the fact that agriculture has potential to turnaround many livelihoods, the paper recommended a need to improve quality and sustainability of especially capital expenditure on Nigeria’s agriculture sector.

Another study, on Nigeria, by Chude and Chude (2013) investigated the effect of public expenditure in education on economic growth over the period from 1977 to 2012. They applied a disaggregated government expenditure analysis. The study applied an Error Correction Model (ECM). The findings were that total education expenditure was significant and positively impacted on the growth of the economy over a longer period of time. This result placed an important policy and budget implementation for the country. The study concluded that the Nigerian economic growth was impacted by both endogenous and exogenous factors to the public expenditure. The paper recommended that government reduced budget spending on education and in instead focus on developmental expenditure that was tailored to drive the growth of the economy.

Nworji et al. (2012), in Nigeria, undertook a similar study during the years of 1970 to 2009. The tools applied included the OLS multiple regression models. The time series data included GDP and various components of public expenditure. The findings of the research study were that government spending on economic services had no impact. On the other hand, government spending on social and community services positively impacted on the economy. The recommendations, arising, from the research study were that the Nigerian government ought to allocate increased spending to areas that had positively impacted on the growth of the economy.

Nketiah-Amponsah (2009) investigated the impact of both aggregated and disaggregated public expenditure on the growth of the economy in Ghana from the years of 1970 to 2004. The findings of the research were that aggregated government expenditure impacted negatively on economic growth. It slowed down economic growth. On the other hand, an examination of disaggregated public expenditure highlighted that expenditure on infrastructure and health positively impacted on growth, and whilst public spending on sectors such as education had no impact in the short-run. Furthermore, the study revealed that other variables such as the nature of peace and governance framework were important in providing valuable insights.

Ebaidalla (2013) investigated the relationship between government expenditure and the growth of the country's economy for Sudan during the years from 1970 to 2008. The tools applied included the Granger causality test and Error Correction Model (ECM). The research findings were that over the long term there was a relationship between government expenditure and the growth of the economy for Sudan, and it was noted that the government expenditure had a positive impact on the economy. This finding by Ebaidalla (2013) was in support of the school of thought as determined by the Keynesian theory. The paper recommended that fiscal policy, in Sudan, was an important driver of economic growth.

Table 1: Summary of Empirical Case Studies (Developing Countries)

No.	Author	Place. Period	Type of study	Methodology
1	Ansari et al (1997)	South Africa, Ghana & Kenya 1957 - 1990	Aggregated: GDP vs. Govt. expenditure	Granger and Holmes-Hutton. Co-integration & VAR model
3	Odhiambo (2015)	South Africa. 1980 - 2013	General government expenditure vs. GDP	Auto-regressive distributed lag model – (ARDL)
4	Gisore et al. (2014)	East Africa. 1980 - 2010	Disaggregated model. Govt. expenditure vs. economic growth	Balanced panel fixed effect model. Panel unit root test. Levin-Lin-Chu (LLC, 2002) method. Multiple regression. Hausman (1978) test.
5	Ebong et al. (2016)	Nigeria. 1970 - 2012	Disaggregated model. Government expenditure and economic growth	Multiple regression model: (health, agriculture, education, infrastructure); OLS, ADF, Philips-Perron (PP) approach, Engel-Granger model, Error

				correction model-ECM.
6	Chude & Chude (2013)	Nigeria. 1977 - 2012	Disaggregated model. Public expenditure on education vs. economic growth	Error Correction Model – ECM.
7	Titus (2012)	Nigeria 1970 – 2012	Disaggregated time series model. Public expenditure vs. economic growth	OLS, multiple regression model.
8	Wolde-Rufael (2008)	13 African countries. 1964 to 2004	Government expenditure vs. economic growth	Granger causality test
9	Amponsah, (2009)	Ghana. 1970 - 2004	Aggregated & Disaggregated. Public spending and economic growth	Two sector production output model built on Gershon Feder (1983). Ram (1986). Granger causality test
10	Ebaidalla (2013)	Sudan 1970 - 2008	Public expenditure and economic growth	Granger causality test. Error Correction Model – ECM.

Source: The table summarizes the selected empirical studies undertaken in Africa on the subject of government expenditure and economic growth.

2.4.2 Empirical Review on Emerging Economies and Others

In the study by Pahlavani et al. (2011) on government spending and the growth of the economy in Iran during the years from 1960 – 2008, it was noted that the growth of the economy drove further government expenditure. This position confirmed Wagner's law. The study applied econometric techniques which included the use of cointegration test as outlined by Pesaran et al. (2001) and Granger causality test based on the Error Correction Model – ECM. The research findings were that the growth of the Iranian economy, at the time, moved with the size of the government spending. The Granger causality test using the ECM revealed a unidirectional relationship that moved from the growth of the economy to government expenditure. This position was in support of Wagner's law.

Srinivasan (2013),in India, during the years from 1973 to 2012 investigated the relationship between government expenditure and economic growth. The study applied cointegration approach and error correction model. The Johansen's cointegration approach revealed that over the long-run a relationship, existed, between public expenditure and the growth of the Indian economy. (Srinivasan, 2013, p. 338). Prior to formulating the cointegration test, the study tested the stationarity of the variables. In order to, further, confirm the stationary of the variables, the Augmented Dick-Fuller (ADF) test was used. (Srinivasan, 2013, p. 338). On the basis of this test, it was observed that the variables were non-stationary in levels and stationary in first differences. This, further, was indicative of the possibility of cointegration between the variables and this position was reflective of a long-run relationship between the variables. The findings of the error correction model were that a unidirectional causal relationship ran from the growth of the economy to government spending, during both the short-run and long-run. This supported Wagner's law. On the basis of these findings, Srinivasan (2013) explained that public spending in India was growing ahead of the growth of the economy and this was due to the expansion of revenue expenditure on subsidies, interest payments, non-developmental expenses such as administrative and defense. The paper, subsequently, recommended that the Indian government needed to review in detail the non-developmental expenditure that had no impact on the growth of the economy and to focus more on those public expenditure areas that had the capacity to positively transform the economy.

Alshahrani & Alsadiq (2014), in Saudi Arabia, investigated the effect of a number of government expenditures variables on the growth of the economy over the years from 1969 to 2010. In terms of the econometric tools used, the study applied the Vector Auto Regression (VAR), cointegration analysis, and a Vector Error Correction Model (VECM).

The research findings were that expenditure on health positively impacted on the economy over the long-run and whilst public spending on housing and openness to trade impacted positively over the short-run. Understandably, investment in healthcare, ultimately, leads to a healthier workforce and which is able to contribute favorably to national productivity over the short-run and long-run. This is more, especially, whereby governments concentrate healthcare expenditure on both disease preventative and treatment mechanisms. As to public spending on housing, this allows for both skilled and unskilled workforce to be accommodated and reside in areas closer to the work places and thereby contribute to the immediate growth in the economy. Whether this can be sustained over the longer term is highly debatable as the economy grows; the greater number of the workforce, over the longer term, may ascribe to building own accommodation and this may have the effect of scaling down pressure on the government to spend additional resources on housing.

Suanin (2015), in Thailand, over the years of 1993 to 2014, examined the relationship of public spending on the growth of the economy. Suanin (2015) disaggregated government expenditure into budgetary expenditure, which is the annual spending in each fiscal year and approved by congress / parliament; extra-budgetary expenditure which included extra-budgetary funds (EBF) and fiscal deficits and quasi-fiscal expenditure which is in respect of specialized financial institutions and state owned enterprises and whose government expenditure was measured by guaranteed debt of state enterprises. The study applied econometric techniques that included time series analysis; stationarity of data was tested using the Augmented Dick-Fuller (ADF) unit root test and the Phillip Perron (PP) test. For purposes of testing cointegration, the study, applied the Engle and Granger two-step based residual test and the Johansen and Juselius procedure. Due to the limitation in data available, the lag order for all models was set to 4, which was the frequency of quarterly data. For purposes of highlighting the relationship between the variables, over the longer term, the Vector Autoregressive (VAR) was adjusted so as to be the Vector Error Correction Model (VECM). The research findings were that although the budgetary spending had the potential to promote the growth of the economy over the longer term, on the other hand, extra budgetary expenditure and quasi fiscal spending stimulated short-run economic growth. This was due to the fact that the process of budgetary expenditure was transparent as it was exposed to congress / parliamentary approval. Secondly, extra-budgetary and quasi-fiscal expenditure were to be applied only for the short term and to move the economy out of recession and both of which did not contribute significantly to economic growth over the long term and could lead to fiscal deficits and higher inflation over the long term. Extra-budgetary expenditure was most suited to driving sound policies in state owned enterprises, which could lead to positive change over the long term and enhance economic growth.

In a study on Azerbaijan, Koeda & Kramarenko (2008), which applied the Barro's model, the research findings were that the growth of the economy was dependent on the increased levels of public spending. This position was in support of the Keynesian theory and which postulates that government spending was an input and not an output factor to growth of the economy. The government had to inject more resources into the economy for it to register forward momentum. As was earlier noted in this study, this position on the other hand may have the downside effect of ''crowding – out'' the private sector and with a possibility of increasing the interest rates, government borrowings but with a likelihood of a positive turn on reduced inflation. What is important, to note, therefore is the type of fiscal policy that each specific government may want to attain in order to register the desired end result.

In an oil exporting country called Kuwait, and during the years of 1969 to 1995, Burney & Al-Mussallam (1999) investigated the Wagner's law and the relationship between increased public spending and the growth of the country's economy. The econometric tools applied in the study included the OLS method and unit root test. The research findings revealed that as public spending increased, in Kuwait, there was a corresponding decline in the growth of the economy. This position, therefore, was indicative of the fact that public spending, in Kuwait, had a negative relationship with the growth of the economy. On this basis, the Wagner's law was not confirmed in Kuwait. Some of the contributing reasons to the increased growth of public spending included the structure of the economy and the overall development of the financial sector.

Dritsakis et al. (2006) in a study on Greece over the period 1960 – 2002 investigated the relationship between the national exports, gross capital formation, foreign direct investment and the growth of the economy. The study applied tools that included multivariate autoregressive model. The examined variables had a unit root. The research findings revealed that foreign direct investment positively impacted the growth of the economy.

Tang (2008) re-investigated the relationship between public spending on defense and security and the growth of the Malaysian economy over the period of 1960 to 2006. The study applied cointegration and causality analyses. Techniques applied included the bound testing procedure, the OLS method and an Unrestricted Error Correction Model (UECM). The research findings revealed that there was a negative relationship between the government expenditure of defense and the growth of the Malaysian economy. Drawing from these findings, the paper, recommended that, for Malaysia, discouraging defense expenditure would benefit the growth of the local economy over the long term, given the fact that the military was non-productive. However, caution was provided as defense expenditure was needed in order to protect the country from terror attacks and crime. It is important, therefore, for Malaysia to have an understanding of the optimal defense budget so as to spend on what is needed for security purposes and within the budget constraints and ability of the economy to generate necessary revenues.

In Sri Lanka, and during the years from 1952 to 2002, Dilrukshini (2009) investigated the relationship between government expenditure and economic growth. Econometric techniques that included the Dickey-Fuller test and the Augmented Dickey-Fuller tests were applied. The study found no empirical support to infer conformity to either the Wagner or Keynesian theories. The research findings revealed unprecedented primary cause factors that led to the increase in government spending. Notably, the paper highlighted the increased voice from pressure and interest group behavior as one of the key primary factors that led to the build-up in public spending in Sri Lanka. Again, and as was earlier noted in this paper, it is not always necessary that the Wagner or Keynesian views are always confirmed as can be noted from the case of the study on Sri Lanka.

During the years from 1970 to 2013, Lahirushan & Gunasekara (2015) investigated the relationship between government expenditure on the growth of the economy in selected Asian countries. The countries that were part of the study included Singapore, Malaysia, Thailand, South Korea, Japan, China, Sri Lanka, India, and Bhutan. The research findings revealed that public spending was positively related to the growth of the economy and that the movement was unidirectional and vice versa. This meant that an increase in public spending pushed the growth of the economy, further, upwards and vice versa. This development, therefore, confirmed both the Wagner and Keynesian theory. In this instance and unlike in some of the earlier selected examinations, both theories are confirmed. Equipped with this knowledge, the paper, recommended that the Asian countries should involve the government in increasing economic growth. It was noted that caution was to be given to the nature of government expenditure as it had the potential to negatively impact on the economy and general population over the long term and if it was not well managed.

The study by Lahirushan and Gunasekara (2015) was developed through a carefully planned out data analyzing procedure which consisted of the following steps model estimation (pooled model, fixed effect model and random effect model), panel cointegration (Pedroni and Kao cointegration tests), testing for causality (Granger causality test), choosing among models (using the F-Test and Hausman test) and testing for stationarity of the variables.

Lahirushan and Gunasekara (2015) noted that increased government expenditure was seen as an hindrance to the growth of the country's economy. This is based on the understanding that the greater the size of public spending the more taxes was to be levied and this may have the unintended consequence of creating disincentive to invest by the private sector based participants. In addition, the funds, which were earlier, earmarked for private sector investment and development was channeled to government expenditure and which in turn reduced the capacity by the private sector to invest in profitable investments.

Kolluri et al. (2000) examined the relationship between government expenditure and the growth of the economy from the G7 industrialized countries during the years from 1960 to 1993. The research highlighted that public spending was income elastic and therefore grew at a level more than the growth of the economy over the longer term. Under this view, it was argued that as the economy grew it generated additional taxes and which in turn created more revenue for the government to apply towards public and social sectors such as roads, health, education, security, insurance and pensions. Oxley (1994) in the case of the G7 industrialized countries, highlighted that as economies grew this led to industrialization and which in turn resulted in increased tax revenues. Furthermore, industrialization was seen as replacing the public sector by the private sector and which in turn resulted in increased national wealth and with a corresponding increase in expenditure for health, education, welfare and social services.

Kolluri et al. (2000) , further, outlined that government spending was sensitive to the growth of the country's economy over the long term and was noted as being elastic. This sensitivity comes on the background of a forward-looking government budgetary planning and execution process, which was prepared on the basis of sound strategic goals and which the fiscal authorities can prepare on the basis of taxation and expenditure policies. But the problem with this situation is that increased government expenditure can result into huge budget deficit and which can then force the fiscal authorities to internal and external borrowings and which in turn may lead to increased interest rates and likely to impact negatively on the private sector and thus impacting negatively on the national wealth. If this is allowed to continue, the economy may shrink with general conditions of living worsening. This situation occurred in Zambia after 2010 to-date. Prior to that, the then government in place took measures to ensure fiscal and monetary discipline and qualifying the country to Highly Indebted Poor Countries (HIPC) platform with the World Bank. This was achieved on the back of improved government expenditure management. Sadly, this experience was not sustained after 2010 and the results were seen through increased budget deficit and increased interest rates. It is also important to mention that lower global commodity prices impacted, negatively, economic performance in this period.

Table 2: Summary of Empirical Case Studies (Emerging Economies)

No.	Author	Place. Period	Type of study	Research methodology
1	Pahlavani et al. (2011)	Iran. (1960 – 2008)	Public expenditure and growth of the economy	Granger causality test. Error Correction Model. ECM.
2	Srinivasan (2013)	India (1973 – 2012)	Public expenditure vs. economic growth	Johansen's (1991) cointegration test. ECM,
3	Alshahrani & Alsadiq (2014)	Saudi Arabia (1969 – 2010)	Impact of Public expenditure on the growth of the economy	VAR, Cointegration. VECM. ADF and PP unit root tests.
4	Suanin (2015)	Thailand. 1993 - 2014	Disaggregated model. Government expenditure and the growth of the economy	Time series analysis. ADF, PP. Engle and Granger. VAR. VECM.
5	Koeda & Kramarenko (2008)	Azerbaijan.	Relationship between government expenditure and growth of the economy	Barro (1990) model.
6	Burney & Al-Mussallam (1999)	Kuwait 1969 - 1995	Wagner's law and public expenditure in Kuwait	Ordinary Least Squares – OLS – method. Unit root and cointegration tests. ECM.
7	Dritsakis et al. (2006)	Greece 1960 - 2002	Determinants of economic growth: Empirical investigation with Granger causality analysis for Greece	VAR. ADF. Unit root test. Johansen and Juselius model. Error Correction Model – ECM.

				Granger causality test.
8	Tang (2008)	Malaysia 1960 - 2006	Defense expenditure and growth of the economy in Malaysia.	Bounds test procedure. Unrestricted Error Correction Model (UECM), OLS, MWALD.
9	Dilrukshini (2009)	Sri lanka 1952 - 2002	Public expenditure and economic growth in Sri lanka: Cointegration analysis and Causality testing.	DF, ADF, ECM and Granger causality test.
10	Lahirushan & Gunasekara (2015)	9 Asian countries 1970 – 2013	Disaggregated study Impact of government expenditure on economic growth: A study of Asian countries	OLS, Panel unit root test, Hausman test and F-test, Granger causality test, LLC and PP approaches

Source: Authors compilation

2.5 Summary of Literature review

A greater number of the empirical case studies have argued that causality may be bi-directional. Furthermore, almost 50% of the empirical case studies were in respect of the impact of disaggregated government expenditure variables on economic growth. Countries and Regions in which such a study was undertaken included; Ghana, Nigeria, Thailand, East Africa and Asia.

A number of the empirical case studies applied the methodology that included econometric techniques, among others, of multiple regression analysis and panel root test. This study will adopt some of these models and this is explained, further, in the next section on research methodology.

CHAPTER THREE- RESEARCH METHODOLOGY

3.0 Introduction

This section outlines the research methodology that will guide the data collection, analysis and findings. Section one explains the research design and provides further detail on the nature of the study and the type of data collected. The second section gives a background as to the source of the data. Section three explains the regression model that is applied. The fourth section presents the measurement and discussion of the variables used in the research. Section five outlines the estimation approach and this is broken down into three parts; the first part examines the integration of the variables using unit root tests, the second part analyzes the co-integration of the variables and whilst the third part concludes with the short-run and long-run estimates.

3.1 Research Design

The purpose of the research is to empirically examine the effect of government expenditure variables on the growth of the Zambian economy over the study period of 2001Q1 to 2014Q4. The government expenditure will be disaggregated into various public expenditure categories and the specific components of the total government expenditure will be examined and in relation to the total GDP as a measure of the growth of the local economy. Given the nature of the study, the research design will be tailored in such a way as to be quantitative, in nature, and will apply secondary data.

3.2 Data sources

The data sources will be varied and will mainly include the compilation of data from sources that include the World Bank and International Monetary Fund websites, the country's Ministry of Finance – Budget department, Zambia Central Statistical Office

(CSO), Zambia Association of Chambers of Commerce and Industry (ZACCI), and other research centers that include the Policy Monitoring and Research Centre (PMRC) and the Zambia Institute of Policy Analysis and Research (ZIPAR).

3.3 Regression Model

In the specification of growth model, this study adopts the aggregate expenditure approach which defines economic growth as a function of household consumption, investments and government expenditure (this includes net exports in an open economy). This relationship is specified in equation 1 below;

$$GDP = f(C, I, G, NEXP)$$

where:

GDP = Gross Domestic Product of the country

C= Household consumption

I = Investments in physical capital

G = Government capital expenditure variables

Following Gisore et al. (2014), the government expenditure variable is disaggregated into expenditures on health, education, security, agriculture and transport. The functional form of the growth equation is specified in a time series format as;

$$y_t = \beta X_t + \gamma G_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

where y denotes economic growth as the dependent variable. The independent variables are categorized into control variables captured by X_t . G represents the government expenditure variables. Equation 2 expanded into equation 3 as;

$$y_t = \gamma_1 HE_t + \gamma_2 EE_t + \gamma_3 SE_t + \gamma_4 AE_t + \gamma_5 TE_t + \beta_1 GFCF_t + \beta_2 NEXPTS_t + \varepsilon_t \ldots\ldots 3$$

where t refers to the period; HE_t denotes government expenditure on health; EE_t is government expenditure on education; SE_t is government expenditure on security; AE_t is government expenditure on agriculture; TE_t is government expenditure on transport; $GFCF_t$ is the gross physical capital formation used as a proxy for Investments; $NEXPTS_t$ denotes net exports; y_t is the real Growth Domestic Product (GDP) Growth and ε_t is the error term.

3.4 Measurement and Discussion of Variables

Economic Growth

Epley (2003) ,in explaining, economic growth highlighted that the factors of production in the form of land, human labor and capital were all important ingredients in ,positively, driving forward a country's economy. For example, land is required for agriculture and construction of infrastructure; human labor is needed for both the skilled and unskilled services and whilst capital is important for purposes of financing. Drawing from this, it can be noted that no meaningful development can, therefore, take place if the above factors of production were absent. Economic growth, therefore, can be determined when there is a positive change in the total incomes generated from the total demand and sales of all units in the country to register what is referred to as the Gross Domestic Product – GDP.

This research will measure GDP in United States dollars (US$) rather than the local currency the Zambian Kwacha. The US$ will be applied for the reason that the currency has been viewed as a dominant global currency (MacEwan, 2016). Further, Rahn (1990) explained that the Unites States dollar is used by most countries as the international vehicle currency.

Public Expenditure on Education

Public expenditure will be represented by the total quarterly government expenditure on education in United States Dollars.

Public Expenditure on Health

Government expenditure on health will be in respect of total quarterly expenditure on health. The amounts will be denominated in United States Dollars.

Public Expenditure on Security

Government expenditure on security will be in respect of expenditure on defense and security for the country and over the period from 2001Q1 to 201Q4. The amounts will be denominated in United States Dollars.

Public Expenditure on Agriculture

Total quarterly Government expenditure on agriculture measured in United States dollars over the research period.

Public Expenditure on Transport infrastructure

Government quarterly expenditure on transport infrastructure measured in United States Dollars.

Gross Fixed Capital Formation

Gross Fixed Capital Formation (GFCF) will be measured in United States Dollars and on a quarterly basis. Panic (1967) explained Gross Fixed Capital Formation (GFCF) as the total productive investment made by a country. This includes expenditure on investment in, machinery, equipment, vehicles, dwellings and non-residential property.

Net Exports

This will represent the net difference between exports and imports on a quarterly basis and also recorded in United States Dollars.

3.5 Estimation Approach

3.5.1 Unit Root test

The study involved an investigation that commenced with tests of integration of the variables. Further, a test for non-stationarity was undertaken for the reason that a regression between time series that were non-stationary may result in a spurious regression, in which there was a high coefficient of determination even if the variables were unrelated. Furthermore, estimating a regression model in which time series are non-stationary might result in hypothesis tests on the estimated parameters being invalid (Asteriou & Hall, 2011).

Given this background, the Augmented Dickey Fuller (ADF) and the Phillips-Perron unit root tests were applied. This was necessary before conducting cointegration tests and establishing whether the variables were stationary and eliminating the possibility of spurious regression estimates.

The Augmented Dickey Fuller (ADF) test and Phillips-Perron unit root tests are based on the following linear regression:

$$\Delta x_t = \alpha + \beta t + \delta x_{t-1} + \sum_{i=1}^{m} \Delta x_{t-i} + \varepsilon_t$$

where x is the variable of interest and m is the optimal lag length.

As noted, above, the Augmented Dick-Fuller (ADF) and Philips Perron (PP) tests were undertaken. For both tests, the null hypothesis of interest will be that a given time series is non-stationary or has a unit root. The null hypothesis will be rejected if the ADF/PP test statistic is less than the 5% critical value. The MacKinnon (1996) critical values, in this instance, will be used.

3.5.2 Co-integration Analysis

The next step of the study involved co-integration testing. Asteriou and Hall (2011) highlighted that variables were said to be cointegrated if there existed, a relationship, over the long term. The arising equilibrium relationship is presented by the stationary linear combination of the variables called the cointegration equation. The Johansen (1991) maximum likelihood procedure for co integration was applied. The linear equation, below, highlights the relationship:

$$\Delta X_t = \mu + \sum_{t=1}^{p} \boldsymbol{A}_i \Delta X_{t-i} + \boldsymbol{B} X_{t-p} + \omega_i$$

Johansen's (1991) test for cointegration was used, in order, to determine whether there existed a long run relationship among the variables. The maximum eigenvalue and trace test was applied to determine the number of cointegrating equations.

In the linear equation, the terms are defined as follows:

- Δ is the first difference lag operator,
- X_t is a (kx1) random vector of time series and whereby the order of integration is one, that is, I(1),
- μ is a (kx1) vector of constants,
- A_i are (kxk) matrices of parameters
- ω_i, is a sequence of zero-mean

- p-dimensional white noise vectors,
- B is a k (kxk) matrix of parameters, whose rank contains very useful information about the long-run relationship between variables.
- B ($=\alpha\beta'$) has less than full rank, the variables are cointegrated,
- β being the cointegration vector.

Note that if B has full rank, the variables are stationary in levels.

There are many approaches that can be applied in testing for the presence of cointegration among variables. Some of these include: the Engel-Granger Two-Step procedure, the Engel-Granger Three-Step procedure, the principle components method, and the Johansen-Juselius cointegration test. This study used the Johansen-Juselius cointegration test because it allows for more than one cointegrating relationship. The cointegration rank is determined using the maximum eigenvalue and trace test. Furthermore, the study used Johansen and Juselius (1990) and MacKinnon-Haug-Michelis (1999) (asymptotic) critical values. The rationale for conducting the cointegration test is to determine the existence of a relationship, over the long-run, among the variables. Whereby the variables are cointegrated, it then implies that there is need to decompose the relationship among the variables into short- and long-run dynamics using econometric models such as the Vector Error Correction Model (VECM).

3.5.3 Long run and Short run estimates

The study progressed to the third part which involved estimating the short- and long-run impact of various components of government expenditure on the growth the economy. The Vector Error Correction Model (VECM) was applied, in this instance.

In addition, the underlying tests for autocorrelation, heteroscedasticity and normality of the error terms were conducted. The estimated model was also tested for stability. The

Impulse response functions were estimated in order to highlight how economic growth changed to the turbulence or shocks in the system. Furthermore, the variance decomposition analysis was undertaken in order to demonstrate the percentages that each of the shocks contributed to the changes in economic growth.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESEARCH FINDINGS

4.0 Introduction

This chapter presents and discusses the key findings of the study. It is divided into eight parts. The first part presents the key descriptive statistics of the variables included in the empirical model. Part two discusses the results of the unit root tests, while part three outlines the results of Johansen's cointegration tests. Part four presents the results of the VECM. Part five gives a summary of key diagnostic tests conducted on the estimated VECM. Part six presents the results of the estimated impulse response functions. Part seven explains the results of the variance decomposition analysis. Part eight provides a discussion of the key findings of the study.

4.1 Descriptive statistics

This subsection presents key descriptive statistics on the variables included in the model: the mean, median, and standard deviation. It also outlines the results of the Jarque-Bera test for normality of the variables. A p-value of less than 0.05 or 5%, the conventional level of significance, indicates that a variable is not normally distributed. The distribution of the explanatory variables provides the research with added insights into whether there are outliers present in the data and which may bias the results of the estimated model, Gujarati as cited in (Cetintas, 2003).

Table 3: Descriptive Statistics (in ZMW Millions, Constant 2010)

Statistic	AE	EE	GFCF	HE	NEXPTS	SE	TE	Y
Mean	227	176	4944	775	156.4	286	32	17008
Median	185	165	4630	752	-116.3	298	20	16189
Standard Deviation	201	63.2	2825	354	960.2	141	26	4993.6
Jarque_Bera Statistic	5.8	3.4	4.1	3.1	3.2	3.5	7.4	4.7
P-value of the Jarque - Bera Statistic	0.06	0.18	0.13	0.21	0.20	0.17	0.00	0.10

Note: AE=Agricultural expenditure; EE=Education Expenditure; GFCF=Gross fixed capital formation; HE=Health expenditure; NEXPTS=Net Exports; SE= Security expenditure; TE=Transportation expenditure; Y= Real Gross domestic product. All figures above are in constant 2010 local currency. Source: Author's computations

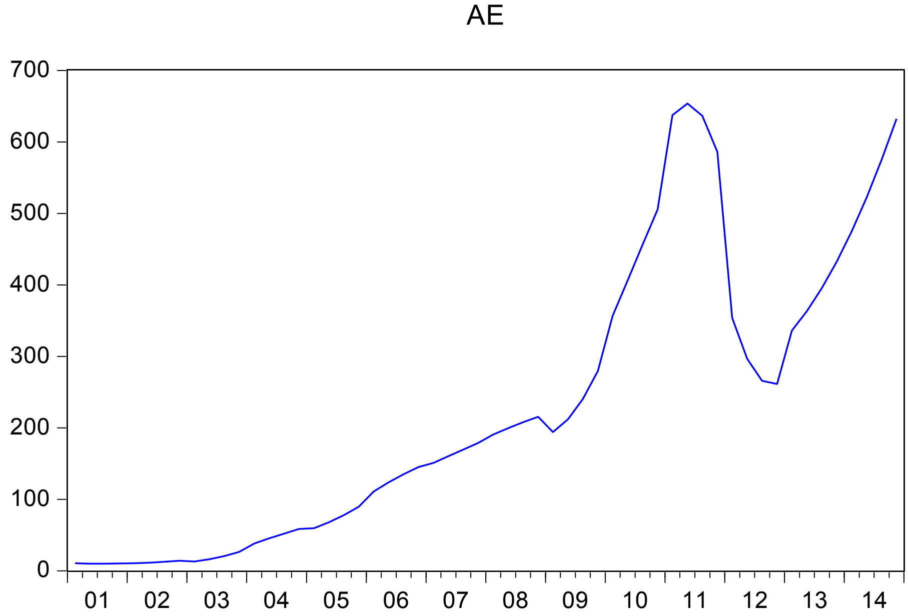
From table 3, above, it is observed that the variables vary widely in terms of their means, medians, standard deviations and Jarque-Bera statistics. The highest mean value is 17,008 million for the Y variable, followed by 4,944 million for GFCF, 775 million for HE, 286 million for SE, 227 million for AE, 176 million for EE, 156.4 million for NEXPTS, and 32 million for TE. With respect to the median, the highest value was 16, 189 million for Y followed 4630 million for GFCF, 752 million for HE, 298 million for SE, 185 million for AE, 165 million for EE, 20 million for TE, and -116.3 million for NEXPTS. The standard deviation is largest for the Y variable at 4993.6 million; followed by 2825 million for GFCF, 960 million for NEXPTS, 354 million for HE, 201 million for AE, 141 million for SE, 63,2 million for EE, and 26 million for TE.

However, what is common among all the variables, apart from the transport expenditure (TE) variable, is that they are normally distributed; because the p-value of their Jarque - Bera statistics are greater than 5%. Therefore, the null hypothesis of normality of the variables is not rejected for these variables. The non-normality of the distribution for the transport expenditure variable may be a reflection of the high volatility in government expenditure on transport infrastructure.

4.2 Unit Root Results

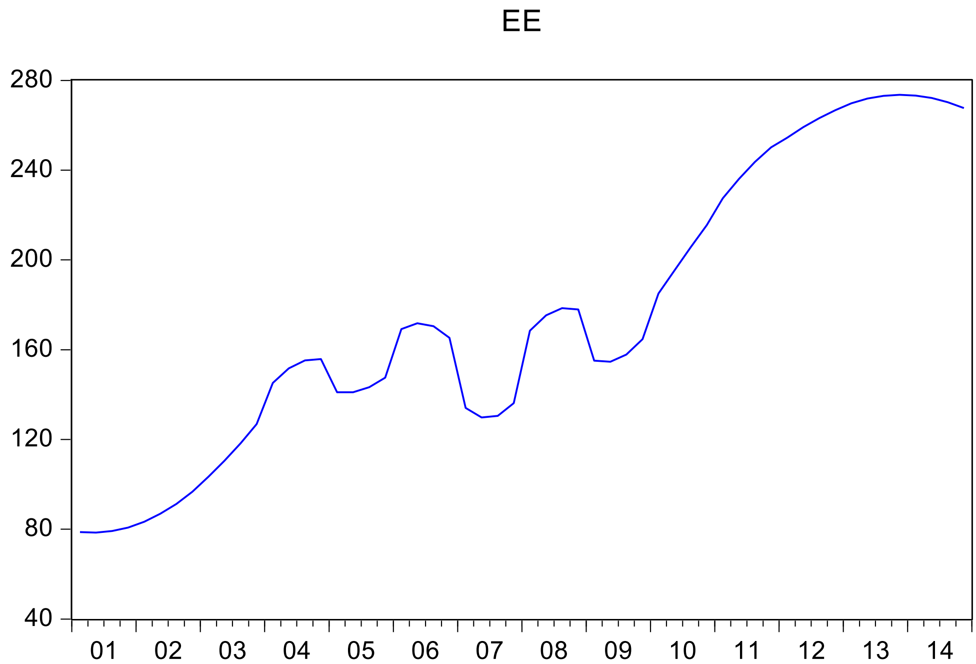
Two unit root tests were done in order to test for the stationarity of the variables in levels and at first difference. The econometric techniques applied, included, the Augmented Dickey-Fuller (ADF) and the Phillips-Peron (PP) tests. Prior to conducting the ADF and PP tests, a visual review of the movement of all the variables overtime was done. For example, for Agriculture (AE) and Education expenditures (EE), below, the visual graphs show an upward trend (figures 9 and 10). This may be indicative of variables that are non-stationary in levels.

Figure 9: Agriculture Expenditure (2001-2014)



Source: Author's elaboration

Figure 10: Education Expenditure (2001-2014)



Source: Author's elaboration

Table 4 highlights the findings of the results of Augmented Dickey-Fuller (ADF) test at level form. Detailed results are presented in appendix. The results indicate that the ADF test statistics are greater than the 5% level of significance; thereby, indicating that the variables are non-stationary in level form and that a unit root exists**.**

Table 4: Unit Root Test summary results (ADF Test - Level)

Variable	ADF test statistic level	5% ADF Critical Value
HE_t	-2.719076	-3.510740
EE_t	-2.895143	-3.510740
SE_t	-2.864465	-3.510740
AE_t	-3.415186	-3.502373
TE_t	-2.334171	-3.502373
$GFCF_t$	-2.649130	-3.502373
$NEXPTS_t$	-2.687413	-2.921175
y_t	-2.028722	-3.510740

Note: AE=Agricultural expenditure; EE=Education Expenditure; GFCF=Gross fixed capital formation; HE=Health expenditure; NEXPTS=Net Exports; SE= Security expenditure; TE=Transportation expenditure; Y=Gross domestic product growth.

Source: Author's computations

For example, the results show that for agriculture expenditure (AE), the ADF test statistic is higher than the 5% ADF critical value. This, therefore, implies that the variable is non-stationary in levels or has a unit root. At first difference the results from the ADF test indicated that all the variables except net exports and agriculture expenditure were non-stationary (table 5). The two variables become stationary at second difference.

Table 5: Unit Root Test Results (ADF Test – First Difference)

Variable	ADF test statistic First Difference	5% ADF Critical Value
HE_t	-1.736309	-3.510740
EE_t	-2.211096	-3.502373
SE_t	-1.780537	-3.510740
AE_t	-4.910470	-3.508508
TE_t	-2.738538	-3.502373
$GFCF_t$	-2.435168	-3.502373
$NEXPTS_t$	-2.959925	-2.921175
y_t	-3.253090	-3.495295

Note: AE=Agricultural expenditure; EE=Education Expenditure; GFCF=Gross fixed capital formation; HE=Health expenditure; NEXPTS=Net Exports; SE= Security expenditure; TE=Transportation expenditure; Y=Gross domestic product growth.

Source: Author's computations

To confirm the ADF test results, the Phillips-Perron (PP) test was undertaken. The summary results of the investigation are recorded in table 6, with detailed analysis included in the appendix. The data show that the PP test statistics for all the variables examined in level form are greater than the 5% PP critical value. This, therefore, confirms that all the variables are non-stationary and thus a unit root exists for all the variables in level form.

Table 6: Unit Root Test Results (Phillip-Perron test – level)

Variable	PP Statistic	5% PP Critical Value
HE_t	-2.690518	-3.493692
EE_t	-2.244300	-3.493692
SE_t	-2.398111	-3.493692
AE_t	-2.506219	-3.493692
TE_t	-2.681133	-3.493692
$GFCF_t$	-2.700260	-3.493692
$NEXPTS_t$	-2.238585	-2915522
y_t	-2.681133	-3.493692

Note: AE=Agricultural expenditure; EE=Education Expenditure; GFCF=Gross fixed capital formation; HE=Health expenditure; NEXPTS=Net Exports; SE= Security expenditure; TE=Transportation expenditure; Y=Gross domestic product growth.

Source: Author's computations

For purposes of determining whether the variables had a unit root at first difference the PP test was done. The findings of the PP test at first difference are presented in table 7. The results show that all variables, except net exports and real GDP, were stationary at first difference. The two variables, however, become stationary at second difference.

Table 7: Unit Root Test Results (Phillip-Perron Test – First Difference)

Variable	PP Statistic	5% PP Critical Value
HE_t	-4.827641	-3.495295
EE_t	-4.825216	-3.495295
SE_t	-4.335013	3.495295
AE_t	-4.112794	-3.495295
TE_t	-3.810799	-3.495295
$GFCF_t$	-4.251049	-3.495295
$NEXPTS_t$	-2.238585	-2.915522
y_t	-3.253090	-3.495295

Note: AE=Agricultural expenditure; EE=Education Expenditure; GFCF=Gross fixed capital formation; HE=Health expenditure; NEXPTS=Net Exports; SE= Security expenditure; TE=Transportation expenditure; Y=Gross domestic product growth.

Source: Author's computations

From table 7, above, it is noted that all the variables are non-stationary in levels and that they, generally, become stationary at first difference. This finding necessitates the need to carry out Johansen's test for cointegration.

4.3 Cointegration Results

After confirming the non-stationarity of variables, in level form, using the ADF model and Phillips-Perron test, the study proceeded to perform Johansen's cointegration test. The test for cointegration is necessitated by the order of integration of the variables, which was found to be one. The Johansen cointegration test suggests the existence of seven cointegrating equations on the basis of the trace test, at the conventional 5% level of significance (table 8). This implies that the estimation of seven error correction models as highlighted, further, below. The maximum eigenvalue test indicates no cointegrating equations (table 9). In the event of a contradiction between the trace and maximum eigenvalue test, the trace test is adopted (Juselius, n.d).

The Mackinnon-Haug-Michelis (1999) p-values were applied. The results of the Johansen cointegration test are summarized in the table below.

Table 8: Johansen Cointegration Test (Trace Test)

Hypothised No. of CEs	Trace Statistic	Critical Value [Trace] at 5%
None*	231.39	187.87
At most 1*	188.51	150.56
At most 2*	150.31	117.71
At most 3*	115.00	88.80
At most 4*	81.19	63.88
At most 5*	50.67	42.92
At most 6*	27.65	25.87
At most 7	7.36	12.52

*Note: * implies that the null hypothesis of no cointegrating relationships/vectors among the series is rejected at 5 % significance level.*

Source: Author's computations

Table 9: Johansen Cointegration Test (Maximum Eigenvalue Test)

Hypothised No. of CEs	Max-Eigen Statistic	Critical Value at 5%
None	42.9	56.7
At most 1	38.2	50.6
At most 2	35.3	44.5
At most 3	33.8	38.3
At most 4	30.5	32.1
At most 5	23.0	25.8
At most 6	20.3	19.4
At most 7	7.36	12.5

Note: The above table indicates no cointegrating equations on the basis of the maximum eigenvalue test.

Source: Author's computations

4.4 Vector Error Correction Model results

Having determined the non-stationarity of the variables and confirmed the presence of cointegration among the variables, the next stage involved investigating the existence of the short- and long-run dynamics among the variables. For this purpose, the VECM was estimated. The short-run results of the VECM are depicted in the table 10, below, based on the seven (7) cointegrating equations suggested by Johansen's trace test for cointegration.

From the results of the estimated vector error correction term for the first cointegrating equation, table 9, is statistically significant at the conventional 5% level of significance. The optimal lag length of two for the VECM was determined using the Schwarz information criterion. This criterion is ideal, especially if the sample size is not very large. However, the error correction terms for the other cointegrating equations are statistically insignificant. The stability condition of the VECM requires that the estimated coefficient of the vector error correction term be negative and statistically significant. This means, therefore, that there is a presence of a strong long-run relationship among the variables. Any short-run disequilibrium in the system will be corrected over the longer term. For example, when there is disequilibrium in the economic growth caused by a change in a variable within the system, it will adjust to its equilibrium level in the long-run.

The speed of adjustment, based on the first cointegrating equation, is equal to the estimated coefficient of the vector error correction term of -0.147. This means that if economic growth deviated from its long-run equilibrium value due to an external shock, it will converge to its long-run equilibrium at a rate of 14.7% in each subsequent period.

Table 10: VECM Results on the Basis of Seven Co-integrating Equations

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
CointEq1	-0.14663	0.05095	-2.878	0.0044**
CointEq2	-0.0417	0.05089	-0.8193	0.4134
CointEq3	0.211704	0.22904	0.92432	0.3563
CointEq4	-0.32078	1.45981	-0.2197	0.8263
CointEq5	0.942977	1.82899	0.51557	0.6066
CointEq6	-0.13934	0.37951	-0.3672	0.7138
CointEq7	0.015276	0.02473	0.61784	0.5373
D(Y(-1))	-0.19334	0.58156	-0.3325	0.7398
D(Y(-2))	-0.5461	0.57339	-0.9524	0.3419
D(GFCF(-1))	0.246148	0.05583	4.40888	0.0001***
D(GFCF(-2))	0.296521	0.1867	1.58825	0.1136
D(AE(-1))	-0.41551	0.6913	-0.6011	0.5484
D(AE(-2))	-0.63733	0.7001	-0.9104	0.3636
D(TE(-1))	4.461701	1.76387	2.5295	0.0001***
D(TE(-2))	5.00832	2.05694	2.43484	0.001***
D(EE(-1))	-2.49444	2.80783	-0.8884	0.3753
D(EE(-2))	-3.17285	3.12048	-1.0168	0.3103
D(HE(-1))	-0.13385	0.52811	-0.2535	0.8001
D(HE(-2))	-0.07586	0.59834	-0.1268	0.8992
D(NEXPTS(-1))	0.015269	0.05899	0.25886	0.796
D(NEXPTS(-2))	0.039479	0.05898	0.66939	0.5039
D(SE(-1))	-5.50206	4.91162	-1.1202	0.2638
D(SE(-2))	-8.11291	4.99369	-1.6246	0.1056
Intercept	561.9143	264.178	2.12703	0.0345**

*Notes: Note: AE=Agricultural expenditure; EE=Education Expenditure; GFCF=Gross fixed capital formation; HE=Health expenditure; NEXPTS=Net Exports; SE= Security expenditure; TE=Transportation expenditure; Y=Gross domestic product growth. ***, ** and* denotes significance at 1%, 5% and 10% respectively. (1) R-squared = 0.85, Adjusted R-squared = 0.74, F-statistic = 7.31; (2) A p-value less than 5% implies significance of the coefficient (and variable) * denotes significance at 5%.*

Source: Author's computations

From table 10, above, the R-squared value of 0.85 implies that 85% of the variations in the economic growth are explained by the variables included in the VECM. The relatively high R-squared of 85% and F-Statistic of 7.31, which are statistically significant at the conventional 5% significance level, show that all the explanatory variables jointly influence economic growth in Zambia. Before the results of the VECM can be exhaustively interpreted and discussed, it is important to first run some diagnostic tests on the assumptions made about the model. Table 11 shows the long-run results.

Table 11: Long-Run Results

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Intercept	6570.352	614.316	10.69539	0.0000***
EE	19.42627	8.40217	2.312054	0.0251**
HE	-2.86847	2.38909	-1.20065	0.2358
TE	16.8064	6.69866	2.508919	0.0155**
SE	3.51	3.88883	0.902585	0.2154
AE	3.399327	1.74056	1.953007	0.0567*
NEXPTS	0.131374	0.12509	1.050266	0.2989
GFCF	0.243774	0.207	1.177627	0.2448

*Note: AE=Agricultural expenditure; EE=Education Expenditure; GFCF=Gross fixed capital formation; HE=Health expenditure; NEXPTS=Net Exports; SE= Security expenditure; TE=Transportation expenditure; Y=Gross domestic product growth. ***, ** and* denotes significance at 1%, 5% and 10% respectively.*

Source: Author's computations

The diagnostic tests results are interpreted in the next subsection.

4.5 Diagnostic Tests

Next, there was need to determine whether the coefficients of the short- and long-run estimates obtained were unbiased, efficient and consistent, by conducting diagnostic tests for autocorrelation, heteroscedasticity and normality of the error terms. There was also need to determine whether the model was stable. The stability test is important to ensure that the system convergences in the long-run.

Table 12, below, summarizes the results of the diagnostic tests for the residuals. The Jarque-Bera test indicates that the residuals are not normally distributed at all levels of significance. This implies that the results of this study should be treated with caution because violation of the normality assumption of the error terms may result in estimates that are inefficient. In addition, the table indicates that on the basis of the Langrage Multiplier (LM) test, there was no serial correlation at the one per cent level of significance. Furthermore, on the basis of White's heteroscedasticity test (with no cross terms), the vector error correction residuals are homoscedastic at the one per cent level of significance.

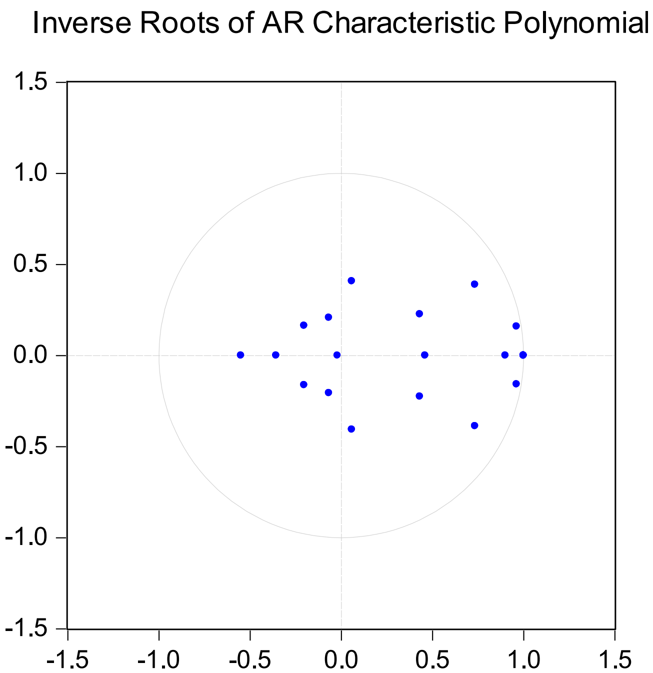
Furthermore, on the basis of the AR roots graph, the model was determined to be stable since all the roots had a modulus less than one and were positioned inside the unit circle (see figure 11). This implies that the system converges over time. Thus, the results of the VECM are reasonably reliable. As such, there is no need to run a heteroscedasticity- and autocorrelation-corrected (HAC) VECM. Although the error terms are not normally distributed, the fairly large sample size (of 56) may imply that there is little need to be concerned on the violation of the normality assumption because the estimates may be asymptotically efficient. Therefore, the specified model is a fairly good fit and the estimates are reasonably unbiased, efficient and consistent.

Table 12: Summary of Diagnostic Tests for the Residuals

Test	Null Hypothesis	Test Statistic	Probability	Conclusion
Langrage Multiplier (LM)	No serial correlation at lag *h**	9.54642 (LM-Stat)	0.1354	No serial correlation at lag two
White's	No heteroscedasticity	785.126 (Chi-Square)	0.1139	No heteroscedasticity
Jarque-Bera	Residuals are normally distributed	282.9649 (Jarque-Bera)	0.000	Residuals are not normally distributed
Stability Test	The model is stable	AR roots graph	-	The model is stable (all roots lie on the unit circle)

Source: Author's computations

Figure 11: AR Roots Stability Test

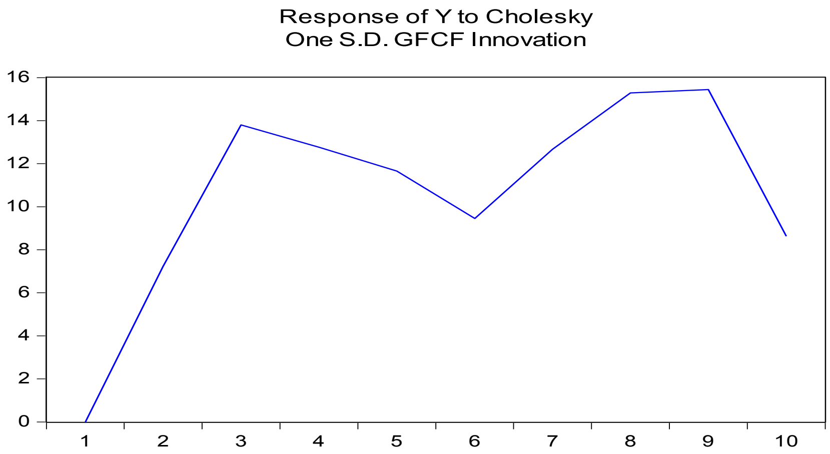


4.6 Impulse Response Functions

This study also estimated impulse response functions (IRFs) to show how economic growth responds to shocks in net exports, gross fixed capital formation and various components of government expenditure. The impulse response functions graphically illustrate the length and the magnitude of the responsiveness of economic growth to various shocks.

Figure 12 below shows the responsiveness of economic growth to a shock in gross fixed capital formation over 10 quarters. Within the first three quarters after the shock there is an increase in economic growth, before it falls slight over the next three quarters (although it is still positive). Over the next three quarters it increases slightly before falling by the 10th quarter.

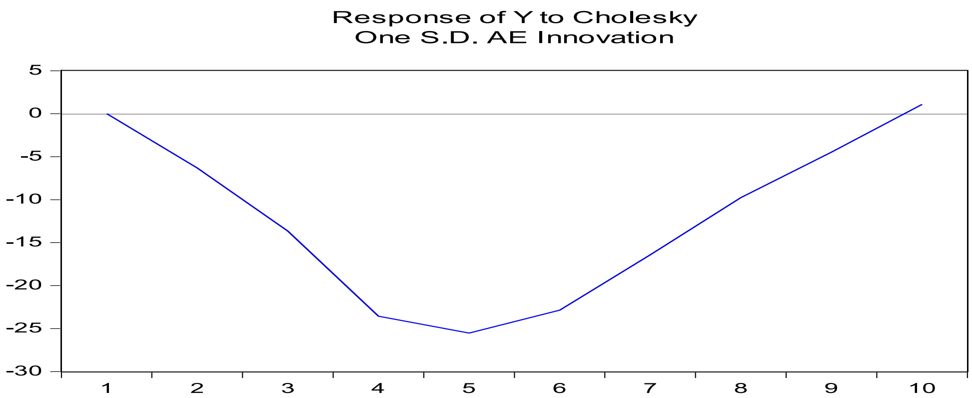
Figure 12: Response of Economic Growth to GFCF Shock



Source: Author's estimates

From figure 13 below, a one standard deviation shock to agriculture expenditure reduces economic growth in the first five quarters, after which it increases consistently over subsequent quarters.

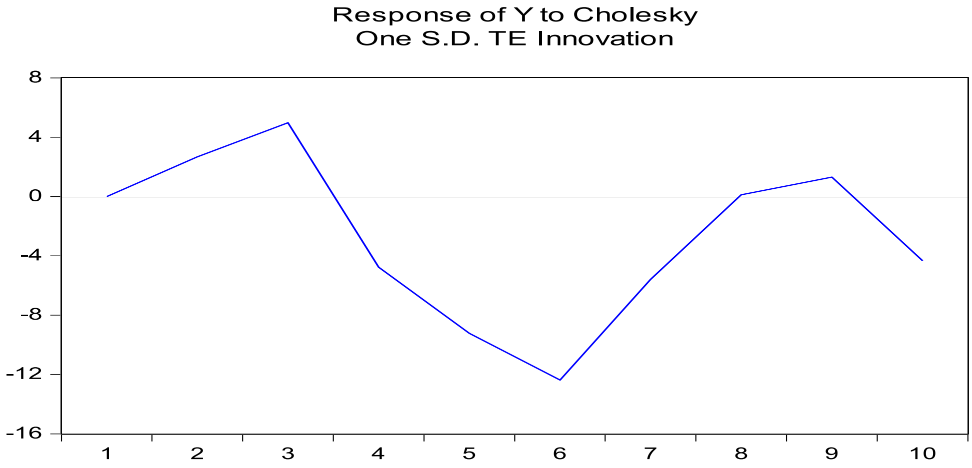
Figure 13: Response of Economic Growth to AE Shock



Source: Author's estimates

Figure 14, below, shows the response of the growth of the economy to shocks in transport expenditure. From the figure, it can be concluded that a one standard deviation transport expenditure innovation leads to swings in economic growth over the 10 quarters.

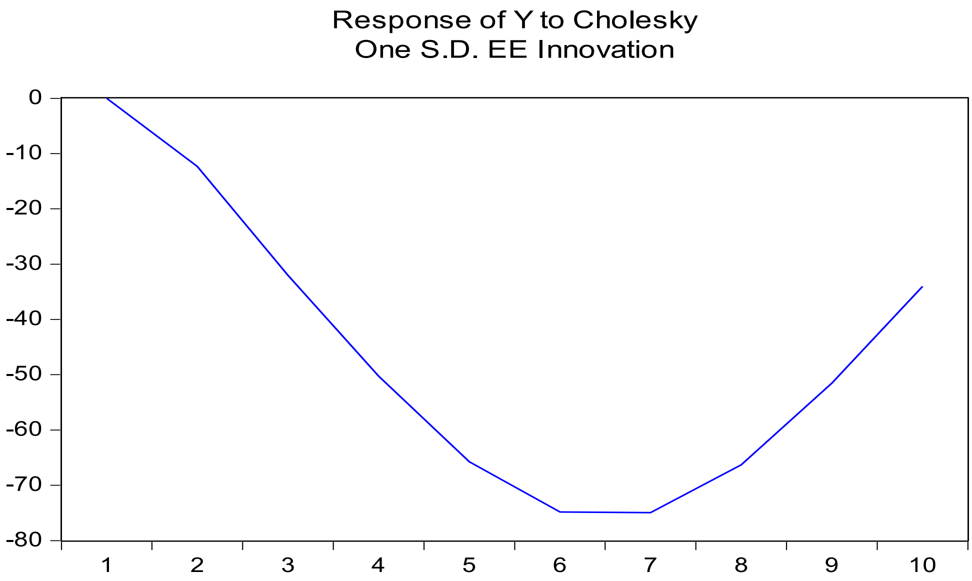
Figure 14: Response of Economic Growth to TE Shock



Source: Author's estimates

Figure 15, below, shows the response of the growth of the economy following a random shock to education expenditure. There is a consistent decline in economic growth up to the 7th quarter after which it begins to rise through to the 10th quarter.

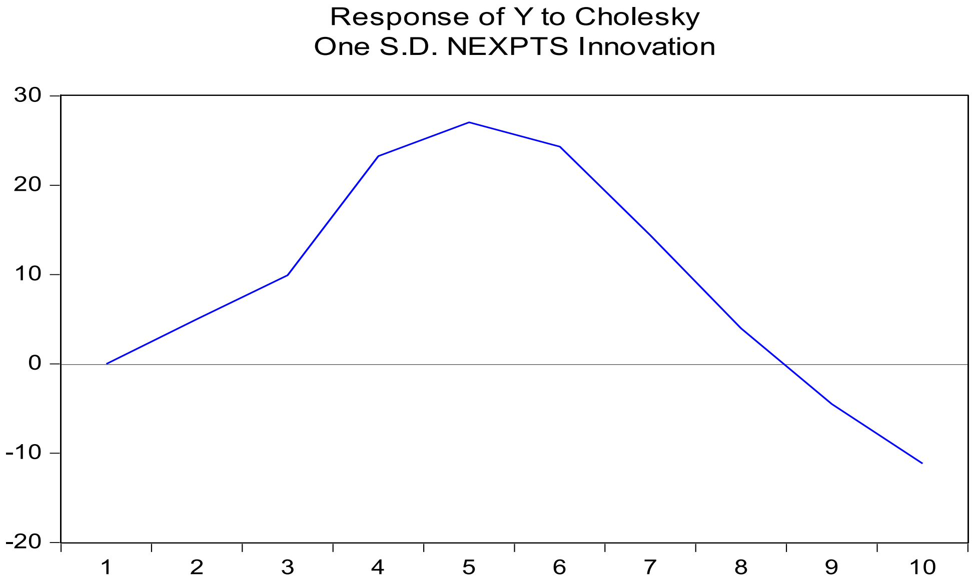
Figure 15: Response of Economic Growth to EE Shock



Source: Author's estimates

Figure 16, below, shows the response of economic growth as a result of a random shock to net exports. For the first five quarters, there is a gradual increase in economic growth; after which it gradually falls through to the 10th quarter.

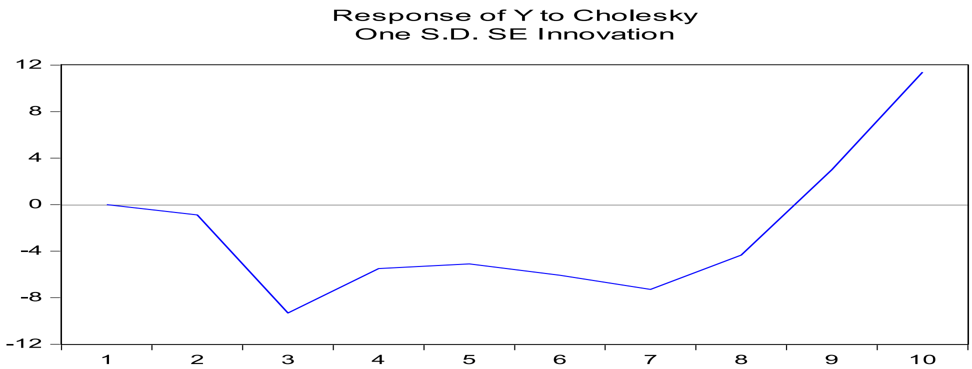
Figure 16: Response of Economic Growth to NEXPTS Shock



Source: Author's estimates

Figure 17, below, shows the response of economic growth to a random shock in security expenditure. For the first seven quarters, growth in real GDP fluctuates in the negatives. After the seventh quarter, however, the initial shock to security expenditure gradually increases economic growth.

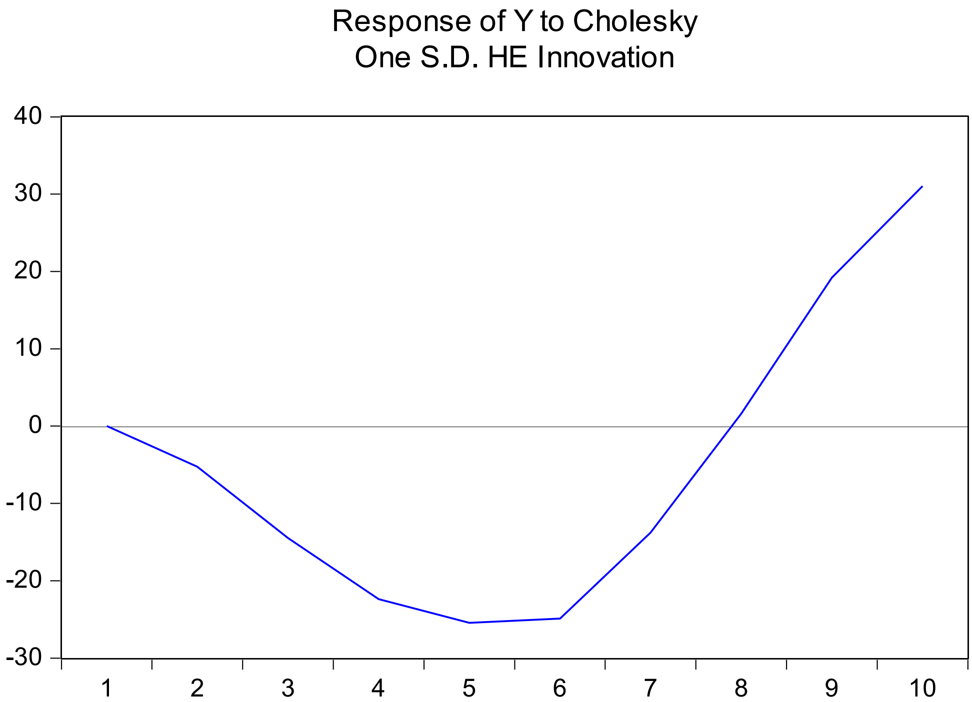
Figure 17: Response of Economic Growth to SE Shock



Source: Author's estimates

Figure 18, below, shows the response in economic growth to a one standard deviation health expenditure innovation. The figure shows that economic growth decline consistently, and is negative up to the sixth quarter, after which it begins to rise through to the 10th quarter.

Figure 18: Response of Economic Growth to HE Shock



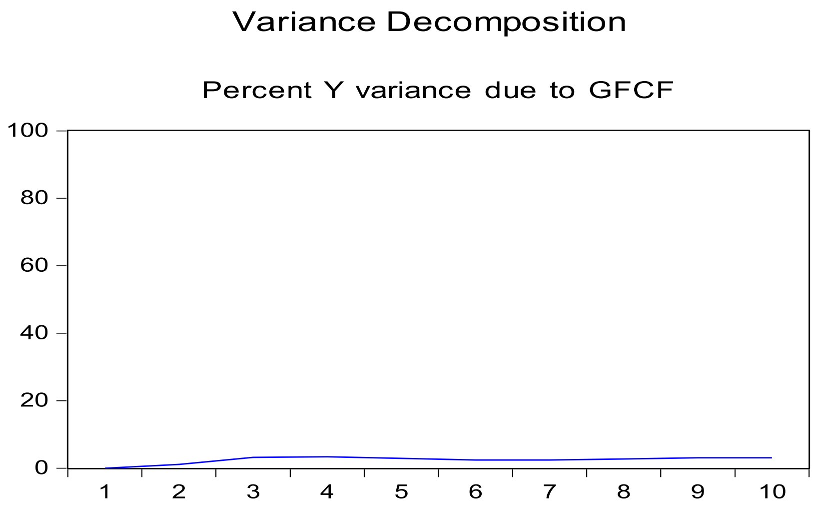
Source: Author's estimates

4.7 Variance Decomposition Analysis

The study also estimated the variance decomposition to illustrate the percentages that each of the shocks (to transport expenditure, health expenditure, education expenditure, agriculture expenditure, security expenditure, net exports, and gross fixed capital formation) contributed to the variations in economic growth over 10 quarters.

Figure 19 shows the percentage of the variance in economic growth due to shocks to gross fixed capital formation over the first ten quarters. The figure shows that this percentage of the variance in economic growth is relatively low, ranging between 2% and 4%.

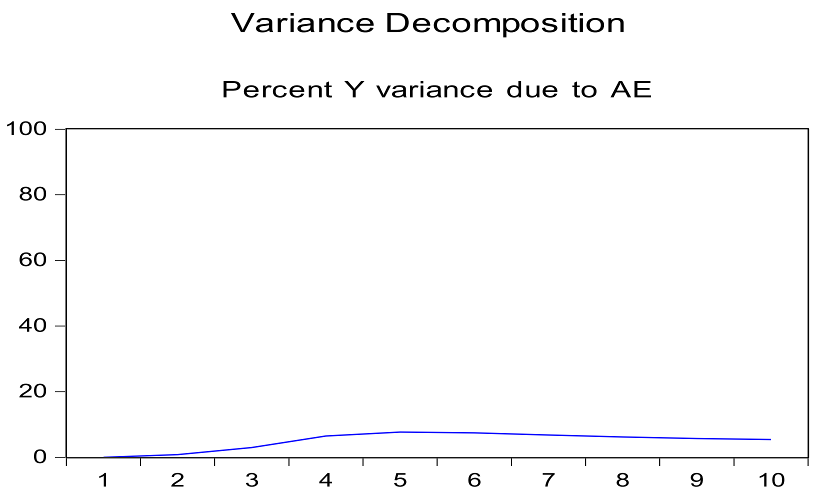
Figure 19: Percentage Variation in Economic Growth Due to Gross Fixed Capital Formation



Source: Author's estimates

Figure 20, below, shows the proportion of the variation in economic growth due to a shock to agriculture expenditure. The proportion increases gradually to about 6% by the 4^{th} quarter, after which it decreases slightly to about 5% by the 10^{th} quarter.

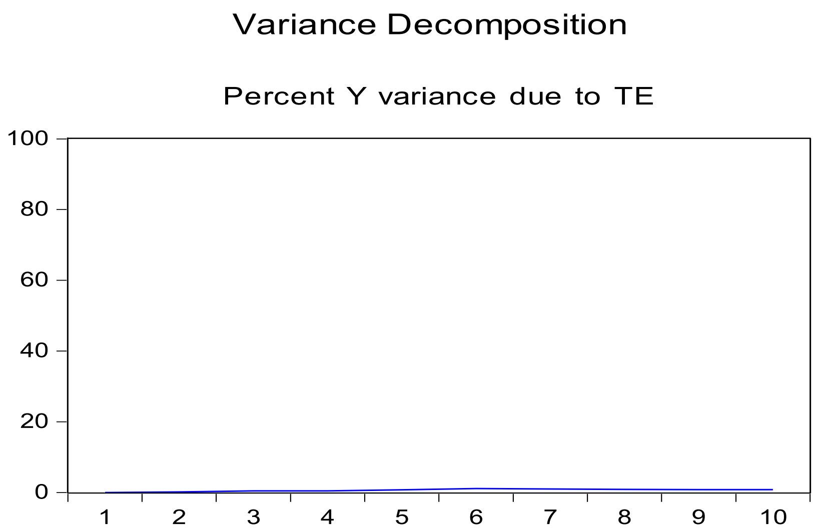
Figure 20: Percentage Variation in Economic Growth due to Agriculture Expenditure



Source: Author's estimates

Figure 21, below, shows the percentage of the variation in economic growth due to a shock to transport expenditure. The proportion is pretty lower, hovering around 1% over the ten quarters.

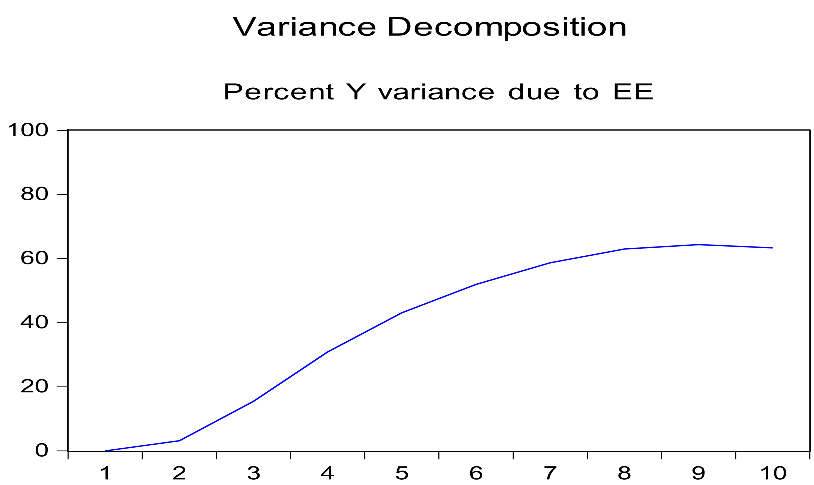
Figure 21: Percentage Variation in Economic Growth Due to Transport Expenditure



Source: Author's estimates

Figure 22, below, shows the contribution of shocks to education expenditure to variations in economic growth. The figure shows that education expenditure is an important contributor. Its contribution increases to as much as 60% by the 10th quarter.

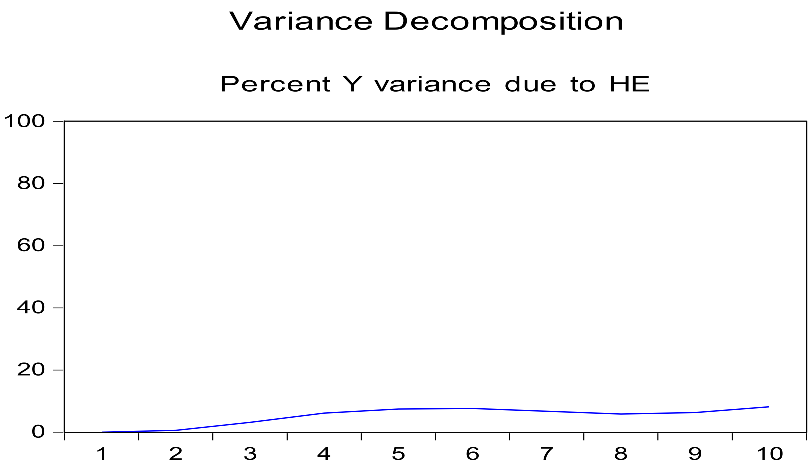
Figure 22: Percentage Variation in Economic Growth Due to Education Expenditure



Source: Author's estimates

Figure 23, below, shows the proportion of the variation in economic growth due to a random shock in health expenditure. The proportion increases gradually to about 7% by the 10th quarter.

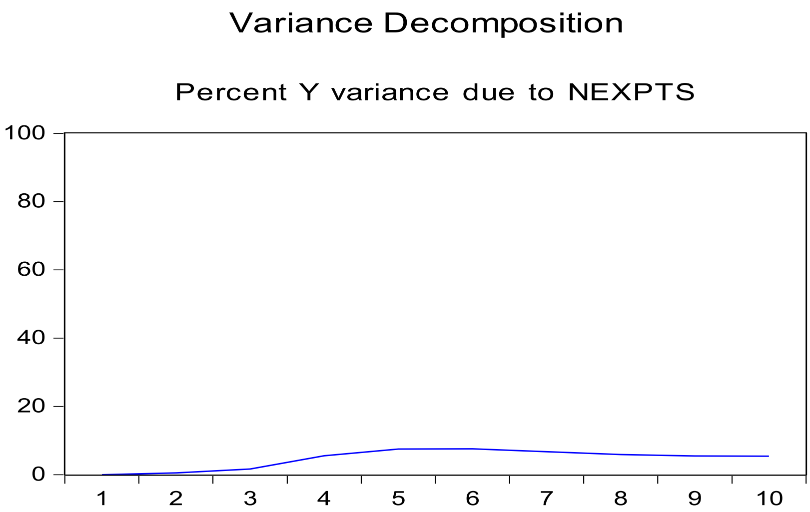
Figure 23: Percentage Variation in Economic Growth Due to Health Expenditure



Source: Author's estimates

Figure 24, below, shows the percentage of the variation in economic growth that is due to a random shock to net exports over ten quarters. The contribution of shocks to net exports to variations in economic growth increases to a maximum of about 6% by the 5th quarter. It then slightly declines to about 5% by the 10th quarter.

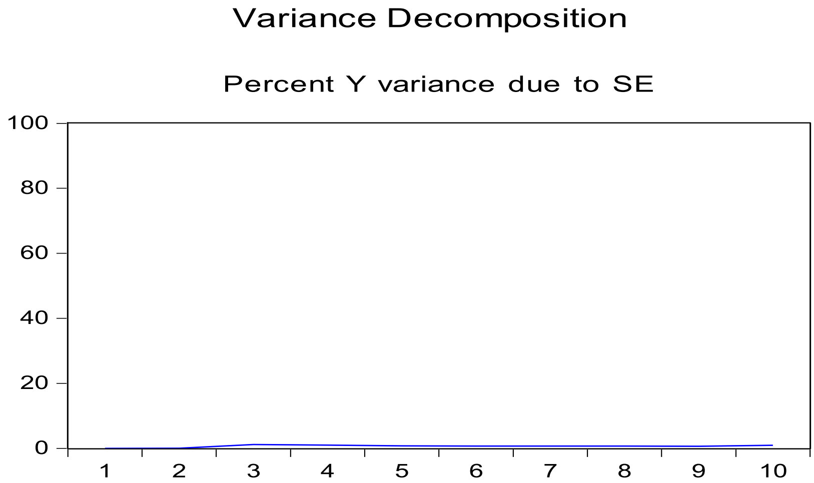
Figure 24: Percentage Variation in Economic Growth due to Net Exports



Source: Author's estimates

Figure 25, below, shows the proportion of the variation in economic growth due to a random shock in security expenditure. Like transport expenditure, the contribution of a random shock to security expenditure to variations in economic growth is very small, hovering around 1-2% over the ten quarters.

Figure 25: Percentage Variation in Economic Growth Due to Security Expenditure



Source: Author's estimates

4.8 Discussion of the Findings

Before progressing to the effect of the various components of government expenditure variables on economic growth, it is important to briefly discuss the effect of other control factors included in the model (net exports and gross fixed capital formation) on economic growth.

From table 10, above, gross fixed capital formation, was found to have a significant positive impact on economic growth in the short-run. This meant that in the short-run, an upsurge in the gross fixed capital formation had a corresponding positive impact on the growth of the economy. An increase in the expenditure on gross fixed capital formation gave rise to an increase in the economy. But this was to take effect in the short-run and not the long-run. This finding is consistent with a priori expectations of a positive impact, as well as findings by Alshahrani and Alsadiq (2014), who ,earlier, explained that government expenditure on areas such as health and education, may impact favorably on labor productivity and whilst public spending on roads and communication may tend to positively impact on the private domestic investment and which ultimately resulted in economic growth.

The study found that gross fixed capital formation had no significant impact on economic growth in the long-run as shown in table 11. On the other hand, net exports were found to have no significant impact on economic growth in both the short- and long-run. Further, it was noted that government expenditure on Agriculture sector was found to have no significant impact on economic growth in both the short-run and the long-run at the 5% significance level. That is, an increase public spending on agriculture led to no change in the growth of the economy. This result is inconsistent with the predictions of Keynes' and Musgrave's (2008) theories which predict that an increase in government expenditure leads to the growth of the economy, ceteris paribus. However, this finding is consistent with findings by scholars such as Chude and Chude (2013) and Gisore et al. (2014) who both found that government expenditure on agriculture had no statistically significant impact on the growth of the economy. This could partly be due to a focus on crop input and output price interventions (such as the farmer input support programme - FISP) that fail to increase agricultural productivity.

Government expenditure on transport infrastructure was found to have a significant positive impact on the growth of the economy in both the short- and long-run. The long-run impact is as expected especially that the returns to capital investments on such infrastructure as roads, bridges and schools take long to be realized. This result is consistent with the predictions of Keynes' and Musgrave's (2008) theories.

Expenditure on the education sector was found not to have any significant impact on the growth of the economy in the short-run. Being an investment in human capital, the insignificance of education expenditure on the growth of the economy is expected because returns to human capital can take a considerable period of time to be realized. However, this finding is consistent with the finding by Gisore et al. (2014) who highlighted that education expenditure had no significant positive impact on the growth of the economy in the short-run, mainly due to the low budgetary allocation to the education sector. The study however found that government expenditure on education sector was noted to have significant positive impact on the growth of the economy in the long-run. This research finding is also consistent with findings by Samundram et al. (2009) and Chude and Chude (2013) who argued that increasing government expenditure on education increased the growth of the economy because it increased the nation's stock of human capital.

Expenditure on health was observed to have no significant impact on the growth of the economy in the short-run. Again, since expenditure on the health sector can be viewed as an investment in people or human capital, the health expenditure is expected to impact the growth of the economy only with a lag. The study however found that the coefficient for health sector expenditure had the unexpected negative sign. This peculiar finding in the case of Zambia may be explained by the fact that much of the expenditure on health sector over the sample period has been devoted to dealing with the malaria and HIV/AIDS pandemics, rather than on ventures that significantly improve the nation's stock of human capital such as disease preventive measures (Richards, 2009). The study found that expenditure on health had no significant impact on the growth of the economy over the longer term.

Lastly, expenditure on the defense and security sector was found to have no impact on the growth of the economy in both the short- and long-run. This result may be explained by the fact that the budgetary allocation to the defense sector is inadequate to have any significant impact on the growth of the economy.

In summary, the study has found that only expenditure on transport infrastructure and gross fixed capital formation had significant positive impact on the growth of the economy in the short-run. In the long-run, government expenditure on education and transport had a significant positive impact on the growth of the economy. A peculiar finding was that, although not statistically significant, government expenditure on the health sector had a negative impact on the growth of the economy, against a priori expectations. Furthermore, the impulse response functions and the variance decomposition analysis have shown the impact of various components of government expenditure on economic growth is not instantaneous.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5. 0 Introduction

This chapter, on conclusion and recommendations, is divided into two parts. The first part summarizes the findings of this study. The second part presents the policy recommendations.

5. 1 Conclusion

This study investigated the impact of various components of government expenditure variables on economic growth in Zambia, between 2001Q1 and 2014Q4. In particular, the research set out to determine the impact of government expenditure variables on the growth of Zambian economy. In particular, focus was placed on public spending that included the agriculture, education, health, security and transport components of government expenditure. The study also incorporated two other control variables: gross fixed capital formation and net exports.

The study started by examining the time series properties of the expenditure variables. This was done to avoid estimating spurious regressions. On the basis of the Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) tests, it was found that the variables were stationary at first difference. Given this finding, the Johansen cointegration test was conducted; which found evidence of a stable long-run relationship among the variables.

The VECM results showed that only the education and transport components of government expenditure had a significant positive impact on the growth of the economy over the long-run. This meant, therefore, that an increase in government expenditure on the education and transport sectors of the economy resulted in an increase in the overall Zambian economy. This position was attained in the long-run. On the other hand and during the short-run, however, only expenditure on transport and gross fixed capital formation were found to have a significant positive impact on the growth of the economy. In this case, an increase in government spending on transport and gross fixed capital formation resulted in an upsurge on economic growth over the short-run.

The study made two peculiar findings with respect to the effect of expenditures on health and agriculture. The coefficient for the expenditure on health was found to have the unexpected negative sign (although insignificant), contrary to prior expectations of a positive sign. This typical finding may be explained by the increasing expenditure on treatment measures for epidemics such as HIV/AIDS and malaria, rather than on preventive measures that are more likely to contribute directly to the nation's stock of human capital. With respect to agriculture, the insignificance of expenditure on the agricultural sector in explaining economic growth may be due to economic distortions resulting from a heavy focus of expenditure on crop input and output price support programs.

5.2 Policy Recommendations

Based on the findings of the study, a number of recommendations are in order:

1. There is need to refocus agriculture sector expenditure away from input and output price support programs towards programs that directly increase technical efficiency (productivity) in the agricultural sector, such as investing in irrigation technology, adopting hybrid crop varieties, and improving agriculture extension services in key farming areas of the country. This positive shift in focus and

investment will transform the agriculture sector, into one, with the capability to register positive impact on the local economy in the short-run and long-run.

2. In order to increase the education sector's contribution to economic growth, there is need to increase the expenditure on the education sector (as a proportion of the total national budget) in order to grow the nation's stock of human capital. The increased expenditure to the education sector should not only focus on increasing access to basic education (quantity); but it should also focus on improving the quality of education.
3. Good transport infrastructure is vital for the transportation of humans and goods, and for opening up new markets. Therefore, there should be further increases in spending on road infrastructure especially in rural areas in order to open them up to greater economic activity. Opening of the previously unreached areas of the country will spur growth to the economy and allow people to meaningfully participate in commerce and trade.
4. Lastly, in order to ensure that the health sector contributes positively to the growth of the economy, there is need for policymakers to increase spending on disease preventive measures and not on treatment only. This move is expected to contribute more directly to the nation's stock of human capital over the long-run.

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APPENDIX

1. **ADF**

LEVEL

Null Hypothesis: AE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 5 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.415186	0.0608
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(AE)
Method: Least Squares
Date: 08/07/17 Time: 10:52
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AE(-1)	-0.262880	0.076974	-3.415186	0.0014
D(AE(-1))	0.637603	0.136196	4.681516	0.0000
D(AE(-2))	0.249565	0.133442	1.870211	0.0684
D(AE(-3))	0.181699	0.138187	1.314880	0.1957
D(AE(-4))	-0.400162	0.140702	-2.844042	0.0069
D(AE(-5))	0.391453	0.142510	2.746844	0.0088
C	-30.86655	14.17967	-2.176817	0.0352
@TREND("2001Q1")	3.129526	0.912642	3.429086	0.0014

R-squared	0.597436	Mean dependent var	12.42039
Adjusted R-squared	0.530342	S.D. dependent var	47.06649
S.E. of regression	32.25542	Akaike info criterion	9.930896
Sum squared resid	43697.31	Schwarz criterion	10.23682
Log likelihood	-240.2724	Hannan-Quinn	10.0473

		criter.	9
F-statistic	8.904456	Durbin-Watson stat	2.13744 6
Prob(F-statistic)	0.000001		

FIRST DIFFERENCE

Null Hypothesis: D(AE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.910470	0.0013
Test critical values:	1% level	-4.165756	
	5% level	-3.508508	
	10% level	-3.184230	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(AE,2)
Method: Least Squares
Date: 08/07/17 Time: 10:56
Sample (adjusted): 2003Q2 2014Q4
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AE(-1))	-1.278527	0.260368	-4.910470	0.0000
D(AE(-1),2)	0.706473	0.232937	3.032891	0.0044
D(AE(-2),2)	0.887289	0.220547	4.023128	0.0003
D(AE(-3),2)	0.981070	0.214443	4.574975	0.0001
D(AE(-4),2)	0.107237	0.171562	0.625063	0.5358
D(AE(-5),2)	0.357442	0.163280	2.189135	0.0350
D(AE(-6),2)	0.477350	0.159395	2.994768	0.0049
D(AE(-7),2)	0.572335	0.150725	3.797207	0.0005
C	10.15523	12.33773	0.823103	0.4157
@TREND("2001 Q1")	0.072531	0.349579	0.207481	0.8368

R-squared	0.619696	Mean dependent var	1.248201
Adjusted R-squared	0.527190	S.D. dependent var	46.99710

S.E. of regression	32.31577	Akaike info criterion	9.975290
Sum squared resid	38639.44	Schwarz criterion	10.36894
Log likelihood	-224.4193	Hannan-Quinn criter.	10.12342
F-statistic	6.698955	Durbin-Watson stat	1.766338
Prob(F-statistic)	0.000012		

2. PHILLIPS-PERRON

LEVELS

Null Hypothesis: AE has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.506219	0.3242
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1849.149
HAC corrected variance (Bartlett kernel)	4024.928

Phillips-Perron Test Equation
Dependent Variable: D(AE)
Method: Least Squares
Date: 08/07/17 Time: 11:02
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AE(-1)	-0.107711	0.064179	-1.678280	0.0993
C	-7.842568	13.10270	-0.598546	0.5521

@TREND("2001 Q1")	1.528768	0.780075	1.959769	0.0554

R-squared	0.068891	Mean dependent var	11.30882
Adjusted R-squared	0.033079	S.D. dependent var	44.97488
S.E. of regression	44.22477	Akaike info criterion	10.46945
Sum squared resid	101703.2	Schwarz criterion	10.57894
Log likelihood	-284.9098	Hannan-Quinn criter.	10.51179
F-statistic	1.923677	Durbin-Watson stat	0.906165
Prob(F-statistic)	0.156322		

FIRST DIFFERENCE

Null Hypothesis: D(AE) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.112794	0.0107
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1441.668
HAC corrected variance (Bartlett kernel)	1654.936

Phillips-Perron Test Equation
Dependent Variable: D(AE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:03
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AE(-1))	-0.473257	0.120107	-3.940304	0.0002
C	-0.170931	11.08297	-0.015423	0.9878
@TREND("2001 Q1")	0.217254	0.343102	0.633206	0.5294

R-squared	0.233902	Mean dependent var	1.074649
Adjusted R-squared	0.203859	S.D. dependent var	43.78743
S.E. of regression	39.07009	Akaike info criterion	10.22254
Sum squared resid	77850.06	Schwarz criterion	10.33304
Log likelihood	-273.0087	Hannan-Quinn criter.	10.26516
F-statistic	7.785573	Durbin-Watson stat	2.051733
Prob(F-statistic)	0.001120		

1. **ADF**

LEVELS

Null Hypothesis: EE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 9 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.895143	0.1735
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EE)
Method: Least Squares
Date: 08/07/17 Time: 11:08

Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EE(-1)	-0.152992	0.052844	-2.895143	0.0066
D(EE(-1))	0.777091	0.146751	5.295306	0.0000
D(EE(-2))	0.277009	0.167864	1.650196	0.1081
D(EE(-3))	0.176214	0.174122	1.012017	0.3187
D(EE(-4))	-1.211790	0.176677	-6.858797	0.0000
D(EE(-5))	1.052504	0.231214	4.552078	0.0001
D(EE(-6))	0.187071	0.167169	1.119047	0.2710
D(EE(-7))	0.098807	0.170206	0.580516	0.5654
D(EE(-8))	-0.440618	0.169994	-2.591967	0.0140
D(EE(-9))	0.465712	0.156614	2.973632	0.0054
C	10.53701	3.565077	2.955619	0.0056
@TREND("2001Q1")	0.518142	0.190701	2.717042	0.0103

R-squared	0.860245	Mean dependent var	3.415401
Adjusted R-squared	0.815030	S.D. dependent var	10.08128
S.E. of regression	4.335768	Akaike info criterion	5.991133
Sum squared resid	639.1619	Schwarz criterion	6.468170
Log likelihood	-125.7961	Hannan-Quinn criter.	6.169834
F-statistic	19.02574	Durbin-Watson stat	2.186636
Prob(F-statistic)	0.000000		

FIRST DIFFERENCE

Null Hypothesis: D(EE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.211096	0.4732
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:08
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EE(-1))	-0.420107	0.190000	-2.211096	0.0324
D(EE(-1),2)	0.155777	0.121345	1.283758	0.2061
D(EE(-2),2)	0.209786	0.119960	1.748806	0.0875
D(EE(-3),2)	0.227879	0.119661	1.904375	0.0636
D(EE(-4),2)	-0.662557	0.117360	-5.645497	0.0000
C	2.295903	1.740406	1.319176	0.1941
@TREND("2001Q1")	-0.026534	0.047960	-0.553251	0.5830

R-squared	0.816666	Mean dependent var	-0.123313
Adjusted R-squared	0.791085	S.D. dependent var	10.67296
S.E. of regression	4.878312	Akaike info criterion	6.136652
Sum squared resid	1023.311	Schwarz criterion	6.404336
Log likelihood	-146.4163	Hannan-Quinn criter.	6.238588
F-statistic	31.92420	Durbin-Watson stat	2.126379
Prob(F-statistic)	0.000000		

SECOND DIFFERENCE

Null Hypothesis: D(EE,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.071361	0.0129
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EE,3)
Method: Least Squares
Date: 08/07/17 Time: 11:09
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EE(-1),2)	-2.614158	0.642085	-4.071361	0.0002
D(EE(-1),3)	1.458605	0.592733	2.460812	0.0188
D(EE(-2),3)	1.519228	0.514240	2.954319	0.0055
D(EE(-3),3)	1.633318	0.417681	3.910445	0.0004
D(EE(-4),3)	0.374478	0.331990	1.127979	0.2668
D(EE(-5),3)	0.248339	0.295875	0.839336	0.4068
D(EE(-6),3)	0.312844	0.237691	1.316175	0.1964
D(EE(-7),3)	0.422922	0.150453	2.810998	0.0079
C	0.598641	1.902985	0.314580	0.7549
@TREND("2001Q1")	-0.027020	0.054362	-0.497030	0.6222

R-squared	0.941782	Mean dependent var	-0.022867
Adjusted R-squared	0.927228	S.D. dependent var	17.97434
S.E. of regression	4.848806	Akaike info criterion	6.185002
Sum squared resid	846.3930	Schwarz criterion	6.582533

Log likelihood	-132.2550	Hannan-Quinn criter.	6.33392 0
F-statistic	64.70786	Durbin-Watson stat	2.02952 4
Prob(F-statistic)	0.000000		

2. PHILLIPS-PERON

LEVELS

Null Hypothesis: EE has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.244300	0.4563
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	79.4798 3
HAC corrected variance (Bartlett kernel)	133.455 9

Phillips-Perron Test Equation
Dependent Variable: D(EE)
Method: Least Squares
Date: 08/07/17 Time: 11:10
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EE(-1)	-0.111896	0.064264	-1.741196	0.0876
C	11.53443	5.149274	2.240010	0.0294
@TREND("2001Q1")	0.405431	0.250725	1.617035	0.1119

R-squared	0.055348	Mean dependent var	3.435653
Adjusted R-squared	0.019016	S.D. dependent var	9.257146
S.E. of regression	9.168708	Akaike info criterion	7.322471
Sum squared resid	4371.390	Schwarz criterion	7.431962
Log likelihood	-198.3680	Hannan-Quinn criter.	7.364812
F-statistic	1.523378	Durbin-Watson stat	1.148633
Prob(F-statistic)	0.227542		

FIRST DIFFERENCE

Null Hypothesis: D(EE) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.825216	0.0014
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

*MacKinnon (1996) one-sided p-values.

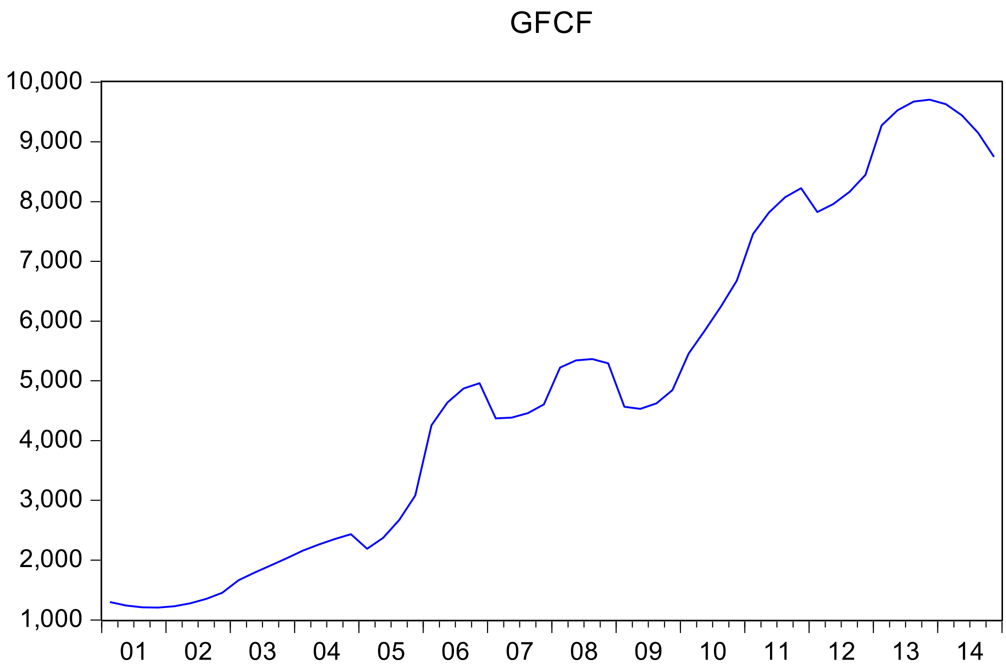
Residual variance (no correction)	72.15343
HAC corrected variance (Bartlett kernel)	81.15412

Phillips-Perron Test Equation
Dependent Variable: D(EE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:10
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EE(-1))	-0.605747	0.129019	-4.695029	0.0000
C	2.641225	2.519130	1.048467	0.2994
@TREND("2001 Q1")	-0.018830	0.076317	-0.246733	0.8061

R-squared	0.302471	Mean dependent var	-0.044919
Adjusted R-squared	0.275117	S.D. dependent var	10.26612
S.E. of regression	8.740581	Akaike info criterion	7.227783
Sum squared resid	3896.285	Schwarz criterion	7.338282
Log likelihood	-192.1501	Hannan-Quinn criter.	7.270398
F-statistic	11.05761	Durbin-Watson stat	1.997191
Prob(F-statistic)	0.000103		

Gross Fixed Capital Formation – GFCF



1. ADF

LEVELS

Null Hypothesis: GFCF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 5 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.649130	0.2615
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GFCF)
Method: Least Squares
Date: 08/07/17 Time: 11:12
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GFCF(-1)	-0.189221	0.071427	-2.649130	0.0113
D(GFCF(-1))	0.704066	0.138907	5.068630	0.0000
D(GFCF(-2))	0.187277	0.118590	1.579195	0.1218
D(GFCF(-3))	0.127174	0.121466	1.046993	0.3011
D(GFCF(-4))	-0.644711	0.122502	-5.262840	0.0000
D(GFCF(-5))	0.495839	0.141500	3.504164	0.0011
C	31.75179	78.16894	0.406194	0.6867
@TREND("2001Q1")	31.84431	12.55349	2.536690	0.0150

R-squared	0.657552	Mean dependent var	149.3834
Adjusted R-squared	0.600478	S.D. dependent var	331.7753
S.E. of regression	209.7078	Akaike info criterion	13.67495
Sum squared resid	1847049.	Schwarz criterion	13.98088
Log likelihood	-333.8738	Hannan-Quinn criter.	13.79145
F-statistic	11.52092	Durbin-Watson stat	2.101584
Prob(F-statistic)	0.000000		

FIRST DIFFERENCE

Null Hypothesis: D(GFCF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.435168	0.3578
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GFCF,2)
Method: Least Squares
Date: 08/07/17 Time: 11:12
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GFCF(-1))	-0.562296	0.230907	-2.435168	0.0191
D(GFCF(-1),2)	0.184584	0.163853	1.126521	0.2662
D(GFCF(-2),2)	0.291271	0.160151	1.818728	0.0759
D(GFCF(-3),2)	0.319255	0.157802	2.023139	0.0493
D(GFCF(-4),2)	-0.438763	0.149316	-2.938491	0.0053
C	111.4872	77.02479	1.447419	0.1550
@TREND("2001Q1")	-0.922796	2.289380	-0.403077	0.6889

R-squared	0.619748	Mean dependent var	-9.073025
Adjusted R-squared	0.566690	S.D. dependent var	340.1403
S.E. of regression	223.9018	Akaike info criterion	13.78947
Sum squared resid	2155677.	Schwarz criterion	14.05715
Log likelihood	-337.7367	Hannan-Quinn criter.	13.89140
F-statistic	11.68048	Durbin-Watson stat	1.97678

Prob(F-statistic)	0.000000		1

SECOND DIFFERENCE'

Null Hypothesis: D(GFCF,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.229396	0.0000
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GFCF,3)
Method: Least Squares
Date: 08/07/17 Time: 11:13
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GFCF(-1),2)	-1.808301	0.250132	-7.229396	0.0000
D(GFCF(-1),3)	0.680421	0.222754	3.054588	0.0038
D(GFCF(-2),3)	0.674222	0.174818	3.856704	0.0004
D(GFCF(-3),3)	0.703903	0.107751	6.532700	0.0000
C	63.43372	78.51461	0.807923	0.4235
@TREND("2001Q1")	-2.361288	2.332484	-1.012349	0.3169

R-squared	0.831719	Mean dependent var	-2.728150
Adjusted R-squared	0.812597	S.D. dependent var	545.4191
S.E. of regression	236.1126	Akaike info criterion	13.87866
Sum squared resid	2452962.	Schwarz criterion	14.10810
Log likelihood	-340.9665	Hannan-Quinn	13.9660

		criter.	3
F-statistic	43.49359	Durbin-Watson stat	2.24711 6
Prob(F-statistic)	0.000000		

2. **PHILIPS-PERRON**

LEVELS

Null Hypothesis: GFCF has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.700260	0.2407
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	92658.1 1
HAC corrected variance (Bartlett kernel)	177542. 3

Phillips-Perron Test Equation
Dependent Variable: D(GFCF)
Method: Least Squares
Date: 08/07/17 Time: 11:16
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GFCF(-1)	-0.141277	0.068988	-2.047859	0.0456
C	140.1480	85.84753	1.632522	0.1086
@TREND("2001 Q1")	24.42880	12.07081	2.023792	0.0481

R-squared	0.074863	Mean dependent var	135.392 6
Adjusted R-	0.039281	S.D. dependent var	319.391

squared			4
S.E. of regression	313.0555	Akaike info criterion	14.38364
Sum squared resid	5096196.	Schwarz criterion	14.49313
Log likelihood	-392.5501	Hannan-Quinn criter.	14.42598
F-statistic	2.103958	Durbin-Watson stat	0.984762
Prob(F-statistic)	0.132237		

FIRST DIFFERENCE

Null Hypothesis: D(GFCF) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.251049	0.0073
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

*MacKinnon (1996) one-sided p-values.

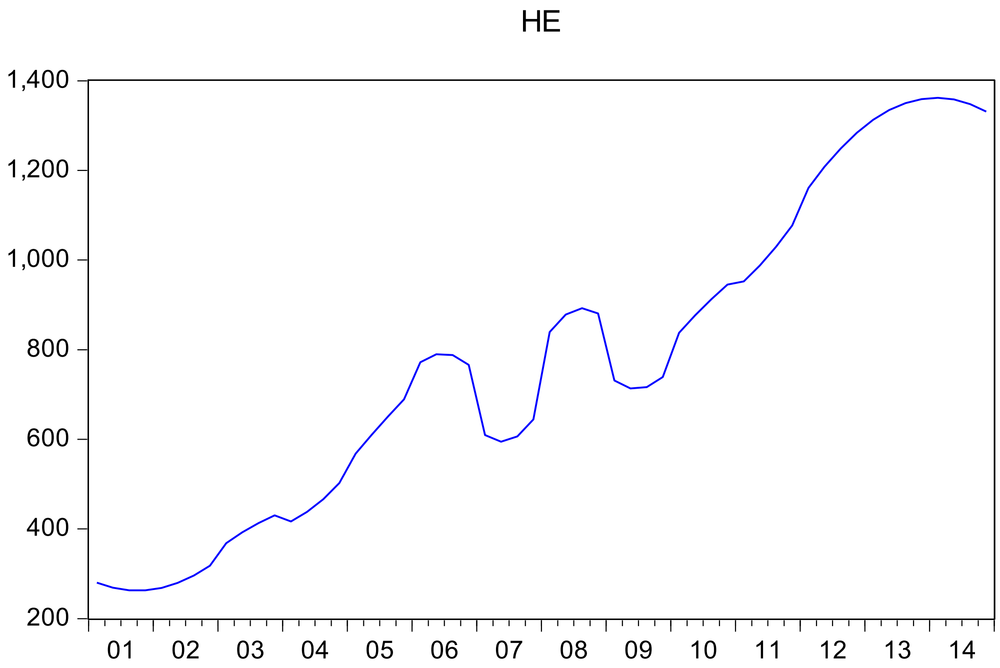
Residual variance (no correction)	78873.84
HAC corrected variance (Bartlett kernel)	90045.04

Phillips-Perron Test Equation
Dependent Variable: D(GFCF,2)
Method: Least Squares
Date: 08/07/17 Time: 11:16
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GFCF(-1))	-0.516648	0.126927	-4.070420	0.0002
C	90.94542	83.01035	1.095591	0.2784
@TREND("2001Q1")	-0.780232	2.530059	-0.308385	0.7590

R-squared	0.249334	Mean dependent var	-6.404792
Adjusted R-squared	0.219897	S.D. dependent var	327.1916
S.E. of regression	288.9870	Akaike info criterion	14.22459
Sum squared resid	4259187.	Schwarz criterion	14.33509
Log likelihood	-381.0640	Hannan-Quinn criter.	14.26721
F-statistic	8.469852	Durbin-Watson stat	2.010513
Prob(F-statistic)	0.000667		

HE



1. **ADF**

LEVELS

Null Hypothesis: HE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 9 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.719076	0.2341
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HE)
Method: Least Squares
Date: 08/07/17 Time: 11:17
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HE(-1)	-0.200720	0.073819	-2.719076	0.0102
D(HE(-1))	0.848841	0.147891	5.739628	0.0000
D(HE(-2))	0.275031	0.152666	1.801525	0.0805
D(HE(-3))	0.197228	0.158265	1.246188	0.2212
D(HE(-4))	-1.211113	0.161729	-7.488516	0.0000
D(HE(-5))	1.120739	0.223681	5.010429	0.0000
D(HE(-6))	0.162630	0.147044	1.105997	0.2765
D(HE(-7))	0.099215	0.149542	0.663462	0.5115
D(HE(-8))	-0.554141	0.150402	-3.684395	0.0008
D(HE(-9))	0.558637	0.149574	3.734846	0.0007
C	31.47656	11.97884	2.627680	0.0128
@TREND("2001Q1")	3.963890	1.503234	2.636909	0.0125

R-squared	0.845375	Mean dependent var	20.41231
Adjusted R-squared	0.795349	S.D. dependent var	52.45674
S.E. of regression	23.73057	Akaike info criterion	9.390864
Sum squared resid	19146.76	Schwarz criterion	9.867901
Log likelihood	-203.9899	Hannan-Quinn criter.	9.569565
F-statistic	16.89878	Durbin-Watson stat	2.266220

Prob(F-statistic)	0.000000

FIRST DIFFERENCE

Null Hypothesis: D(HE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 8 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.736309	0.7188
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:19
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HE(-1))	-0.558226	0.321501	-1.736309	0.0913
D(HE(-1),2)	0.288283	0.275275	1.047254	0.3022
D(HE(-2),2)	0.440753	0.270338	1.630379	0.1120
D(HE(-3),2)	0.482364	0.270310	1.784486	0.0830
D(HE(-4),2)	-0.916019	0.265562	-3.449365	0.0015
D(HE(-5),2)	0.064693	0.162250	0.398725	0.6925
D(HE(-6),2)	0.191628	0.159789	1.199255	0.2385
D(HE(-7),2)	0.224550	0.159728	1.405830	0.1686
D(HE(-8),2)	-0.431122	0.154461	-2.791138	0.0084
C	13.56234	10.87974	1.246567	0.2208
@TREND("2001Q1")	-0.051439	0.305650	-0.168295	0.8673

R-squared	0.846749	Mean dependent var	-0.886685
Adjusted R-squared	0.802963	S.D. dependent var	58.13877
S.E. of regression	25.80712	Akaike info	9.54414

		criterion	6
Sum squared resid	23310.27	Schwarz criterion	9.98143 0
Log likelihood	-208.5154	Hannan-Quinn criter.	9.70795 5
F-statistic	19.33837	Durbin-Watson stat	1.98664 7
Prob(F-statistic)	0.000000		

SECOND DIFFERENCE

Null Hypothesis: D(HE,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.978727	0.0011
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HE,3)
Method: Least Squares
Date: 08/07/17 Time: 11:19
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HE(-1),2)	-2.918532	0.586200	-4.978727	0.0000
D(HE(-1),3)	1.786837	0.540817	3.303962	0.0022
D(HE(-2),3)	1.817737	0.468999	3.875778	0.0004
D(HE(-3),3)	1.890121	0.382443	4.942234	0.0000
D(HE(-4),3)	0.572916	0.306495	1.869252	0.0697
D(HE(-5),3)	0.473615	0.270585	1.750333	0.0886
D(HE(-6),3)	0.508193	0.214230	2.372179	0.0231
D(HE(-7),3)	0.575725	0.133677	4.306847	0.0001
C	6.734364	10.42419	0.646032	0.5224
@TREND("2001Q1")	-0.224010	0.297017	-0.754200	0.4556

R-squared	0.936079	Mean dependent	0.42317

		var	9
Adjusted R-squared	0.920099	S.D. dependent var	93.8185 2
S.E. of regression	26.51945	Akaike info criterion	9.58329 4
Sum squared resid	25318.13	Schwarz criterion	9.98082 5
Log likelihood	-210.4158	Hannan-Quinn criter.	9.73221 2
F-statistic	58.57748	Durbin-Watson stat	2.10295 3
Prob(F-statistic)	0.000000		

PHILLIPS-PERRON

LEVELS

Null Hypothesis: HE has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.690518	0.2445
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	2114.77 0
HAC corrected variance (Bartlett kernel)	3548.39 4

Phillips-Perron Test Equation
Dependent Variable: D(HE)
Method: Least Squares
Date: 08/07/17 Time: 11:19
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

HE(-1)	-0.157466	0.072586	-2.169379	0.0346
C	43.24086	18.12146	2.386168	0.0207
@TREND("2001 Q1")	3.441729	1.582117	2.175394	0.0342

R-squared	0.084482	Mean dependent var	19.11402
Adjusted R-squared	0.049270	S.D. dependent var	48.50456
S.E. of regression	47.29457	Akaike info criterion	10.60367
Sum squared resid	116312.4	Schwarz criterion	10.71316
Log likelihood	-288.6009	Hannan-Quinn criter.	10.64601
F-statistic	2.399219	Durbin-Watson stat	1.141326
Prob(F-statistic)	0.100772		

FIRST DIFFERENCE

Null Hypothesis: D(HE) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.827641	0.0014
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

*MacKinnon (1996) one-sided p-values.

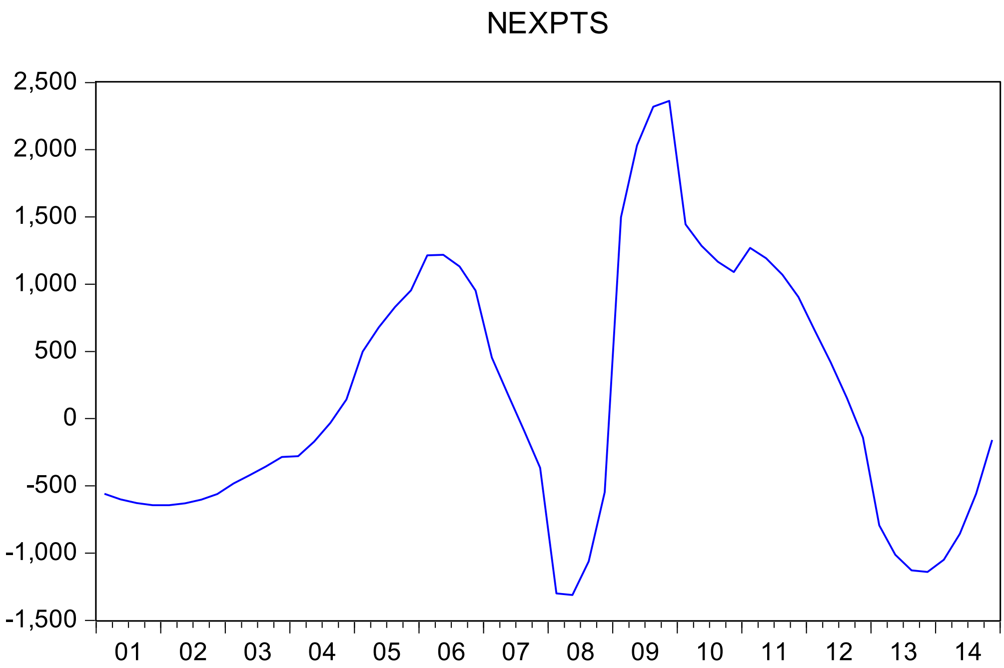
Residual variance (no correction)	1981.242
HAC corrected variance (Bartlett kernel)	2203.623

Phillips-Perron Test Equation
Dependent Variable: D(HE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:20
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HE(-1))	-0.609707	0.129446	-4.710131	0.0000
C	12.35661	13.11536	0.942149	0.3506
@TREND("2001Q1")	-0.014086	0.400774	-0.035146	0.9721

R-squared	0.304278	Mean dependent var	-0.102963
Adjusted R-squared	0.276995	S.D. dependent var	53.86541
S.E. of regression	45.80159	Akaike info criterion	10.54047
Sum squared resid	106987.1	Schwarz criterion	10.65097
Log likelihood	-281.5926	Hannan-Quinn criter.	10.58308
F-statistic	11.15259	Durbin-Watson stat	1.991648
Prob(F-statistic)	0.000096		

NEXPTS



1. ADF

LEVELS

Null Hypothesis: NEXPTS has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.687413	0.0833
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NEXPTS)
Method: Least Squares
Date: 08/07/17 Time: 11:22
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NEXPTS(-1)	-0.160306	0.059651	-2.687413	0.0102
D(NEXPTS(-1))	0.631042	0.137723	4.581963	0.0000
D(NEXPTS(-2))	0.200498	0.130670	1.534384	0.1323
D(NEXPTS(-3))	0.126059	0.134081	0.940172	0.3524
D(NEXPTS(-4))	-0.525716	0.135314	-3.885169	0.0003
D(NEXPTS(-5))	0.401739	0.141474	2.839673	0.0069
C	47.43511	43.95913	1.079073	0.2866

R-squared	0.578744	Mean dependent var	9.408824
Adjusted R-squared	0.519964	S.D. dependent var	419.8703
S.E. of regression	290.9057	Akaike info criterion	14.31305
Sum squared resid	3638923.	Schwarz criterion	14.58074
Log likelihood	-350.8263	Hannan-Quinn criter.	14.41499
F-statistic	9.845934	Durbin-Watson stat	2.105980
Prob(F-statistic)	0.000001		

FIRST DIFFERENCE

Null Hypothesis: D(NEXPTS) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.959925	0.0458
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NEXPTS,2)
Method: Least Squares
Date: 08/07/17 Time: 11:23
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NEXPTS(-1))	-0.585531	0.197819	-2.959925	0.0049
D(NEXPTS(-1),2)	0.150784	0.156713	0.962166	0.3412
D(NEXPTS(-2),2)	0.294558	0.153317	1.921233	0.0612
D(NEXPTS(-3),2)	0.336535	0.152650	2.204622	0.0328
D(NEXPTS(-4),2)	-0.299641	0.145594	-2.058056	0.0455
C	5.968449	43.97638	0.135719	0.8927

R-squared	0.502805	Mean dependent var	7.730377
Adjusted R-squared	0.446306	S.D. dependent var	417.6751
S.E. of regression	310.7948	Akaike info criterion	14.42831
Sum squared resid	4250109.	Schwarz criterion	14.65775
Log likelihood	-354.7077	Hannan-Quinn criter.	14.51568
F-statistic	8.899292	Durbin-Watson stat	1.969364
Prob(F-statistic)	0.000007		

PHILLIPS-PERRON

LEVELS

Null Hypothesis: NEXPTS has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.238585	0.1954
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	149769.2
HAC corrected variance (Bartlett kernel)	311030.2

Phillips-Perron Test Equation
Dependent Variable: D(NEXPTS)
Method: Least Squares
Date: 08/07/17 Time: 11:24
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NEXPTS(-1)	-0.089510	0.055416	-1.615235	0.1122
C	21.66800	53.90312	0.401980	0.6893

R-squared	0.046917	Mean dependent var	7.246945
Adjusted R-squared	0.028934	S.D. dependent var	400.0648
S.E. of regression	394.2346	Akaike info criterion	14.82746
Sum squared resid	8237307.	Schwarz criterion	14.90045
Log likelihood	-405.7550	Hannan-Quinn criter.	14.85568

			0.95524
F-statistic	2.608985	Durbin-Watson stat	2
Prob(F-statistic)	0.112198		

FIRST DIFFERNCE

Null Hypothesis: NEXPTS has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.238585	0.1954
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	149769.2
HAC corrected variance (Bartlett kernel)	311030.2

Phillips-Perron Test Equation
Dependent Variable: D(NEXPTS)
Method: Least Squares
Date: 08/07/17 Time: 11:24
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NEXPTS(-1)	-0.089510	0.055416	-1.615235	0.1122
C	21.66800	53.90312	0.401980	0.6893

R-squared	0.046917	Mean dependent var	7.246945
Adjusted R-squared	0.028934	S.D. dependent var	400.0648
S.E. of regression	394.2346	Akaike info criterion	14.82746
Sum squared resid	8237307.	Schwarz criterion	14.90045
Log likelihood	-405.7550	Hannan-Quinn	14.8556

		criter.	8
F-statistic	2.608985	Durbin-Watson stat	0.95524 2
Prob(F-statistic)	0.112198		

Null Hypothesis: D(NEXPTS) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.256610	0.0013
Test critical values:	1% level	-3.557472	
	5% level	-2.916566	
	10% level	-2.596116	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	119864.2
HAC corrected variance (Bartlett kernel)	137825.8

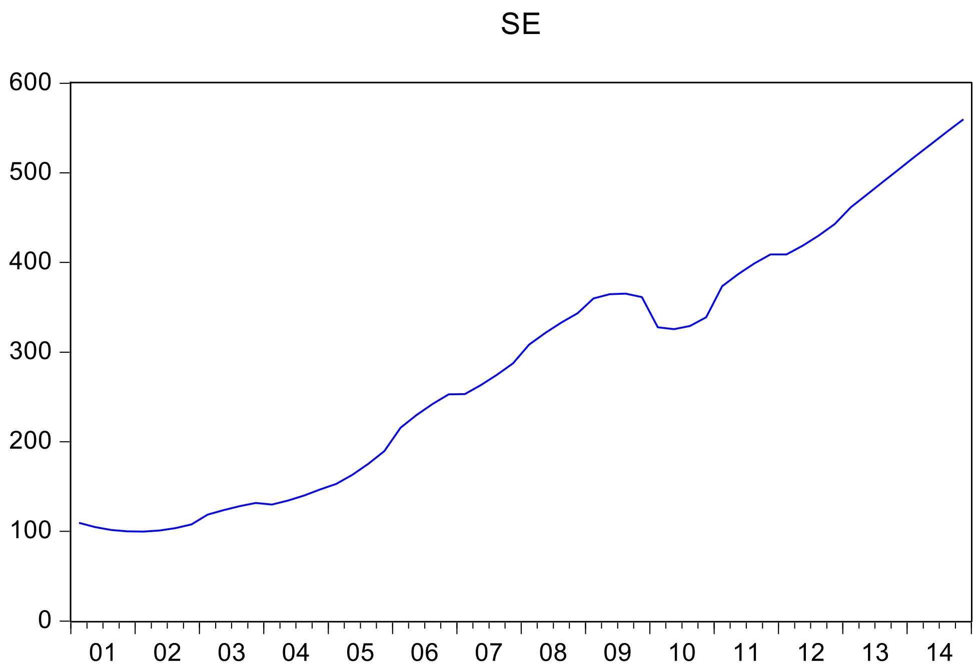
Phillips-Perron Test Equation
Dependent Variable: D(NEXPTS,2)
Method: Least Squares
Date: 08/07/17 Time: 11:24
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NEXPTS(-1))	-0.494581	0.121116	-4.083541	0.0002
C	8.181619	48.01127	0.170410	0.8653

R-squared	0.242814	Mean dependent var	8.196334
Adjusted R-squared	0.228252	S.D. dependent var	401.6081
S.E. of regression	352.8093	Akaike info criterion	14.60607
Sum squared resid	6472669.	Schwarz criterion	14.67973
Log likelihood	-392.3638	Hannan-Quinn	14.6344

		criter.	8
F-statistic	16.67531	Durbin-Watson stat	2.03331 3
Prob(F-statistic)	0.000154		

SE



1. ADF

LEVELS

Null Hypothesis: SE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 9 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.864465	0.1831
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SE)

Method: Least Squares
Date: 08/07/17 Time: 11:26
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SE(-1)	-0.183120	0.063928	-2.864465	0.0071
D(SE(-1))	0.788167	0.133502	5.903805	0.0000
D(SE(-2))	0.266156	0.148537	1.791841	0.0821
D(SE(-3))	0.188349	0.153026	1.230834	0.2268
D(SE(-4))	-1.005345	0.154459	-6.508796	0.0000
D(SE(-5))	0.878761	0.185178	4.745496	0.0000
D(SE(-6))	0.151551	0.144951	1.045535	0.3032
D(SE(-7))	0.103367	0.146920	0.703561	0.4865
D(SE(-8))	-0.577595	0.147486	-3.916256	0.0004
D(SE(-9))	0.518618	0.132438	3.915927	0.0004
C	3.077188	2.224441	1.383353	0.1756
@TREND("2001Q1")	1.619217	0.555662	2.914035	0.0063

R-squared	0.780460	Mean dependent var	9.476089
Adjusted R-squared	0.709433	S.D. dependent var	9.633077
S.E. of regression	5.192640	Akaike info criterion	6.351820
Sum squared resid	916.7595	Schwarz criterion	6.828857
Log likelihood	-134.0919	Hannan-Quinn criter.	6.530521
F-statistic	10.98814	Durbin-Watson stat	2.206640
Prob(F-statistic)	0.000000		

FIRST DIFFERENCE

Null Hypothesis: D(SE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 8 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.780537	0.6979
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:27
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SE(-1))	-0.411759	0.231256	-1.780537	0.0837
D(SE(-1),2)	0.165576	0.209973	0.788559	0.4357
D(SE(-2),2)	0.316491	0.204591	1.546946	0.1309
D(SE(-3),2)	0.362332	0.205604	1.762278	0.0868
D(SE(-4),2)	-0.797494	0.204832	-3.893399	0.0004
D(SE(-5),2)	0.057402	0.147676	0.388704	0.6998
D(SE(-6),2)	0.160939	0.145638	1.105059	0.2767
D(SE(-7),2)	0.192284	0.146752	1.310262	0.1986
D(SE(-8),2)	-0.470981	0.144281	-3.264320	0.0025
C	2.850431	2.441150	1.167659	0.2508
@TREND("2001Q1")	0.037978	0.069752	0.544471	0.5896

R-squared	0.728905	Mean dependent var	0.189738
Adjusted R-squared	0.651449	S.D. dependent var	9.658367
S.E. of regression	5.702129	Akaike info criterion	6.524524
Sum squared resid	1137.999	Schwarz criterion	6.961807
Log likelihood	-139.0640	Hannan-Quinn criter.	6.688333
F-statistic	9.410585	Durbin-Watson stat	2.033924
Prob(F-statistic)	0.000000		

SECOND DIFFERENCE

Null Hypothesis: D(SE,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.787128	0.0018
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SE,3)
Method: Least Squares
Date: 08/07/17 Time: 11:28
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SE(-1),2)	-2.634113	0.550249	-4.787128	0.0000
D(SE(-1),3)	1.506150	0.508707	2.960739	0.0054
D(SE(-2),3)	1.541243	0.445663	3.458311	0.0014
D(SE(-3),3)	1.619234	0.370640	4.368752	0.0001
D(SE(-4),3)	0.539469	0.301006	1.792219	0.0815
D(SE(-5),3)	0.473900	0.264754	1.789962	0.0819
D(SE(-6),3)	0.516521	0.210308	2.456023	0.0190
D(SE(-7),3)	0.586201	0.132786	4.414628	0.0001
C	1.113903	2.304334	0.483395	0.6317
@TREND("2001Q1")	-0.013652	0.065323	-0.208989	0.8356

R-squared	0.885797	Mean dependent var	0.126755
Adjusted R-squared	0.857246	S.D. dependent var	15.54015
S.E. of regression	5.871494	Akaike info criterion	6.567755
Sum squared resid	1241.080	Schwarz criterion	6.965286
Log likelihood	-141.0584	Hannan-Quinn criter.	6.716673
F-statistic	31.02540	Durbin-Watson stat	2.103996
Prob(F-statistic)	0.000000		

2. **PHILLIPS-PERRON**

LEVELS

Null Hypothesis: SE has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.398111	0.3765
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	72.25353
HAC corrected variance (Bartlett kernel)	149.1164

Phillips-Perron Test Equation
Dependent Variable: D(SE)
Method: Least Squares
Date: 08/07/17 Time: 11:28
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SE(-1)	-0.100696	0.049281	-2.043281	0.0461
C	7.126451	3.229114	2.206937	0.0318
@TREND("2001Q1")	1.048373	0.423596	2.474936	0.0166

R-squared	0.176693	Mean dependent var	8.184725
Adjusted R-squared	0.145027	S.D. dependent var	9.454381
S.E. of regression	8.741968	Akaike info criterion	7.227149

Sum squared resid	3973.944	Schwarz criterion	7.33664 0
Log likelihood	-195.7466	Hannan-Quinn criter.	7.26949 0
F-statistic	5.579959	Durbin-Watson stat	0.97907 7
Prob(F-statistic)	0.006377		

FIRST DIFFERENCE

Null Hypothesis: D(SE) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.335013	0.0058
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	58.9743 4
HAC corrected variance (Bartlett kernel)	66.6928 0

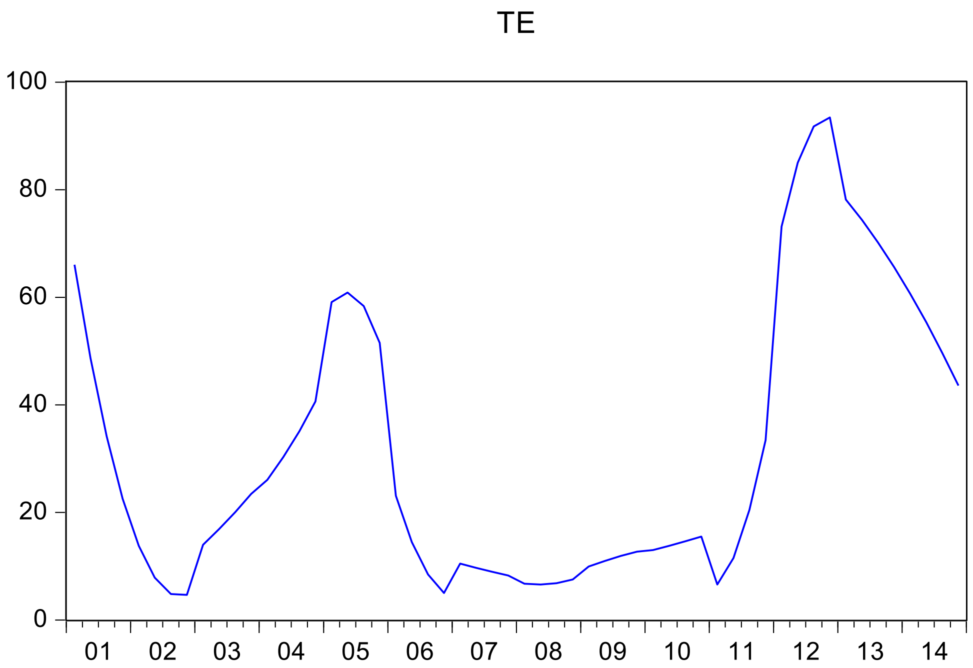
Phillips-Perron Test Equation
Dependent Variable: D(SE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:29
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SE(-1))	-0.506034	0.120605	-4.195797	0.0001
C	2.042142	2.261427	0.903032	0.3708
@TREND("2001Q1")	0.083776	0.072923	1.148828	0.2560

R-squared	0.257142	Mean dependent var	0.33981 8
Adjusted R-	0.228011	S.D. dependent var	8.99368

squared			6
		Akaike info	7.02609
S.E. of regression	7.902115	criterion	1
			7.13659
Sum squared resid	3184.614	Schwarz criterion	0
		Hannan-Quinn	7.06870
Log likelihood	-186.7044	criter.	6
			2.05964
F-statistic	8.826906	Durbin-Watson stat	3
Prob(F-statistic)	0.000511		

TE



1. ADF

LEVELS

Null Hypothesis: TE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 5 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.334171	0.4084
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TE)
Method: Least Squares
Date: 08/07/17 Time: 11:31
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TE(-1)	-0.113010	0.048415	-2.334171	0.0244
D(TE(-1))	0.640605	0.135247	4.736549	0.0000
D(TE(-2))	0.180473	0.132633	1.360698	0.1809
D(TE(-3))	0.102699	0.135424	0.758348	0.4525
D(TE(-4))	-0.571813	0.135535	-4.218935	0.0001
D(TE(-5))	0.418220	0.134675	3.105406	0.0034
C	2.098218	2.231432	0.940301	0.3524
@TREND("2001Q1")	0.053278	0.072707	0.732779	0.4678

R-squared	0.583443	Mean dependent var	0.714498
Adjusted R-squared	0.514016	S.D. dependent var	9.121849
S.E. of regression	6.359072	Akaike info criterion	6.683288
Sum squared resid	1698.387	Schwarz criterion	6.989212
Log likelihood	-159.0822	Hannan-Quinn criter.	6.799786
F-statistic	8.403778	Durbin-Watson stat	2.086376
Prob(F-statistic)	0.000002		

FIRST DIFFERENCE

Null Hypothesis: D(TE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.738538	0.2264
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	

	10% level	-3.180699

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:32
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TE(-1))	-0.482366	0.176140	-2.738538	0.0089
D(TE(-1),2)	0.093560	0.147278	0.635260	0.5286
D(TE(-2),2)	0.237905	0.144236	1.649416	0.1064
D(TE(-3),2)	0.283998	0.143898	1.973604	0.0549
D(TE(-4),2)	-0.362863	0.139259	-2.605679	0.0125
C	0.986831	2.290030	0.430925	0.6687
@TREND("2001Q1")	-0.021020	0.068667	-0.306121	0.7610

R-squared	0.510090	Mean dependent var	-0.003366
Adjusted R-squared	0.441731	S.D. dependent var	8.940219
S.E. of regression	6.679902	Akaike info criterion	6.765261
Sum squared resid	1918.707	Schwarz criterion	7.032944
Log likelihood	-162.1315	Hannan-Quinn criter.	6.867196
F-statistic	7.461874	Durbin-Watson stat	1.998428
Prob(F-statistic)	0.000016		

SECOND DIFFERENCE

Null Hypothesis: D(TE,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.971036	0.0000
Test critical	1% level	-4.152511	

values:		
	5% level	-3.502373
	10% level	-3.180699

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TE,3)
Method: Least Squares
Date: 08/07/17 Time: 11:32
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TE(-1),2)	-1.686681	0.282477	-5.971036	0.0000
D(TE(-1),3)	0.525984	0.250643	2.098540	0.0416
D(TE(-2),3)	0.529916	0.197373	2.684841	0.0102
D(TE(-3),3)	0.581179	0.122326	4.751072	0.0000
C	2.183918	2.408236	0.906854	0.3694
@TREND("2001Q1")	-0.066844	0.071346	-0.936892	0.3539

R-squared	0.775314	Mean dependent var	-0.064921
Adjusted R-squared	0.749781	S.D. dependent var	14.30632
S.E. of regression	7.156286	Akaike info criterion	6.886026
Sum squared resid	2253.347	Schwarz criterion	7.115469
Log likelihood	-166.1506	Hannan-Quinn criter.	6.973399
F-statistic	30.36577	Durbin-Watson stat	2.152384
Prob(F-statistic)	0.000000		

PHILLIPS-PERRON

LEVELS

Null Hypothesis: TE has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*

Phillips-Perron test statistic		-2.681133	0.2482
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	78.20379
HAC corrected variance (Bartlett kernel)	186.1139

Phillips-Perron Test Equation
Dependent Variable: D(TE)
Method: Least Squares
Date: 08/07/17 Time: 11:33
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TE(-1)	-0.114685	0.050276	-2.281093	0.0267
C	-1.398979	2.587958	-0.540573	0.5911
@TREND("2001Q1")	0.163888	0.083137	1.971312	0.0540

R-squared	0.113808	Mean dependent var	-0.408860
Adjusted R-squared	0.079724	S.D. dependent var	9.480569
S.E. of regression	9.094809	Akaike info criterion	7.306286
Sum squared resid	4301.208	Schwarz criterion	7.415777
Log likelihood	-197.9229	Hannan-Quinn criter.	7.348627
F-statistic	3.339010	Durbin-Watson stat	0.820202
Prob(F-statistic)	0.043224		

FIRST DIFFERENCE

Null Hypothesis: D(TE) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.810799	0.0234
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

*MacKinnon (1996) one-sided p-values.

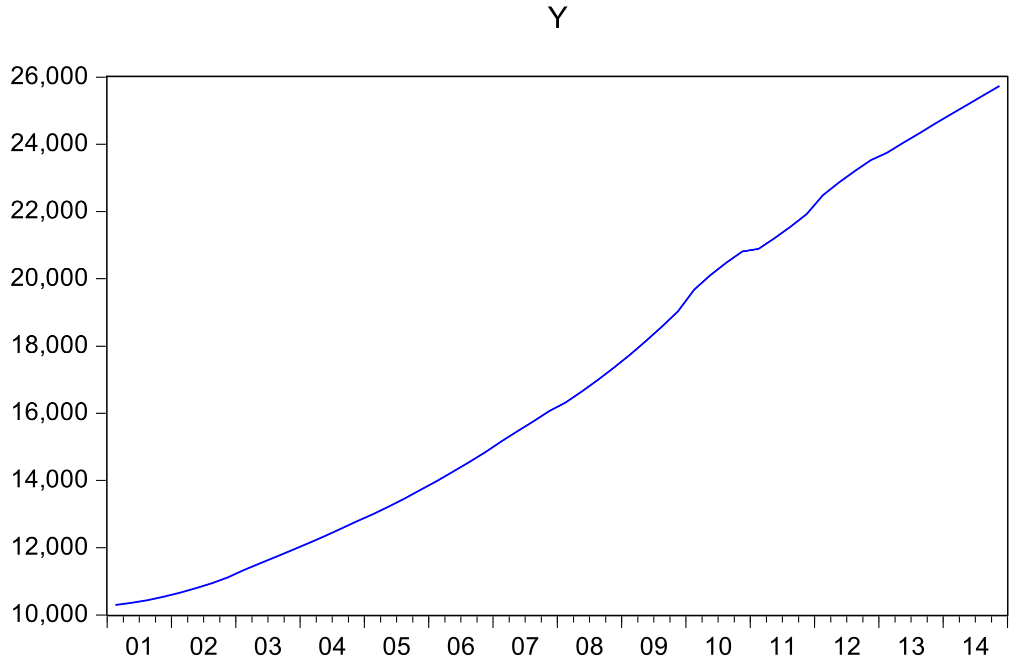
Residual variance (no correction)	56.09010
HAC corrected variance (Bartlett kernel)	52.96797

Phillips-Perron Test Equation
Dependent Variable: D(TE,2)
Method: Least Squares
Date: 08/07/17 Time: 11:34
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TE(-1))	-0.436710	0.112900	-3.868117	0.0003
C	0.047635	2.220476	0.021453	0.9830
@TREND("2001Q1")	0.001019	0.068444	0.014882	0.9882

R-squared	0.232618	Mean dependent var	0.209416
Adjusted R-squared	0.202524	S.D. dependent var	8.629709
S.E. of regression	7.706460	Akaike info criterion	6.975948
Sum squared resid	3028.866	Schwarz criterion	7.086447
Log likelihood	-185.3506	Hannan-Quinn criter.	7.018563
F-statistic	7.729851	Durbin-Watson stat	2.112646
Prob(F-statistic)	0.001169		

Y



F

LEVELS

Null Hypothesis: Y has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 9 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.028722	0.5705
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 08/07/17 Time: 11:35
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.038926	0.019188	-2.028722	0.0504
D(Y(-1))	0.762209	0.141348	5.392427	0.0000
D(Y(-2))	0.191555	0.160006	1.197175	0.2395
D(Y(-3))	0.088358	0.163140	0.541606	0.5916
D(Y(-4))	-1.202014	0.166520	-7.218452	0.0000
D(Y(-5))	0.951831	0.209273	4.548283	0.0001
D(Y(-6))	0.133244	0.160781	0.828728	0.4130
D(Y(-7))	0.060194	0.162686	0.370003	0.7137
D(Y(-8))	-0.639228	0.168883	-3.785041	0.0006
D(Y(-9))	0.523776	0.152944	3.424620	0.0016
C	354.0526	149.4069	2.369720	0.0236
@TREND("2001Q1")	12.17600	6.644342	1.832537	0.0756

R-squared	0.833964	Mean dependent var	308.8462
Adjusted R-squared	0.780247	S.D. dependent var	96.08784
S.E. of regression	45.04392	Akaike info criterion	10.67261
Sum squared resid	68984.45	Schwarz criterion	11.14965
Log likelihood	-233.4701	Hannan-Quinn criter.	10.85131
F-statistic	15.52501	Durbin-Watson stat	2.115147
Prob(F-statistic)	0.000000		

FIRST DIFFERENCE

Null Hypothesis: D(Y) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 8 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.210784	0.9909
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(Y,2)
Method: Least Squares
Date: 08/07/17 Time: 11:35
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1))	-0.035241	0.167190	-0.210784	0.8343
D(Y(-1),2)	-0.119154	0.192698	-0.618348	0.5403
D(Y(-2),2)	0.044447	0.196657	0.226014	0.8225
D(Y(-3),2)	0.089332	0.203585	0.438797	0.6635
D(Y(-4),2)	-1.150702	0.194853	-5.905494	0.0000
D(Y(-5),2)	-0.081283	0.153136	-0.530789	0.5989
D(Y(-6),2)	0.036123	0.156682	0.230548	0.8190
D(Y(-7),2)	0.067890	0.163887	0.414247	0.6812
D(Y(-8),2)	-0.590476	0.155875	-3.788136	0.0006
C	56.50763	29.72698	1.900887	0.0656
@TREND("2001Q1")	-1.139738	1.077604	-1.057659	0.2975

R-squared	0.740168	Mean dependent var	1.863251
Adjusted R-squared	0.665930	S.D. dependent var	81.32713
S.E. of regression	47.00609	Akaike info criterion	10.74340
Sum squared resid	77335.05	Schwarz criterion	11.18068
Log likelihood	-236.0982	Hannan-Quinn criter.	10.90721
F-statistic	9.970233	Durbin-Watson stat	2.130635
Prob(F-statistic)	0.000000		

SECOND DIFFERENCE

Null Hypothesis: D(Y,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.868195	0.0015
Test critical values:	1% level	-4.170583	
	5% level	-3.510740	
	10% level	-3.185512	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y,3)
Method: Least Squares
Date: 08/07/17   Time: 11:36
Sample (adjusted): 2003Q3 2014Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1),2)	-2.880207	0.591637	-4.868195	0.0000
D(Y(-1),3)	1.732580	0.547874	3.162369	0.0032
D(Y(-2),3)	1.747764	0.478737	3.650781	0.0008
D(Y(-3),3)	1.806077	0.395423	4.567456	0.0001
D(Y(-4),3)	0.627098	0.318467	1.969114	0.0567
D(Y(-5),3)	0.532063	0.280122	1.899398	0.0655
D(Y(-6),3)	0.553144	0.221352	2.498934	0.0172
D(Y(-7),3)	0.603744	0.140696	4.291114	0.0001
C	52.30166	21.74040	2.405736	0.0214
@TREND("2001Q1")	-1.326983	0.601850	-2.204839	0.0339

R-squared	0.899287	Mean dependent var	0.635609
Adjusted R-squared	0.874108	S.D. dependent var	130.7115
S.E. of regression	46.37804	Akaike info criterion	10.70119
Sum squared resid	77433.22	Schwarz criterion	11.09872
Log likelihood	-236.1274	Hannan-Quinn criter.	10.85011
F-statistic	35.71668	Durbin-Watson stat	2.144349
Prob(F-statistic)	0.000000		

2,. PHILLIPS-PERRON

LEVELS

Null Hypothesis: Y has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*

Phillips-Perron test statistic		-3.275577	0.0811
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5703.888
HAC corrected variance (Bartlett kernel)	12909.51

Phillips-Perron Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 08/07/17 Time: 11:37
Sample (adjusted): 2001Q2 2014Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.072711	0.016657	-4.365179	0.0001
C	774.9817	140.9609	5.497850	0.0000
@TREND("2001Q1")	26.10411	5.089348	5.129165	0.0000

R-squared	0.523881	Mean dependent var	280.8029
Adjusted R-squared	0.505569	S.D. dependent var	110.4618
S.E. of regression	77.67212	Akaike info criterion	11.59587
Sum squared resid	313713.8	Schwarz criterion	11.70536
Log likelihood	-315.8865	Hannan-Quinn criter.	11.63821
F-statistic	28.60823	Durbin-Watson stat	0.894959
Prob(F-statistic)	0.000000		

FIRST DIFFERENCE

Null Hypothesis: D(Y) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.253090	0.0853
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4557.978
HAC corrected variance (Bartlett kernel)	4235.810

Phillips-Perron Test Equation
Dependent Variable: D(Y,2)
Method: Least Squares
Date: 08/07/17 Time: 11:37
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1))	-0.359715	0.107828	-3.335999	0.0016
C	73.92714	26.04561	2.838372	0.0065
@TREND("2001Q1")	1.090440	0.764213	1.426880	0.1597

R-squared	0.186668	Mean dependent var	3.980081
Adjusted R-squared	0.154772	S.D. dependent var	75.56331
S.E. of regression	69.47009	Akaike info criterion	11.37362
Sum squared resid	246130.8	Schwarz criterion	11.48412
Log likelihood	-304.0878	Hannan-Quinn criter.	11.41624
F-statistic	5.852493	Durbin-Watson stat	2.180445
Prob(F-statistic)	0.005150		

SECOND DIFFERENCE

Null Hypothesis: D(Y,2) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.627341	0.0000
Test critical values:	1% level	-4.140858	
	5% level	-3.496960	
	10% level	-3.177579	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5161.650
HAC corrected variance (Bartlett kernel)	5033.654

Phillips-Perron Test Equation
Dependent Variable: D(Y,3)
Method: Least Squares
Date: 08/07/17 Time: 11:37
Sample (adjusted): 2001Q4 2014Q4
Included observations: 53 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1),2)	-1.296013	0.135094	-9.593450	0.0000
C	22.24232	21.91041	1.015149	0.3149
@TREND("2001Q1")	-0.597047	0.667288	-0.894737	0.3752

R-squared	0.647974	Mean dependent var	-0.371932
Adjusted R-squared	0.633893	S.D. dependent var	122.2484
S.E. of regression	73.96857	Akaike info criterion	11.50010
Sum squared resid	273567.5	Schwarz criterion	11.61162
Log likelihood	-301.7525	Hannan-Quinn	11.5429

		criter.	8
F-statistic	46.01750	Durbin-Watson stat	2.04931 9
Prob(F-statistic)	0.000000		

COINTEGRATION TEST

Date: 08/07/17 Time: 11:43
Sample (adjusted): 2001Q3 2014Q4
Included observations: 54 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: Y AE EE GFCF HE NEXPTS SE TE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.547954	231.3866	187.4701	0.0000
At most 1 *	0.507102	188.5122	150.5585	0.0001
At most 2 *	0.480025	150.3097	117.7082	0.0001
At most 3 *	0.465237	114.9951	88.80380	0.0002
At most 4 *	0.431819	81.19481	63.87610	0.0009
At most 5 *	0.347037	50.66777	42.91525	0.0070
At most 6 *	0.313253	27.65108	25.87211	0.0298
At most 7	0.127391	7.358477	12.51798	0.3086

Trace test indicates 7 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.547954	42.87443	56.70519	0.5624
At most 1	0.507102	38.20246	50.59985	0.5100
At most 2	0.480025	35.31465	44.49720	0.3466
At most 3	0.465237	33.80027	38.33101	0.1514
At most 4	0.431819	30.52705	32.11832	0.0772
At most 5	0.347037	23.01668	25.82321	0.1125
At most 6 *	0.313253	20.29261	19.38704	0.0369

At most 7	0.127391	7.358477	12.51798	0.3086

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
-0.002368	-0.010678	-0.110049	0.000103	0.026506	0.001269	-0.011272	-0.068592
0.002605	-0.010683	-9.60E-05	0.002879	-0.010645	0.001816	-0.033445	0.040047
0.000157	-0.012831	0.008544	-0.000117	-0.005905	-0.000332	-0.076586	-0.092822
0.000607	-0.007295	0.110576	-0.000849	-0.017102	0.000354	0.055294	-0.053568
-0.000392	0.003950	-0.015734	-0.002317	-0.004354	-0.000544	0.019749	0.019675
-0.003605	0.002884	-0.056566	0.003518	-0.012001	0.000263	-0.016342	0.050535
-0.001202	-0.004880	0.071156	-0.001402	-0.005800	-0.000105	0.011275	-0.000512
-4.36E-05	0.008542	0.057838	-0.002611	0.003845	0.000424	-0.004313	-0.012516

Unrestricted Adjustment Coefficients (alpha):

D(Y)	13.99958	-9.473977	-18.44662	29.04762	11.12013	13.12095	-2.717345
D(AE)	5.626100	11.99983	8.922843	-8.452695	4.291998	-11.99782	6.328365
D(EE)	-0.057569	1.186297	0.431825	-1.845273	4.163182	1.176055	-1.738756
D(GFCF)	29.16842	83.94972	27.99271	-97.13840	116.7277	-2.969060	-12.16709
D(HE)	-8.587068	6.896016	5.234944	-2.110700	21.21023	13.52446	-1.039927
D(NEXPTS)	-33.60758	-179.7421	-24.95991	-47.99862	-61.58093	-83.72931	30.93942
D(SE)	-1.224754	-1.021493	2.026694	-4.212158	-0.857493	-0.387343	0.219471
D(TE)	-1.417997	-1.584127	0.434652	3.501902	-1.334472	1.646442	-0.623399

1 Equation(s):	Cointegrating	Log likelihood	-1908.426

Normalized cointegrating coefficients (standard error in parentheses)

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
1.000000	4.508434	46.46577	-0.043570	-11.19169	-0.535968	4.759230	28.96145
	(1.42445)	(9.87436)	(0.37572)	(2.11387)	(0.13733)	(6.11430)	(8.50956)

Adjustment coefficients (standard error in parentheses)

D(Y)	-0.033156
	(0.02190)
D(AE)	-0.013325
	(0.01281)
D(EE)	0.000136
	(0.00295)
D(GFCF)	-0.069082
	(0.09365)
D(HE)	0.020338

	(0.01513)
D(NEXPTS)	0.079596
	(0.11683)
D(SE)	0.002901
	(0.00261)
D(TE)	0.003358
	(0.00245)

2 Cointegrating Equation(s): Log likelihood -1889.324

Normalized cointegrating coefficients (standard error in parentheses)

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
1.000000	0.000000	22.11505	0.558100	-7.471160	0.109712	-4.456386	21.84672
		(6.87800)	(0.24544)	(1.48093)	(0.08488)	(3.89755)	(5.16944)
0.000000	1.000000	5.401148	-0.133454	-0.825237	-0.143216	2.044084	1.578095
		(1.59693)	(0.05699)	(0.34384)	(0.01971)	(0.90493)	(1.20024)

Adjustment coefficients (standard error in parentheses)

D(Y)	-0.057834	-0.048273
	(0.03216)	(0.13799)
D(AE)	0.017932	-0.188268
	(0.01794)	(0.07699)
D(EE)	0.003226	-0.012059
	(0.00435)	(0.01864)
D(GFCF)	0.149587	-1.208289
	(0.13188)	(0.56583)
D(HE)	0.038300	0.018020
	(0.02219)	(0.09522)
D(NEXPTS)	-0.388591	2.279040
	(0.14512)	(0.62262)
D(SE)	0.000240	0.023990
	(0.00384)	(0.01647)
D(TE)	-0.000768	0.032064
	(0.00354)	(0.01521)

3 Cointegrating Equation(s): Log likelihood -1871.667

Normalized cointegrating coefficients (standard error in parentheses)

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
1.000000	0.000000	0.000000	1.127948	-2.915199	0.759837	10.30804	44.44042
			(0.39589)	(2.23475)	(0.14846)	(6.32207)	(8.98804)
0.000000	1.000000	0.000000	0.005719	0.287463	0.015564	5.649992	7.096144
			(0.06161)	(0.34778)	(0.02310)	(0.98387)	(1.39876)
0.000000	0.000000	1.000000	-0.025767	-0.206012	-0.029397	-0.667619	-1.021644

			(0.01439)	(0.08123)	(0.00540)	(0.22981)	(0.32672)

Adjustment coefficients (standard error in parentheses)

D(Y)	-0.060722	0.188417	-1.697345
	(0.03067)	(0.17247)	(0.96057)
D(AE)	0.019329	-0.302758	-0.544060
	(0.01733)	(0.09744)	(0.54269)
D(EE)	0.003294	-0.017599	0.009911
	(0.00434)	(0.02443)	(0.13606)
D(GFCF)	0.153970	-1.567466	-2.978838
	(0.13117)	(0.73771)	(4.10870)
D(HE)	0.039120	-0.049150	0.989066
	(0.02204)	(0.12396)	(0.69037)
D(NEXPTS)	-0.392499	2.599303	3.502468
	(0.14466)	(0.81353)	(4.53100)
D(SE)	0.000557	-0.002014	0.152198
	(0.00369)	(0.02075)	(0.11556)
D(TE)	-0.000700	0.026487	0.159915
	(0.00354)	(0.01991)	(0.11090)

4	Cointegrating	Log	
Equation(s):		likelihood	-1854.767

Normalized cointegrating coefficients (standard error in parentheses)

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
1.000000	0.000000	0.000000	0.000000	-10.84648	-1.946540	-126.0370	-25.51880
				(5.20088)	(0.50759)	(21.9528)	(20.9378)
0.000000	1.000000	0.000000	0.000000	0.247249	0.001842	4.958680	6.741429
				(0.20831)	(0.02033)	(0.87928)	(0.83862)
0.000000	0.000000	1.000000	0.000000	-0.024826	0.032428	2.447115	0.576539
				(0.09583)	(0.00935)	(0.40450)	(0.38579)
0.000000	0.000000	0.000000	1.000000	7.031603	2.399382	120.8789	62.02346
				(5.42988)	(0.52994)	(22.9194)	(21.8597)

Adjustment coefficients (standard error in parentheses)

D(Y)	-0.043088	-0.023477	1.514630	-0.048336
	(0.02689)	(0.15882)	(1.17498)	(0.02261)
D(AE)	0.014198	-0.241098	-1.478727	0.041265
	(0.01698)	(0.10028)	(0.74191)	(0.01427)
D(EE)	0.002174	-0.004139	-0.194132	0.004926
	(0.00429)	(0.02536)	(0.18762)	(0.00361)
D(GFCF)	0.094999	-0.858871	-13.72003	0.323922
	(0.12237)	(0.72270)	(5.34676)	(0.10287)
D(HE)	0.037838	-0.033753	0.755673	0.020150
	(0.02234)	(0.13191)	(0.97594)	(0.01878)
D(NEXPTS)	-0.421638	2.949438	-1.805036	-0.477357
	(0.14449)	(0.85332)	(6.31305)	(0.12146)
D(SE)	-0.002000	0.028712	-0.313567	0.000271

	(0.00298)	(0.01758)	(0.13005)	(0.00250)
D(TE)	0.001426	0.000942	0.547142	-0.007731
	(0.00306)	(0.01805)	(0.13357)	(0.00257)

5 Cointegrating Equation(s): Log likelihood -1839.503

Normalized cointegrating coefficients (standard error in parentheses)

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
1.000000	0.000000	0.000000	0.000000	0.000000	6.212242	336.1193	207.5248
					(1.40297)	(66.5865)	(60.4588)
0.000000	1.000000	0.000000	0.000000	0.000000	-0.184141	-5.576325	1.429123
					(0.03317)	(1.57426)	(1.42939)
0.000000	0.000000	1.000000	0.000000	0.000000	0.051102	3.504911	1.109936
					(0.01245)	(0.59075)	(0.53638)
0.000000	0.000000	0.000000	1.000000	0.000000	-2.889829	-178.7298	-89.05505
					(0.73709)	(34.9831)	(31.7637)
0.000000	0.000000	0.000000	0.000000	1.000000	0.752206	42.60888	21.48564
					(0.16809)	(7.97766)	(7.24351)

Adjustment coefficients (standard error in parentheses)

D(Y)	-0.047444	0.020444	1.339663	-0.074099	0.035655
	(0.02637)	(0.15751)	(1.15120)	(0.02782)	(0.24993)
D(AE)	0.012516	-0.224146	-1.546258	0.031321	0.094579
	(0.01692)	(0.10107)	(0.73870)	(0.01785)	(0.16037)
D(EE)	0.000543	0.012305	-0.259637	-0.004720	-0.003270
	(0.00368)	(0.02200)	(0.16077)	(0.00389)	(0.03490)
D(GFCF)	0.049275	-0.397834	-15.55666	0.053483	0.867352
	(0.10558)	(0.63058)	(4.60888)	(0.11139)	(1.00059)
D(HE)	0.029530	0.050021	0.421946	-0.028991	-0.388173
	(0.01930)	(0.11529)	(0.84261)	(0.02036)	(0.18293)
D(NEXPTS)	-0.397516	2.706213	-0.836105	-0.334684	2.258858
	(0.14146)	(0.84489)	(6.17524)	(0.14925)	(1.34064)
D(SE)	-0.001664	0.025325	-0.300075	0.002258	0.042213
	(0.00296)	(0.01767)	(0.12912)	(0.00312)	(0.02803)
D(TE)	0.001949	-0.004329	0.568139	-0.004639	-0.077371
	(0.00299)	(0.01785)	(0.13047)	(0.00315)	(0.02833)

6 Cointegrating Equation(s): Log likelihood -1827.995

Normalized cointegrating coefficients (standard error in parentheses)

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-13.75527	11.51627
						(4.02715)	(3.52852)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	4.794505	7.239123

						(0.84850)	(0.74344)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.626811	-0.502448
						(0.19026)	(0.16670)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-15.97416	2.124761
						(5.20564)	(4.56109)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.244528	-2.247929
						(0.79449)	(0.69612)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	56.32017	31.55197
						(10.7861)	(9.45062)

Adjustment coefficients (standard error in parentheses)

D(Y)	-0.094748	0.058286	0.597467	-0.027945	-0.121810	0.014370
	(0.03595)	(0.15302)	(1.17823)	(0.03653)	(0.25513)	(0.01657)
D(AE)	0.055771	-0.258749	-0.867592	-0.010882	0.238566	0.017484
	(0.02212)	(0.09414)	(0.72481)	(0.02247)	(0.15695)	(0.01019)
D(EE)	-0.003697	0.015696	-0.326161	-0.000583	-0.017384	-0.000672
	(0.00514)	(0.02186)	(0.16830)	(0.00522)	(0.03644)	(0.00237)
D(GFCF)	0.059979	-0.406397	-15.38871	0.043040	0.902984	0.081469
	(0.14946)	(0.63616)	(4.89822)	(0.15186)	(1.06065)	(0.06888)
D(HE)	-0.019229	0.089026	-0.343075	0.018583	-0.550480	-0.008850
	(0.02528)	(0.10760)	(0.82844)	(0.02568)	(0.17939)	(0.01165)
D(NEXPTS)	-0.095654	2.464732	3.900106	-0.629209	3.263697	-0.366241
	(0.18968)	(0.80736)	(6.21636)	(0.19273)	(1.34608)	(0.08742)
D(SE)	-0.000268	0.024208	-0.278164	0.000895	0.046862	-0.005208
	(0.00418)	(0.01778)	(0.13690)	(0.00424)	(0.02964)	(0.00193)
D(TE)	-0.003987	0.000420	0.475007	0.001152	-0.097130	-0.002422
	(0.00404)	(0.01719)	(0.13235)	(0.00410)	(0.02866)	(0.00186)

7 Equation(s):	Cointegrating	Log likelihood	-1817.849

Normalized cointegrating coefficients (standard error in parentheses)

Y	AE	EE	GFCF	HE	NEXPTS	SE	TE
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-14.21806
							(5.64201)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	16.20902
							(2.36905)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.670235
							(0.27419)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-27.76084
							(8.23960)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-1.790448
							(0.66411)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	136.9198
							(26.0257)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	-1.870871
							(0.46000)

Adjustment coefficients (standard error in parentheses)

D(Y)	-0.091482	0.071546	0.404112	-0.024135	-0.106049	0.014656	3.152515
	(0.03688)	(0.15659)	(1.27868)	(0.03778)	(0.25796)	(0.01656)	(0.73753)
D(AE)	0.048166	-0.289630	-0.417292	-0.019754	0.201860	0.016818	-1.263311
	(0.02217)	(0.09413)	(0.76868)	(0.02271)	(0.15507)	(0.00995)	(0.44337)
D(EE)	-0.001608	0.024181	-0.449884	0.001855	-0.007298	-0.000489	-0.130736
	(0.00510)	(0.02163)	(0.17667)	(0.00522)	(0.03564)	(0.00229)	(0.10190)
D(GFCF)	0.074600	-0.347024	-16.25447	0.060097	0.973556	0.082748	-8.434885
	(0.15327)	(0.65081)	(5.31436)	(0.15703)	(1.07212)	(0.06882)	(3.06529)
D(HE)	-0.017979	0.094101	-0.417072	0.020041	-0.544448	-0.008741	-0.465338
	(0.02596)	(0.11023)	(0.90014)	(0.02660)	(0.18159)	(0.01166)	(0.51919)
D(NEXPTS)	-0.132833	2.313752	6.101629	-0.672584	3.084241	-0.369495	6.148788
	(0.19336)	(0.82105)	(6.70449)	(0.19810)	(1.35257)	(0.08682)	(3.86711)
D(SE)	-0.000531	0.023137	-0.262548	0.000587	0.045589	-0.005231	-0.348284
	(0.00429)	(0.01821)	(0.14870)	(0.00439)	(0.03000)	(0.00193)	(0.08577)
D(TE)	-0.003238	0.003462	0.430648	0.002026	-0.093515	-0.002356	0.169021
	(0.00412)	(0.01749)	(0.14286)	(0.00422)	(0.02882)	(0.00185)	(0.08240)

Stability

Inverse Roots of AR Characteristic Polynomial