

**THE EFFECTS OF BUDGET DEFICITS AND PUBLIC
DEBT ON REAL INTEREST RATES IN KENYA**

BY

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DECLARATION

I affirm that the content of this research project is my original work, with external materials used rightfully cited and acknowledged. The research project was conducted between June 2015 and November 2015 under the guidance of my supervisor.

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This research project has been submitted with my approval as the university supervisor

Signature Date.....

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DEDICATION

I dedicate this study to my late father Mr. Patrick Simiyu, who is the source of my inspiration. May this study inspire your spirit wherever you are.

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LIST OF ABBREVIATIONS

GDP: Gross Domestic Product

HIPC: Highly Indebted Poor Countries

IMF: International Monetary Fund

LIC: Low-Income Countries

PBO: Parliamentary Budgetary Office

REH: Ricardian Equivalence Hypothesis

TFH: Twin Deficit Hypothesis

USD: United States Dollars

ABSTARCT

The subject of Public Expenditure, Public Debt and government financing has dominated the social airwaves in Kenya in the recent past. The enshrouding debate that the government is living beyond its means is now almost becoming synonymous with every Kenyan in the street and the households experience in the consumption system. This has now brought a sharp focus to the policy analysts, policy makers and academicians. It is upon this ground that the present study sought to investigate the effects of budget deficit and public debt on real interest rates in Kenya for 37 years (1978-2014). The study adopted yearly data series as the data availability dictated. Focusing on answering two research questions advanced in the maiden chapter of the study, the variables were subjected to unit root test using Phillips-Peron and Augmented Dickey Fuller. The test found out that budget deficit variable was not stationary at level, while all the remaining variables had constant moments at level. This therefore ensured that the only available model of analysis is the ARDL (Autoregressive Distributive Lag). The ARDL model proved signifiant and jointly resulted into a result of all the variables causing real interest rate in Kenya at 76% contribution range. On the other hand, it is interesting that only CPI variable had a significant contribution to Real Interest rate in Kenya in the Long run. This is an interesting bit of this study as the main variables such as Public Debt and Budget Deficit did not reveal to be significant. The reuslt is in contravention with *apriori*. The results also indicate that the two of the investigated variables have causality running from real interest rate at 5% significance level. Public Debt and GDP growth proved to be caused by Real Interest Rate in the long run.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Budget deficits, usually the end result of fiscal indiscipline and lack of fiscal space, have been the focus of fiscal and macroeconomic adjustment in developed and developing countries. Academic debate on the subject has been mostly on the issue of whether budget deficits and public debt affect interest rates and the conditions in which the interest rates are affected remains one of the most studied subjects in macroeconomics. One side of the debate, in which Friedman's work on the subject is highly referred to hold the view that there is a large, significant, positive effect of budget deficit and public debt on interest rates (Hubbard & Judd, 2012) The other side disagrees and holds the perspective that there is no significant impact of budget deficit and public debt on interest rates (Regan, 1984). In the wake of the financial crisis in 2007 to 2009, there has been renewed focus on the importance of a nation's net external debt position in determining domestic interest rates and, its vulnerability to a crisis (Denes, Eggertsson, & Gilbukh, 2012).

The relationship between budget deficits, public debt and interest rates is a complex one because countries finance their deficits in various ways (Regan, 1984). According to the World Bank(1993) in economies where financial markets are not repressed, the higher deficits financed by domestic debt increase the domestic real interest rates when external borrowing is not possible. On the other hand, if financial markets are integrated with world capital markets, higher domestic borrowing results in international capital inflows and higher foreign debt. Kenya like many developing

countries has been unable to constrain the growth of their public debt to ensure that sufficient revenues remain available after debt service payments to finance other vital government recurrent and development expenditures (Maana, Owino, & Mutai, 2008). Stagnating real revenue receipts, unending expenditure pressures and reduced external donor support especially in the 1990s among other factors, have resulted in accumulation of high stocks of domestic debt in developing countries (Maana, Owino, and Mutai, 2008).

1.1.1 Budget Deficits

A budget deficit is a status of a country's financial health where the revenue earned is lower than the expenditure; hence government is unable to balance revenue and expenditure (Rosen, 2005). Budget deficit usually measured as a percentage of a country's GDP is specified over three dimensions namely; the conventional public deficit, coverage or size of the public sector usually through aggregate demand deficit and the time horizon dimension usually the current deficit measure (Blejer & Cheasty, 1991). Deficits can be structural or cyclical, depending on economic situation in the country (Yulia, 2011). In structural deficit, the government spends money on the investments for the future of the country. The opposite event is cyclical deficit. It is the kind of deficit that occurs only when economy does not perform to its full capacity, for example because of recession (Yulia, 2011).

A study by (Fatima, Ahmed, & Rahman, 2012) used a time-series method to investigate the long-term impact of budget deficits to the economy of Pakistan. They found that budget deficits lead to slowed-down economic growth in the long run. Budget deficits may decrease during periods of economic prosperity, because conditions such as increased tax revenue, higher employment levels and economic growth reduces the need for the government to establish high expenditure programs to sponsor better living conditions (Fatima, Ahmed & Rahman, 2012). Countries can counter budget deficits by promoting economic growth, reducing government spending and increasing tax revenues. With better fiscal policies that reduce the budget deficits, investor confidence will be boosted prompting better economic

conditions while increasing treasury inflows from taxes (Rosen, 2005). Fatima, Ahmed & Rahman (2012) focused on Pakistan, where government spending also exceeds revenue. The current study will investigate whether the same findings will be achieved in the context of Kenya.

1.1.2 Public Debt

Public debt is all of the money owed at any given time by all branches of the government-national, county, municipal and local authorities (Maana, Owino & Mutai, 2008). Public debt appears over time because government spends more money than it collects in taxations.

The more debt a country holds the less money it is able to put away in savings and reinvest in the nation's economy (Chongo, 2013). Internal public debt is money owed to domestic creditors, for example, bonds issued to the public, while external public debt is money that the government owes to foreign creditors (Obi & Nurudeen, 2009). Public debt is usually measured in terms of three economic debt indicators. These are: indicators that measure the risk that current economic conditions generate over public debt evaluate the government's ability to face upcoming contingencies considering certain expected circumstances and financial indicators which show the liabilities' market performance. Usually measured in terms of institutional or gross public debt, instrument or securities coverage and the net debt (IMF, 2012) Short-term public debts last for only one or two years. Long-term debts are designed for a period of more than ten years (IMF, 2003). There might also be mid-term debts that last between three and ten years.

A study by Yulia (2011) analyzed and compared the situation of public debt in three countries- Greece, Spain and Portugal. He chose the three countries because they are highly studied in economics for being some of the highly indebted countries in the world. Yulia (2011) found that years of large public debt negatively impacts the three countries especially in periods of financial distress when prices and interest rates are very volatile. In these circumstances, large gross external debt positions pose a threat to the overall financial stability of the economies.

1.1.3 Real Interest Rates

A real interest rate is an interest rate that has been adjusted to remove the effects of inflation to reflect the real costs of funds to the borrower and the real yield to the lender (Kandel, Ofer, & Sarig, 1996). The real interest rate often described by the Fisher equation which asserts that the real interest rate is approximately the nominal interest rate minus the inflation rate. Real Interest rates are usually measured by either simple averages of the estimated spot yields on debt instruments or the average real GDP over whole time period (Mervyn & Low, 2014)

Somers (1998) conducted a study on interest rates in relation to fiscal deficits through a systematic review of economic papers on fiscal policy. (Somers, 1998) found that the government's impact on the loanable funds market and interest rates is not measured by the deficit alone. Instead, the detailed nature of governmental expenditure and revenues is what determines the budget impacts on interest rates. There could be a condition of moderating interest rates despite a massive deficit and a strong private demand for loanable funds; or there could be a budget that puts an upward pressure on interest rates even without a deficit (Somers, 1998).

1.1. 4 Budget Deficits, Public Debt and Real Interest Rates

Aside from unemployment and inflation, no macroeconomic variable has attracted much attention as fiscal deficits and public sector debts. However, economic consequences of budget deficits and public debts remain uncertain at the theoretical level (Sambiri et al. 2014).

The relationship between the budget deficit and interest rate, and thus its implications for the crowding out effect can be described in terms of different theoretical models. The standard Hicksian IS-LM model shows that the increase in government spending that results in budget deficit shifts the IS curve to the right and results in the increase in interest rate (Sambiri et al. 2014).

1.1. 5 Budget Deficits and Public Debt in Kenya

The fiscal management in Kenya is guided by the Fiscal Management Act of 2012 and chapter twelve of the Constitution of Kenya on Public Finance (Njoroge, Kosimbei, & Korir, 2014).

Despite tight fiscal policies that seek to bring about fiscal discipline in the country, the problem of expanding budget and current account deficits continue to challenge the country. A unique attribute of the country's fiscal operations since the 1970's indicate that Kenya has been running budget deficits and current account deficits for many years since independence (Sabari et al 2014). Government spending has been on a rapid increase unmatched by a commensurate rise in government revenue (PBO, 2015).

The composition of Kenya's public debt has significantly shifted from external debt in favor of domestic debt while considerable progress has been made in extending the maturity profile of the debt, and diversification of the investor base towards institutional investors and individuals (Maana, Owino & Mutai, 2008). The significant rise in domestic debt during the late 1990s to 2007 period resulted in higher domestic interest payments which present a significant burden to the budget. According to the (IMF, 2013) Kenya's risk of external debt distress remains low, while overall public sector debt dynamics continue to be sustainable. The IMF finds that under the baseline scenario and all the stress tests, Kenya's external debt burden indicators do not breach any of the relevant policy-dependent thresholds.

While analysis of the effects of budget deficits and public debt on interest rates has been ongoing for several years, there is still little empirical evidence about the magnitude of the effects. Moreover, the differences in views held on the issues are quite stark. A lot of studies have also already been directed towards the relationship between budget deficits and public debt on various financial parameters in developed countries. However, studies that focus on the same in the context of developing economies such as Kenya are limited. It is the aim of this paper to investigate the effects of budget deficits and national debt and how they affect the interest rates adjusted for inflation in Kenya.

1.2 Research Problem

There is a divide in academic opinions in suggesting an exact relationship between real interest rates and fiscal policy variables, including various government deficit and debt indicators such as overall fiscal balance, primary balance, cyclically adjusted balance, and gross or net government debt.

This has led to much debate in recent years about government budget deficits (Obi & Nurudeen, 2009). Many economists and other observers are of the view that deficits are harmful to the world economies. The supposed harmful effects include high real interest rates, low rates of economic growth, low saving, and current account deficits in countries with large budget deficits (Baro, 1989). Some views show that deficits have positive impacts in the short term but negative impacts on financial parameters in the long term (Yulia, 2011).

The perspectives are argued in the Standard, Ricardian, Neoclassical and Keynesian frameworks. In the standard framework, there is an assumption that the substitution of a budget deficit for current taxation leads to an expansion of aggregate consumer demand (Denes, Eggertsson & Gilbukh, 2012). On the other hand, the Ricardian perspective holds that a deficit-financed cut in current taxes for a given path of government spending, leads to higher future taxes that have the same present value as the initial cut (Ussher, 1998). The neoclassical model has individual consumption, finite life spans and market clearing in all periods as the three central features that play an important role in determining the impact of budget deficits (Somers, 1999). The basic Keynesian approach holds that an increase in the deficit brought about either by an increase in government spending or a reduction in taxes has the effect of raising interest rates (Denes, Eggertsson & Gilbukh, 2012). Traditional Keynesians argue that deficits need not crowd out private investment but actually increase aggregate demand and profitability despite increasing interest rates. This paper seeks to test and empirically obtain results from the Kenyan context to support or reject the position held by traditional Keynesian theory on fiscal deficits.

In Kenya, government spending increased from 24.31 percent of the gross domestic product in the year 2002/2003 to 26.03% in the year 2013/2014 (PBO, 2015). However, the revenue has only grown slightly from 19.39% in 2002/3 to 19.55% in 2013/14 (PBO, 2015). This research paper will be seeking to establish the effects of fiscal deficits and the public debt on the interest rates regimes in Kenya and form the basis of future policy considerations in light of results obtained. A lot of research such as Aisen and Hauner (2007), Gale and Orszag (2004), Cohen and Garnier (1991), Evans (1987) and Laubach (2003), has been conducted about fiscal deficits and public debt and how they affect various financial and economic parameters of developed

nations. This paper departs from such papers by focusing on the Kenyan economy. The shift in focus is necessitated by the need to have country specific relationship since the economic performance and budget financing methods differ significantly from the developed economies. This paper will seek to obtain sufficient country specific data to establish the correct link between interest rates and fiscal deficits and public debt in the Kenyan economy.

Kenya's budget deficit has steadily expanded from 2003 due to increased government spending (PBO, 2015). The public debt has also become large due to the adoption of an expansionary fiscal policy (PBO, 2015). Studies on the effects of fiscal deficits and public debt on real interest rates in Kenya are especially lacking. This research will therefore seek to provide necessary academic literature that is currently lacking or seem inconclusive as Aworinde (2013) found and also form basis of future studies.

1.3 Objectives of the Study

1.3.1 General Objective

The main objective of this study is to investigate the effects of budget deficit and public debt on real interest in Kenya.

1.3.2 Specific Objectives

The specific objectives are:

- i. To determine the impact of budget deficits on real interest rates in Kenya.
- ii. To determine the impact of public debt on real interest rates in Kenya.
- iii. To investigate the effects of budget deficit and public debt on real interest in Kenya.

1.4 Value of the Study

It is necessary to carry out this study because Kenya's budget deficit has been steadily expanding from 2003 due to increased government spending. As a result, the public debt has become large due to the adoption of an expansionary fiscal policy (PBO, 2015). The findings of this study will provide the necessary literature and help understand the effects of budget deficits and public debt in Kenya.

The study will have provided enough evidence and policy recommendations to policy makers for determining the right policy direction that Kenya should adopt in regards to government spending and budget balancing efforts and financing of budget deficits and the management of public debts with a view of managing interest rates and sustainable economic growth.

The findings of the study will also be important for the investors as factors of budget deficits, public debt and interest rates greatly influence investment decisions as regards to the cost of doing business, comparative advantages and the general investment environment.

To the general public the study will provide understanding and literature for greater understanding of the effects of the fiscal variables studied. To the scholars, researchers and the university, the findings of this study will contribute to the reservoir of knowledge in the topic of study to provide future reference points.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews previous studies that are relevant to the research topic. It looks at the theoretical presentations relevant to the topic of budget deficits, public debt and interest rates. The literature review further discusses the various empirical studies done that are relevant to the topic. The literature review provides an opportunity for conducting desk research in which the information will be sourced from peer reviewed articles, books, government and institutional papers and websites and other credible sources. The literature will help to identify the areas of knowledge gap, which will be useful in reinforcing the direction of this research.

2.2 Theoretical Framework

Links between economic performance and public debt can be observed through the effect that a fiscal deficit has on financial indicators. This can be explained through various theories including debt overhang hypothesis, crowding out hypothesis, twin deficit hypothesis and Ricardian Equivalence hypothesis (Patnaik, 2001).

2.2.1 Crowding Out Hypothesis

High debt levels have significant negative effects on economic growth and this can be explained by the crowding out theory. The crowding out effect is an economic theory which explains an increase in interest rates due to rising government borrowing in the money market (McConnel & Brue, 2008). Mostly, government mobilizes debt resources to undertake huge capital investment projects. To the extent that debt is being used to finance these projects, the net effect of this budget deficit will depend on whether it is crowding in or crowding out private investment (Patnaik, 2001).

As per the crowding out hypothesis, the implication of huge borrowings by the government is an increase in interest rates (Ussher, 1998). The increase in interest rates may reduce or crowd out private-sector investments. This decline in investment means that the overall economy has a smaller capital stock with which to work, which then decreases future growth rates (Elmendorf & Mankiw, 1999).

2.2.2 Debt Overhang Theory

The adverse effect of public debt balance on economic growth has largely been explained by the debt overhang hypothesis. Kobayashi(2013) defines debt overhang as a situation in which investments are reduced or postponed since the the private sector anticipates that the returns from their investment will serve repay creditors. Therefore, huge accumulation of public debt stock creates uncertainty among investors on the actions and policies adopted by the government to meet its debt obligations(Kobayashi, 2013). Theoretically, it is also argued that high level of public debt have adverse effects on macroeconomic stability, discourages capital inflows while encouraging capital flights(PBO, 2015). High debt stocks worsens the adverse consequences of high deficitis(Adam & Bevan 2005).

2.2.3 Ricardian Equivalence Theory

A theoretical construct that often serves as a baseline for evaluating the effect of deficits is known as “Ricardian equivalence.” In a closed economy with rational, forward-looking consumers, Ricardian equivalence suggests that deficits may have no effect at all. It also says that it doesn’t matter which way a government finances its expenditure, debt or a tax increase, the result of total demand level in an economy being the same (Barro, 1989).

The conditions under which Ricardian equivalence holds—even from a theoretical perspective—are quite restrictive; so, it is unlikely to be a literal description of the impact of deficit financing on the economy. In spite of that people spend some of the tax cuts, even if there average propensity to save rises (Yulia, 2011). All these assumptions reduce the model to the determination of consumption and savings paths via an infinitely-lived representative agent with perfect foresight and no liquidity constraints that maximizes the inter-temporal utility given a known permanent income constraint (Barsky, Mankiw, & Zeldes, 1986).

2.3 Factors that Affect Interest Rates

Classical economic theories either support that interest rates are positively or neutrally affected by budget deficits and public debt (Ussher, 1998). However, different studies have given diverse results including the fiscal deficits increase, decrease or do not

change interest rates. Expanding budget deficits and public debt can increase interest rates (Yulia, 2011). The more a deficit or debt increases, the higher the interest rates when repaying the loan. Higher interest rates in turn may reduce investment, hinder interest-sensitive durable consumption expenditure and decrease the value of assets per household thus indirectly weakening consumption expenditure through a wealth effect (Adam & Bevan, 2005)

Inflation plays significant role, because it lowers real value of total debt (Kibet, 2013). When investors expect higher inflation they charge higher interest rate to make public borrowing more expensive. Also, governments with fair or strong economies that have good reputation with the public can borrow by issuing securities, government bonds, notes and bills in order to raise funds (Kibet, 2013). When individuals, organizations or other nations buy these bonds the government promises to pay them back a fairly good interest rate. Countries that may not have strong economies or have not gained trust from their public can turn to international financial institutions and ask them for loans, which they are given but with tough conditions and unfavorable interest rates (Kibet, 2013).

A debt crisis occurs if the debtor is unable or unwilling to pay the interest and redemption payments due on their debts, or if creditors are not confident that these payments will be made (Kibet, 2013). This is most likely happening when the debts are too large, and interest rates rise or the economy slumps, and the government has insufficient revenue to clear the debt (Obi and Nurudeen, 2013).

2.4 Empirical Review

Many studies have attempted to deduce the relationship that budget deficits and public debt have on various financial and macroeconomic indicators such as real interest rates.

Evans(1987) conducted a study to find out the much held position that larger budget deficits lead to higher interest rates. The study used three statistical techniques – regression on commercial paper rate, Moody’s AAA bond rate and ex post real commercial paper rate on current and past government spending, budget deficits and real money supplies. The result disapproved previously held perspectives that large

budget deficits have a significant impact in interest rates. The author based the findings on the Ricardian equivalence that there is no relationship between the two.

Cohen and Garnier(1991) used forecast data of federal deficits for the United States provided by the Office of Management and Budget (OMB) and, in an additional analysis, investigated the effects of forecasts of general government deficits made by the Organization for Economic Cooperation and Development (OECD) on interest rates across the G7 countries. The authors find a significant positive effect of deficit-GDP ratio on interest rates in the US. According to their result, a one percentage increase in deficit to GDP ratio is projected to raise interest rates on the order of 40 to 55 basis points. On the other G7 countries, they find no evidence of a positive and significant relationship between home-country current debt or deficits and current interest rates.

Bhalla(1995) argued that most interest rates are highly correlated. Due to the correlation of interest rates, causation does not run from high fiscal deficits to high interest rates. Instead, causation runs from high interest rates to high fiscal deficits, and that to reduce deficits, interests should be reduced. Bhalla's (1995) study was in the context of India.

Regionally, (Anyanwu, 1998) uses a regression analysis to pooled cross-section and time series data for Nigeria, Ghana and the Gambia. The result however, does not reveal a significant positive association between overall fiscal deficits, and its foreign financing, and domestic nominal deposit interest rates. The study reported a significant positive relation between domestic financing of the fiscal deficits and domestic nominal deposit rates.

Ewing and Yanochik (1999) examined the impact of federal budget deficits on the term structure of interest rates in Italy over the period 1977-1991 using co integration techniques, this study suggested that budget deficits increase the yield spread between long-term government bonds and the three-month Treasury bill rate

Modeste (2000) utilized the loanable funds model of interest rate determination to investigate the relationship between budget deficits and interest rate movements. The methodology of loanable funds framework and error correction was applied on

Jamaican data over the period 1964- 1996. This study found that the government's budget deficits exerted a significant positive effect on the long-term interest rate.

Lal et al (2001) observed how determination of interest rates in India is influenced by budget deficits as the government attempts to mobilize funds to pay for the deficits. Lal (2001) observed that the financing of large fiscal deficits, as in sales of bonds, has led to higher real interest rates and crowding out of private investment. Hence, high interest rates would reduce economic growth in India.

Siddiqui(2002) presented his findings in a general annual conference in Islamabad, Pakistan. He found that foreign borrowing increased resource availability and contributed to economic growth in South Asia including Hong Kong, Taiwan and Singapore. On the other hand, excessive reliance on public debt and inappropriate public debt management and strategies can increase macroeconomic risks and hamper economic growth. Even with concessional flows of loans, high public debt calls for increased revenues to service debt and this certainly has social, economic and political implication in the absence of a broad tax revenue base.

Canzoneri et al (2002) conducted an academic literature review to determine the relationship between fiscal stability policies and interest rates. The context of the study was based on the European Central Bank and the Federal Reserve in the Europe Union and the United States respectively. The study found that interest payments depend on the size of the federal debt and the interest rates at which it was contracted. The study implies that budget deficits and debt are acceptable as long as there are policies to ensure they are balanced to avoid negative escalation of interest rates.

Vamvoukas (2002) investigated the empirical framework of both the Keynesian and Ricardian paradigms by applying SURE technique and impulse response functions. SURE results concluded that a bidirectional pattern of causality might exist between deficit and interest rates. Impulse response functions revealed that deficits and interest rates follow a joint feedback causality which was consistent with the Keynesian proposition that changes in interest rates are a response to positive movements in the budget deficits.

Gale and Orszag (2003) used statistical methods to test whether there is a relationship between budget deficits and interest rates. The study found that deficits cause interest rates to increase. The authors show that a projected rise in the budget deficits to GDP ratio of one percentage result in an increase in the long term interest rates by 0.4 to 0.6 percentage points.

Laubach (2003) argued against the Ricardian equivalence hypothesis and asserted that fiscal deficit has a significant effect on interest rate. Using fiscal data from the United States, Laubach (2003) found that budget deficits lead to high interest rates. A one percentage increase in the projected deficit to GDP ratio is estimated to raise long term interest rates by approximately 25 basis points. Similarly, interest rate rises by about four basis points in response to a percentage point in the projected debt-GDP ratio.

Shapiro (2004) conducted an empirical analysis to evaluate whether public debt affects interest rates. Using a standard set of data and a simple analytical framework, he analyzed the effect of federal government debt and interest rates. He analytically derived the effect of government debt on the real interest rate and found that an increase in government debt equivalent to one percent of GDP would be predicted to increase the real interest rate by about two to three basis points. Shapiro (2004) found that rising interest rates are associated with federal deficits.

Dai and Phillipon (2004) used a no-arbitrage structural VAR model to test the effect of government deficits on interest rates. The justification for using the model was that it allowed the researchers to incorporate cross-sectional information in bond yields into a structural macroeconomic framework. The study showed that government deficit is an important factor behind the yield curve and matter for interest rates. They found that a one percentage point increase in the deficits increases ten-year interest rate by 41 basis points.

Goyal (2004) conducted an empirical investigation to ascertain whether higher fiscal deficits lead to a rise in interest rates. The researcher drew his results using the VAR model in the Indian context. The study found that there is a feedback relationship between fiscal deficits and interest rates. There is a two-way causality between gross fiscal deficit and real interest rate.

Gosselin and Lalonde (2005) studied various macroeconomic variables, including gross domestic product, inflation, interest rates, and the exchange rate by looking at forecasts data for banks in Canada. Some of the variables forecasted were real interest rates and budget deficits. The study reported that real interest rates rise by three basis points for every one percentage point increase in the public debt-to-GDP ratio.

Aisen and Hauner (2007) examined both developed and emerging economies to explore the relationships between budget deficits and interest rates and how they interact across the two contexts. They applied the Generalized Method of Moments (GMM) and found that there is overall a highly significant positive effect of budget deficits on interest rates. However, the effect depends on interaction terms and is only significant when deficits are high, mostly domestically financed or interact with high domestic debt, when financial openness is low, interest rate liberalized or financial depth is low.

Keigo (2008) used published budgetary forecasts to analyze the relationship between budget deficits, government debt and interest rates in Japan. The result showed that in the Japanese economy, budget deficits have larger effects on interest rates than public debt. The study also found that a percentage point increase in the projected deficit-to-GDP raises the real ten-year and five-year interest rates by 35 and 42 basis points, respectively

Maana Owino and Mutai (2008) analyzed the development in public domestic debt in Kenya and its impact on the economic for the period 1996 to 2007. They used a version of Barro's growth regression model –GMM, to assess the impact of domestic debt on Kenya's economy. They also applied the crowding out hypothesis to determine the impact of domestic debt on credit to the private sector in Kenya. The findings of the study show that domestic debt is characterized by higher interest rates compared with those on external debt, which is contracted mainly on concessional terms, and it is therefore expensive to maintain. They implicated the urgent need for the government to formulate and implement debt reduction schemes for domestic debt. Such schemes should recognize the fact that outright reductions in domestic debt could increase liquidity in the system which may pose a risk to macroeconomic stability.

Obi and Nurudeen (2009) applied the vector auto-regression approach to study the effects of fiscal deficits and government debt on interest rates in Nigeria. They found that fiscal deficits and debt result in high interest rates. They recommended that government revenue base should be increased, while unnecessary spending should be discouraged. Moreover, where deficit financing is inevitable, it should be put into productive activities in order to create more employment opportunities, raise national output, and increase the living standard of the people. This should check interest rates from rising.

Noula(2012) investigated an ideal model that could test the impact of budget deficits on nominal lending interest rates in Cameroon. Noula identified the loanable funds model which he tested using annual time series data from 1974 to nine using regression analysis. Cameroon was experiencing very large fluctuations in its budget deficits and nominal lending rates at the time of the study. The study found a significant positive association between budget deficits and domestic nominal lending interest rates for the period under study.

Chakraborty (2012) studied the interest rate determination in India with the intent to arrive at empirical evidence that links fiscal deficit and interest rates and financial crowding out. The period for the analysis was April 2006 to 2007 and the year 2011. The method ensured that capital flows are controlled using the high frequency macro data of a financially regulated regime. Asymmetric vector autoregressive model was used in the analysis. The study found that interest rates do not increase with the increase of fiscal deficits. The study established that the interest rate is affected by changes in the reserve currency, expected inflation, and volatility in capital flows, but not by the fiscal deficit.

Chongo (2013) analyzed the impact of increasing public debt on the economic growth of Zambia in the period 1980 to 2008. The study also analyzed the channels through which public debt is said to have an impact on economic growth namely through private investments, public investments and domestic savings. The main method used in the analysis is Vector Error Correction Model. Results from the analysis confirm a long-run negative relationship between public debt and economic growth. The result on the impact of public debt on private investments and domestic savings also gives

indication to the presence of the crowding out and debt overhang effects which can be explained by a rising debt burden measured by both the stock of Public Debt to Gross Domestic Product (GDP) and Public Debt Service to Revenues.

Aworinde (2013) analyzed the relationship between budget deficits and economic performance in developing economies in Africa including Botswana, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Morocco and Nigeria among others. Basing on the twin deficit hypothesis, the VAR model was used to analyze the impact of fiscal policies in the countries. Aworinde (2013) argues that developing countries depend on bank credit to finance their budget deficits which has two effects on the budgetary policy. The study found that a positive government deficit shock increases the current account deficit in Botswana, Egypt, Ethiopia, Ghana, Morocco, South Africa and Tanzania. This result is consistent with the Keynesian absorption theory that increase in the fiscal deficits would induce domestic absorption and thus, import expansion, causing a worsening of the current account deficits. However, in Cameroon and Uganda the current account improves in response to a positive government deficit shock, a twin divergence. The presence of twin divergence in these countries is because foreign aid and grants constitute a larger percentage of their revenue. Also in response to a positive government deficit shock, the current account was found to remain constant in Kenya, Nigeria and Tunisia and this outcome is consistent with the Ricardian Equivalent Hypothesis (REH).

Sambiri et al (2014) investigated the factors influencing lending rates and their impacts on the general performance of the economy of Kenya. Research methods included annual secondary time series data spanning from 1980 to 2010 obtained from the World Bank annual reports, IMF annual reports, annual government publications and reports and other relevant publications. The collected data was parametrically analyzed using EViews to present descriptive and inferential statistics. Unit roots, co-integration tests and the Error Correction Model were carried out to investigate the dynamic behavior of the model. The findings of the study indicated that the impact of budget deficit and inflation on interest rates in Kenya were positive and significant. This implies that any attempt to control the rise in interest rates must pay attention to expansionary macroeconomic policies and reduce the budget deficit. Such policies

should address structural and non-structural causes of inflation. For instance, it involves enacting policies to reduce the cost of doing business in Kenya.

2.4 Chapter Summary

Literature on the impact of budget deficit and public debt on the economy in Kenya, and Africa in general, is scanty. Most studies in this section have largely focused on developed countries. Recent studies also used old domestic debt databases which are likely to yield debatable results which reflect the current situation in the Kenyan economy. Furthermore, studies on budget deficits and public debt and interest rates have typically focused on external debt. This study aims at filling this gap by using the most recent data to analyze the impact of budget deficits and public debt on the interest rates of Kenya.

As a summation, empirical studies reviewed herein show that the government's budget deficit exerts a significant positive effect on the long term interest rate. A major implication is that, to the extent that they force up interest rates, deficits can crowd-out private investment. However, for this causal link to hold, the deficit must be incurred on recurrent rather than capital expenditure. The empirical findings on deficit and interest rates fail to make a clear distinction between nominal and real interest rates. In the absence of this clear distinction, any conclusion arrived at may not stand the test of empirical rigidity. On this vein therefore, the current study proposes to understand the effects of fiscal deficit on real interest rate in Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This study proposes to examine the effect of budget deficit on real interest rates in Kenya due to lack of consensus of the results in the vast majority of the literature reviewed in the previous two chapters. Moreover, the existence of mixed evidence in the relevant studies has prompted us to re-examine for possible effect in order to extract safe and sound conclusions. This chapter introduces the methods of analysis that will be adopted for this research. Furthermore, data and the data sources, method of analysis and model specification will be discussed in this chapter.

3.2 Research Design

Research design refers to the way the study is designed, that is, the method used to carry out a research. This study will employ a case study design aimed at identifying the impact of budget deficits and public debt on the real interest rates in Kenya. A case study is an in depth investigation of a particular situation, in this case the fiscal policy and its manifestation and impact on Kenya. The case study strategy allows narrowing down a broad subject of research into a topic that is easy to research. It involves the study of selected cases which represent or have experienced the phenomena being considered (Creswell, 2007). For example, in this context, the researcher will narrow down from fiscal deficits and debt impacts in general, to the particular case of the Kenyan public.

The advantage of using the case study design is that it is a flexible method which allows the researcher to use multiple methods to collect data such as interviews, observation and surveys (Creswell 2007). This study will apply the survey methodology.

3.3 Data Collection

The fundamental empirical strategy in this study is to test whether budget deficit influence the interest rate levels in Kenya. Taking the Keynesian theoretical model of crowding out effects, the data for this study will be sourced from different

independent sources. This is mostly to enhance the credibility of the data in testing the proposed theory. The data on budget deficit and public debt will be collected from the World Bank Development Indicators. This will be compared with the data collected from the Kenya Bureau of Statistics (henceforth, KBS) website. The purpose here is to avoid data problems that usually hamper credible data analysis. Data on interest rate will be collected from the Central Bank, while inflation will be collected from KBS website.

3.4 Data Analysis and Presentation

For the purpose of data estimation, this study proposes to use the simple ordinary least squares method due to the long run anticipation of the effects. Regression performed using OLS coincide with the true value of the average and have the least possible variance so that the analysis can produce Best Linear Unbiased estimates (BLUE). Before subjecting the data to a regression analysis, a descriptive statistics test will be conducted to provide a general view of the distribution and behavior of the variables in use. This entails showing trends of the variables in form of tables, graphs, and charts. Residual test for normality of the data series will be conducted and the Jacque Bera coefficient and its p-value observed for significance. There can be both short-run and long-run relationships between macroeconomic time series. Correlation analysis is therefore undertaken to examine short-run co-movements and multi-collinearity among the variables. If correlation is greater than 0.8, it indicates that multicollinearity exists.

3.4.1 Model Specification

The study proposes a linear model for the understanding of the effects of Budget deficit on Real Interest Rate in Kenya. The proposed model is as follows;

$$RI_t = \beta_0 + \beta_1 BDFTg_t + \beta_2 PDTg_t + \beta_3 INFL_t + GDPg_t + \varepsilon_t \dots\dots\dots 3.1$$

Where, RI_t is Real Interest $BDFTg_t$ is growth in the Budget Deficit, $PDTg$ growth in the public debt, $INFL_t$ inflation rate (proxied in the model by CPI) and $GDPg_t$ is the GDP growth (used as a controlling variable at time t).

β_0 = captures all other explanatory variables which affect Real Interest Rate, but are not captured in the model.

β_1, β_2 = are the coefficients of the variables. While ε_t captures the error term in the model. The error term should be even distributed for the model to be dependent upon.

3.4.2 Stationarity Test

In order to avoid a nonsensical result, usually referred as a spurious result, stationarity of the variables will be carried out to ascertain if the data characteristics conform to the BLUE criteria mentioned previously. The test to verify whether the variables are stationary and that shocks are only temporary and will dissipate and revert to their long-run mean, Maysami et al., (2004). In time series analysis, the Ordinary Least Squares regression results might provide a spurious regression if the data series are non-stationary. Stationarity test will be carried out using the Augmented Dickey-Fuller.

3.4.3 Autocorrelation Test

Assumptions of the OLS model are that the error term is free of autocorrelation, that is, the observations are independent of each other. Time series data are however prone to serial correlation problem. This may result into abnormal size of R^2 at values such as 95% which may render the test results insignificant and with no economic meaning. The presence of autocorrelation is detected by the Durbin Watson Statistic and corrected by Breusch-Godfrey Test.

3.4.4 Test of Heteroscedasticity

One of the major assumptions of OLS regression model is that the error term is homoscedastic, that is, the errors have the same variance throughout the sample. If the error variance is not constant, the data are said to be heteroscedastic. Heteroscedasticity causes the OLS estimates to be inefficient and can as well make the forecast error variance inaccurate since the predicted forecast variance is based on the average variance instead of the variability at the end of the series. The problem is often addressed by Breusch-Pagan-Godfrey test which revealed the error term to be homoscedastic.

CHAPTER 4

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the preliminary analysis of the data used in the study, the stationarity of the data using the Augmented-Dickey Fuller (ADF) and Phillips-Peron (PP), while the regression analysis carried out using the ARDL as the data behavior do not permit use of VAR models nor Ordinary Linear Regression Model to establish the behavior of the variables. The chapter also presents the post analysis test to establish the robustness of the model used and as well the causality test to show if the independent variables have a causal relationship with the dependent variable.

4.2 Preliminary Data Analysis

4.2.1 Graphical Analysis

Appendix I presents the graphical analysis of the variables to be included in the models of this study. The analysis reveals that the series is time-varying hence conforms to stochastic data generating process. From a casual check of the graphical analysis, it is evident that majority of these variables do not exhibit constant moments at levels. Taking a keen look at the graph for real interest rate, it is challenging to conclude that the data has constant moments or not, however the rest of the variables clearly demonstrate a feature of non-stationarity. This prompts the performance of the stationarity test. Albeit this clear indication in the data series, it is beneficial to first look at the preliminary statistics of the data, to find out if the variables can be included in the same regression equation or not, this will be carried out using the Pearson's Pearwise Correlation Coefficient, while Descriptive statistics will reveal the mean, median, kurtosis to show the series concentration

4.2 Descriptive Statistics

The basic statistical features of the data under consideration are summarized using the mean values, standard deviation, kurtosis, skewness, and the Jarque-Bera Test for the data. Table 4.1 shows these measures of central tendency and dispersion of the variables which provide a historical background for the behavior of the data in use here. The mean values reveal the averages of the variables in the study in their levels for the thirty-seven-year period of the study.

The skewness defines the degree of asymmetry of the distribution around its mean. A distribution that is symmetric around its mean has skewness of 0. A distribution is negatively skewed when the mean is less than the median, and positively skewed when the mean is greater than the median. Kurtosis on the other hand, is a measure of concentration of a distribution around the mean. A normal distribution has a kurtosis of 3. Table 4.1 reveals that the budget deficit series (BDFT henceforth) is negatively skewed with a value of -0.23. All the independent variables and the dependent variable are positively skewed but all reveal non-normal distribution. However, according to the table, only GDP growth has concentration of its series around its mean. This almost reveals a normal distribution with the figures of kurtosis (3.1) almost conforming to mesokurtic distribution.

The results nevertheless reveal that the same variable has almost a symmetric distribution with a figure of 0.52 (this is not standard however, but near the standard of 0). The remaining variables nonetheless, exhibit non-normality distribution according to Kurtosis since the departure from the standard Kurtosis value of 3 is considerable. The values of the other variables maintain a leptokurtic kind of distribution throughout. The results of the Jarque-Bera indicate that the data is not

normally distributed. According to this measure of normality, the P-values should conform to the significance levels.

However, it is interesting to note from the results that Kenyan real interest rates stood at the rate of 1.77, which is desirable to private investment and encourage of savings private savings. This is significant as for economic health of a country, even though this study does not intend to qualify this fact. This according to this study is a milestone. The overall results of normality test using the descriptive statistics reveal that by and large, the data may suggest the non-constant mean and variance hence applying the Classical Regression Model may result to spurious results implying violation of Gauss-Markov Assumptions.

Table 4. 1: Descriptive Statistics

	RI	GPDT	BDFT	GCPI	GDPG
Mean	1.176216	1.167609	-1110500	0.115278	8.356486
Median	0.340000	0.136033	-3498.969	0.105374	8.400000
Maximum	12.15000	37.67806	296030.9	0.459789	19.20000
Minimum	-0.27	-0.1	-10074350	0.000000	0.600000
Std. Dev.	2.216270	6.172063	2275235.	0.086916	4.194018
Skewness	3.608446	5.824243	-2.302393	1.942989	0.526266
Kurtosis	17.66228	34.95867	8.087135	8.202501	3.131059
Jarque-Bera	411.7267	1783.776	72.58628	65.00721	1.734372
Probability	0.000000	0.000000	0.000000	0.000000	0.420132
Sum	43.52000	43.20153	-41088511	4.265272	309.1900
Sum Sq. Dev.	176.8267	1371.397	1.86E+14	0.271955	633.2324
Observations	37	37	37	37	37

Source: Author

4.2.2 Correlation Analysis

Correlation analysis is used to check for collinearity between the variables. Multicollinearity is a serious problem if the correlation coefficient between two regressors is above 0.8. Multicollinearity refers to the condition when two or more of the independent variables, or linear combinations of the independent variables, in a multiple regression are highly correlated with each other. This condition distorts the standard error of estimates hence leading to problems when conducting t-tests for statistical significance of parameters. Multicollinearity can be tested by checking for correlation among the independent variables.

Table 4. 2: Pair-Wise Correlation matrix.

	RI	GPDT	BDFT	GCPI	GDPG
RI	1				
GPDT	0.12	1			
BDFT	-0.09	0.1	1		
GCPI	-0.43	-0.09	0.28	1	
GDPG	-0.13	-0.15	0.48	0.61	1

Source: Author

As the table reveals, the RI variable has a considerable departure from the rest of the variables. The variable exhibits a negative relationship with the rest of the variables except for the GPDT variable. With this kind of display, it is prudent to clearly understand what the *a priori* reveal about the variable and the rest, it being the subject of investigation.

Given the results herein, Multicollinearity may be given a clean bill of health from the data series. The series has not reported any relationship above 0.8. Although at this point of analysis we cannot comment on causality, the results in Table 4.1 reveal positive relationship between Real Interest rate and Public Debt, however, the

relationship is negative for the Budget Deficit, Consumer Price Index, and GDP growth. A casual understanding of these relationships makes a lot of economic sense and it is upon this study to find out.

In the preliminary data tests, we strive to gauge the data on what appropriate models that may fit the analysis. In doing this, we have to be cognizant and admit certain facts that Standard control theory upon which a study is based on tells a decision maker how to make optimal decisions when the model is correct. Robust control theory tells how to make good enough decisions when the model only approximates the correct model. As per the results of graphical analysis, descriptive statistics analysis and correlation coefficient analysis, we can go home with a conclusion that our data is not normally distributed, we can also deduce that the data have some peculiar behavior that may have not been picked by the theories. This critically puts a clear hypothetical direction in our proceeding analysis and model choice. It is now becoming clearer that proceeding forward will be only determined by the results of Unit Root tests.

4.2.3 Stationarity Test

The classical regression model assumes that the dependent and independent variables are stationary over time that is, mean of zero and a constant variance. Most of economic variables however, exhibit long run trend movement and only become stationary after they are differenced. Applying the classical regression technique to series at nominal values (at levels) may lead to a spurious correlation, especially when the variables involved exhibit consistent trend either upward or downward, Geda *et al* (2012). The tests ensures that shocks are only temporary and will dissipitate and revert to their long-run means.

In order to conduct valid statistical inference, we must make a key assumption in time series analysis: We must assume that the time series we are modeling is covariance stationary. A time series is stationary if its properties, such as mean and variance, do not change over time. A stationarity series must satisfy three principal requirements. If a time series that we model is not stationary, then estimation results will have no economic meaning. For a non-stationarity time series, spurious results will be yielded. However, we can attempt to convert the data to a stationarity time series if the time series is nonstationarity.

In statistical terms, we can differentiate it. Before that, we must determine whether a time series is stationarity. Currently, most popular test for nonstationarity is the Dickey-Fuller test for a unit root DeFusco et al., (2007). Therefore, the Augmented Dickey-Fuller (ADF) test is employed to determine whether there is a unit root in economic variables used in the study. In order to verify the unit roots results, the paper also employs the Phillips-Peron test as an alternative which postulate a simple test for unit root in a univariate time series against a stationary and trend alternative (Phillips & Perron, 1988). Both the ADF and PP are applied to the level variables as well as to their first differences in logarithmic terms. The null hypothesis tested that the variables under investigation have a unit root, against the alternative that they do not have.

Augmented Dickey-Fuller tests whether ΔY is equal to 0 or not.

$$\Delta Y = \alpha + \gamma Trend + \rho Y_{t-1} + \sum \sigma \Delta Y_{t-1} + \varepsilon_t \dots\dots\dots 4.1$$

The ADF tests the null hypothesis (H_0) against the alternative (H_1) hypothesis;

H_0 : Each economic variable has a unit root

H_1 : Each economic variable does not have a unit root

At first, ADF test was performed on the variables in levels to determine the presence of unit roots. The results of the ADF test are reported in Table 4.3. The second column of Table 4.3 presents the test statistics for each variable for a unit root in levels

Table 4. 3 ADF Unit Root Test at Level for the Sample period 1978-2014

Variable	P Value	ADF: t statistic	1%	5%	10%	Remarks	Stationary
RI	0.00	-5.06	-3.63	-2.95	-2.61	I(0)	YES
BDFT	1.00	5.66	-3.66	-2.96	-2.62	I(0)	NO
GPDT	0.00	-6.04	-3.63	-2.95	-2.61	I(0)	YES
GCPI	0.03	-3.15	-3.63	-2.95	-2.61	I(0)	YES
GDPG	0.10	-2.59	-3.63	-2.95	-2.61	I(0)	NO

Source: Author.

The test reported in Table 4.3 is tested against the Hypothesis of H_0 : Data has Unit Root and H_1 : Data Series has no Unit Root. The analysis is carried out on data at their nominal values (at level). The results reported herein show that, according to ADF, we reject H_0 for RI, GPDT and GCPI using both the P-Values and F-Statistics. Accordingly, the results indicate that, Real interest rate and Public Debt are stationary at 1%, 5% and 10% significant levels which are interdem with the theory. According to the results, the Consumer Price Index only becomes stationary at 5% and 10% significant levels. This study adopts 5% significant level; hence the three variables pass the Unit root test.

Table 4. 4: Unit Root Test Using Phillips-Perron at Level with Intercept

Variable	P Value	ADF: t statistic	1%	5%	10%	Remarks	Stationary
RI	0.00	-5.05	-3.63	-2.95	-2.61	I(0)	YES
BDFT	1.00	1.30	-3.63	-2.95	-2.61	I(0)	NO
GPDT	0.00	-6.04	-3.63	-2.95	-2.61	I(0)	YES
GCPI	0.02	-3.30	-3.63	-2.95	-2.61	I(0)	YES
GDPG	0.08	-3.31	-4.24	-3.54	-3.20	I(0)	YES

Source: Author

In order to completely rely on the results of ADF test reported in table 4.3, PP is also used at level to test the Unit root of the data. Using the same Hypothesis, PP confirms the results of PI, BDFT, GPDT and GCPI. It is however interesting that the series of GDP prove to be stationary at 10% significant level. Tested against the H_0 : Has Unit Root the series become stationary at 10% significance level with t-value of -3.202 against ADF test statistic of -3.307 indicating nonexistence of unit root. However, the results cannot be accepted since the study adopts 5% level of significance

Table 4. 5: ADF Unit Root Test at first difference for the Sample period 1978-2014

Variable	P Value	ADF: t statistic	1%	5%	10%	Remarks	Stationary
RI							
BDFT	0.9941	0.903	-3.679	-2.946	-2.612	I(1)	NO
GPDT							
GCPI							
GDPG	0.001	-7.044	-3.639	-2.951	-2.614	I(1)	YES

Source: Author

Results presented in Table 4.5 real veal that, even after differencing the variable Budget Deficit, it is still non-stationary as the P Value of 0.99941 is an outright rejection for the null hypothesis of no unit root. It implies that according to ADF, the variable is not stationary at all the levels of significance. GDP growth is however found to be stationary with P-value of 0.001 and obeys the stationarity rules at all the levels of significance. With this result, it is curious to see how the non-stationary data will behave when tested under PP criteria.

Table 4. 6: PP Unit root Test at First Difference for the Sample period 1978-2014

Variable	P Value	ADF: t statistic	1%	5%	10%	Remarks	Stationary
RI							
BDFT	0.001	-6.085	-3.633	-2.948	-2.613	I(1)	YES
GPDT							
GCPI							
GDPG							

Source: Author

With the previous results indicating that one of the variables for this study is not stationary both at I (0) and I (1), the PP results presented in Table 4.6 indicate a different and interesting results. According to PP, the Budget Deficit variable is found to be stationary at I (1) with P-value of 0.001 and a sounding t-statistic results disapproving the null hypothesis non-stationarity.

The prevailing result of unit root tests now takes this study to a model choice. It is prudent considering the results of unit root to choose a model that can accommodate data at different levels of integration. According to ADF, only three variables were found to be stationary at I (0) and 5% significance level, that is Real Interest Rate, Public Debt and CPI. However, PP reported that four of the variables except Budget deficit were stationary at I (0) and at 5% level. The resulting I (1) test for ADF still could not reveal a stationarity of Budget deficit, however, PP found the variable stationary. The optimal model for analysis of data with such behavior is ARDL. (Pesaran, Shin, & Smit, 2001) introduced the new approach to testing for the existence of a relationship between variables in levels which is applicable irrespective of whether the underlying regressors are purely I (0), purely I (1) or mutually cointegrated.

4.3 Empirical Results and Discussion of Results

In light of the preceding findings about the stationarity of the variables, applying OLS would automatically result to spurious results. All the independent variables did not pass the test of stationarity at level hence were not fit for an OLS regression analysis. Contemporary econometrics has indicated that regression analysis using time series data variables with unit root produce spurious or invalid regression results, Townsend(2001). Time Series data are most of the time trended over time and regressions between trended series may produce significant parameters with high R, but may be spurious or meaningless (Granger and Newbold, 1974).

With this knowledge, we are therefore left only with Autoregressive –Distributed Lag (ARDL) model for analysis as is presented by Pesaran *et al*, (2001). According to the authors, when the variables fail to be stationary at same level, that is I (0) and I (1), the only available model of analysis is ARDL. Accordingly, the ARDL model only accepts variables with differing stationarity levels, but not exceeding I (0) and I (1). If the variables become stationary even at I (2), then they fail to meet the model tenets. In our analysis, the variables perfectly match the Pesaran’s hypothesis.

Table 4. 7: Long Run analysis using Lag 2

Dependent Variable: D(RI)
 Method: Least Squares
 Date: 10/12/15 Time: 12:53
 Sample (adjusted): 1981 2014
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.221428	0.953517	-2.329721	0.0317
D(RI(-1))	-0.602833	0.177379	-3.398569	0.0032
D(RI(-2))	-0.139972	0.158959	-0.880552	0.3902
D(BDFT(-1))	2.87E-07	3.49E-07	0.821799	0.4219
D(BDFT(-2))	3.36E-07	2.82E-07	1.193106	0.2483
D(GPDT(-1))	-0.199753	0.062422	-3.200065	0.0050
D(GPDT(-2))	-0.123790	0.042887	-2.886451	0.0098
D(GCPI(-1))	-29.27348	6.686963	-4.377695	0.0004
D(GCPI(-2))	0.188186	7.465902	0.025206	0.9802
D(GDPG(-1))	-0.252983	0.148604	-1.702400	0.1059
D(GDPG(-2))	-0.139006	0.120954	-1.149247	0.2655
RI(-1)	-0.860708	0.263286	-3.269094	0.0043
BDFT(-1)	-4.37E-07	2.77E-07	-1.581615	0.1311
GPDT(-1)	0.220888	0.076827	2.875115	0.0101
GCPI(-1)	14.18749	7.317178	1.938930	0.0684
GDPG(-1)	0.117311	0.146146	0.802701	0.4326
R-squared	0.897650	Mean dependent var		0.062059
Adjusted R-squared	0.812359	S.D. dependent var		3.015421
S.E. of regression	1.306207	Akaike info criterion		3.677320
Sum squared resid	30.71120	Schwarz criterion		4.395608
Log likelihood	-46.51445	Hannan-Quinn criter.		3.922277
F-statistic	10.52450	Durbin-Watson stat		2.234332
Prob(F-statistic)	0.000005			

In order to run ARDL model, it is prudent to first determine the optimum number of lags to examine whether the variables have a long run or short run association among themselves. From the results in Table 4.7, the optimum number of lags as revealed by AIC (3.68) and SC (4.396) suggest that the model fits 2 lags optimally. The results

presented in Table 4.7 reveal a standard ARDL model results. However, we cannot entirely take these results since we have to as well confirm the suitability of the model. This was done by determining if the model does not suffer from serial Correlation and if the model is stable. From the results presented in Table Appendix XXVI and Appendix XXVII respectively, the results revealed that the model did not suffer from serial correlation and it was stable. Having found these results, had to find out the long run associationship among the variables. This was done using bound testing (WALD Statistics), (Pesaran , Shin , & Smith , 2001)

Table 4. 8: Wald Test

Wald Test:			
Test Statistic	Value	df	Probability
F-statistic	4.708378	(5, 18)	0.0063
Chi-square	23.54189	5	0.0003

Source: Author

Bound testing results reveal a long run associationship among the variables. The Pesaran Critical intercept values at 5% level reveal that F-Statistics value of 4.087 is greater than the upper bound of 3.87 and definitely not less than the lower bound of 3.10 at 5% and 2lag criteria in a restricted intercept and no trend (Pesaran, Shin, & Smit, 2001). The results further reveal that our model has restricted Intercept and has no trend. With this result, we can authoritatively reject the null hypothesis and conclude that the variables have a long run relationship among themselves. Having found that the variables move together in the long run, we can now develop a long run model. In order to do this, we run the Classical model and extract the residuals to aid the long run model analysis. The results of OLS is reported in Appendix XXIV

Table 4. 9: ARDL Main model of analysis

Dependent Variable: D(RI)
Method: Least Squares
Date: 10/12/15 Time: 13:06
Sample (adjusted): 1981 2014
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.056157	0.317787	0.176713	0.8614
D(RI(-1))	-0.700788	0.234602	-2.987134	0.0068
D(RI(-2))	0.144010	0.188556	0.763754	0.4531
D(BDFT(-1))	3.29E-08	3.15E-07	0.104521	0.9177
D(BDFT(-2))	1.51E-07	2.93E-07	0.516413	0.6107
D(GPDT(-1))	-0.039954	0.043954	-0.908995	0.3732
D(GPDT(-2))	-0.033389	0.045267	-0.737602	0.4686
D(GCPI(-1))	-17.47465	6.486348	-2.694065	0.0133
D(GCPI(-2))	24.69347	5.700431	4.331861	0.0003
D(GDPG(-1))	-0.088654	0.147579	-0.600723	0.5542
D(GDPG(-2))	0.090317	0.134455	0.671724	0.5088
ECT(-1)	-0.836436	0.244217	-2.963726	0.0084
R-squared	0.766075	Mean dependent var		0.062059
Adjusted R-squared	0.649113	S.D. dependent var		3.015421
S.E. of regression	1.786207	Akaike info criterion		4.268630
Sum squared resid	70.19175	Schwarz criterion		4.807345
Log likelihood	-60.56670	Hannan-Quinn criter.		4.452347
F-statistic	6.549756	Durbin-Watson stat		2.003274
Prob(F-statistic)	0.000097			

Source: Author

The empirical results presented in table 4.9 reveal interesting results regarding our study interest. From this empirical result, the data reveal that only one of the investigated independent variables is significant in the long run in determining the long run changes in real interest rates in Kenya. According to the results posted in table 4.9, only Consumer price index significantly affect real interest rate in the long run. The P-value of 0.0133 and 0.0003 are significant both at 10 % and 5% significance levels. The signs of the coefficients of the variable however real an

interesting result, it reveals that in the short run, the relationship is positive as the results of lag 2 shows. At lag two CPI (-2), the coefficient is 24.69347. On the other hand, the results reveal that in the long run, the relationship is more robust as the P-value of 0.0003 showing that the variable is significant at 5% significance level. This is coupled with a negative coefficient indicating that in the long run, the variable has negative effects on Real Interest rate in Kenya.

The results posted in Table 4.9 also reveal that, in the long run, the dependent variable, Real interest rate has a self-causality. The P value of 0.0068 indicates that in the long run, the variable is significant at 5% significance level and negatively affects the real interest rates in Kenya. The Error Correction Term signified the speed of adjustment towards Long Run Equilibrium. From the table of results, the Term conformed to the tenets that requires a negative coefficient and should be significant. This meant that the whole system (model) could get back to long run equilibrium at the speed of 83.6%.

From the results herein, model does not suffer from autocorrelation as the Durbin-Watson Statistical value of 2.003 is well within the standard critical value of 2. The probability of the F-Statistics value is also significant at 0.001 which is below 5% significance level. The Adjusted R² values of 0.649 indicate that the model is jointly significant. Jointly, the variables investigated in this study affects real interest rate at 76.6%. This is significant and shows that the study had a robust goodness of fit.

4.3.1 Causality between the Dependent and the Independent Variables

According to Appendix XXXI public debt is found to have a causal relationship with real interest rate in Kenya. The results indicate there is causality running from real interest to public debt, which means that in the long run, real interest rate have an

influence in the public debt. The results posted in Appendix XXXI indicate that in the long run, the interest rate variable is significant at 5% significance level with a P value of 0.0252. The coefficient of the variable in the long run reveals that there is a positive relationship between the variables, with the coefficient figure of 0.499.

This is in constancy with *a priory*, since the theory connecting these variables postulate that government borrowing for both capital and current expenditures have to be paid for in future. This is can be explained even casually, the Kenyan government debts such as public infrastructure bonds, critically determine the interest rate directions in future

Appendix XXIX report that budget deficit in Kenya is not caused by real interest rates both in the long run and short run. In theory, this is impossible. The causality results do not support the theoretical expectation of this relationship, and further remains questionable as the public debt, a product of budget deficit reveled to be associated and has a causal relationship with real interest rates in the long run. A controversy that has been empirically revealed by this study. The results in Appendix XXX for consumer price index report rather same results of causality as the variables in the preceding discussion.

The results reveal that there is no causality running from real interest rate to CPI in Kenya for the study period. This is however peculiar since the variable is the only one found to be significant and has a long run causal effect to the real interest rate at 55% level of significance.

GDP growth in Kenya is reported in Appendix XXVIII to be significant at 5% level of significance with long run causality from Real Interest Rate in Kenya. The result is not surprising as the variable; Real Interest rate is a considerable component of a

country's growth index. The relationship presented here is consistent with the theoretical anticipation.

4.4 Diagnostic Tests Results

In order to fully rely on the results presented and discussed above, we needed to be sure that the residuals did not affect the final results of the model and that the model did not suffer from serial correlation, Multicollinearity and that the model was stable.

Table 4. 10: Breusch-Godfrey Serial Correlation LM Test
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.910445	Prob. F(2,20)	0.1741
Obs*R-squared	5.453626	Prob. Chi-Square(2)	0.0654

Source: Author

The Diagnostic tests for the estimated results reported in Table 4.10 indicate the serial correlation among the estimated variables. Serial correlation is a statistical term used to describe the situation when the residual is correlated with lagged values of itself which is not desirable. This study adopted Breusch-Godfrey Serial Correlation LM Test to test for the presence of serial correlation on the residuals. The null hypothesis was of no serial correlation. From the results in Table 4.8 and in the Appendix VI, the p-value is 0.1741 (17%) which is more than 5 per cent ($p > 0.05$), hence null hypothesis could not be rejected. This means that residuals (u) are not serially correlated

Table 4. 11: Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.694080	Prob. F(12,35)	0.7459
Obs*R-squared	9.226857	Prob. Chi-Square(12)	0.6834
Scaled explained SS	17.25847	Prob. Chi-Square(12)	0.1401

Source: Author

Table 4.11 reported a p-value of 0.7459 (74.6%) which is more than 5 per cent ($p > 0.05$) shows that null hypothesis of homoscedasticity could not be rejected. This implied that the residuals had constant variance which is desirable.

4.5 Discussion of the Regression Results

From the results presented in Table 4.9, it is reported that only one variable was significant. The results reveal that with the exception of CPI, all other variables were insignificant influencer of real interest rate in Kenya. The results further point to both negative and positive relationship between CPI and real interest rates in the short run and long run respectively. The empirical results further indicate that the main variable, real interest rate has a significant influence on itself in the long run. The Error Correction Term signified the speed of adjustment towards Long Run Equilibrium. From the results herein, model does not suffer from autocorrelation as the Durbin-Watson Statistical value of 2.00 is well within the standard critical value of 2. The probability of the F-Statistics value is also significant at 0.001 which is below 5% significance level. The Adjusted R^2 values of 0.65 indicate that the model is jointly significant. Jointly, the variables contribute to the real interest rate in Kenya by 76%.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This study set out to investigate the contributory effects of Public Debt, Budget Deficit, and Consumer Price Index and GDP growth for the period of 1978 to 2014. The study adopted yearly data series interval as most of these variables are only reported on annual basis. This chapter presents the Summary, Conclusions and Recommendation for policy and further studies.

5.2 Summary of Findings and Results

In summary, the study deduced some interesting findings from the results presented in Chapter 4. As per the initial anticipation that the variables under investigation could fit the classical linear Regression Technique and that they would be stationary at nominal levels. This however, did not pass the test some variables, Budget Deficit was not stationary at I (0) and to some extent the GDP growth series was found not to have constant moments at level, thereby being stationary at I (1). The other variables were found to be stationary at I (0) rendering the OLS model unsuitable for the empirical analysis. With this shortcoming in the variables, the only suitable technique of analysis would be the ARDL as is discussed by Pesaran *et al* (2001). The ARDL model proved significant and jointly resulted into a result of all the variables causing real interest rate in Kenya at 76% contribution range. On the other hand, it is interesting that only CPI variable had a significant contribution to Real Interest rate in Kenya in the Long run. This is an interesting bit of this study as the main variables such as Public Debt and Budget Deficit did not reveal to be significant. The result is in contravention with *apriori*. The results also indicate that the two of the

investigated variables have causality running from real interest rate at 5% significance level. Public Debt and GDP growth proved to be caused by Real Interest Rate in the long run. The results reveal that with the exception of CPI, all other variables were insignificant influencer of real interest rate in Kenya. The results further point to both negative and positive relationship between CPI and real interest rates in the short run and long run respectively. The empirical results further indicate that the main variable, real interest rate has a significant influence on itself in the long run. The Error Correction Term signified the speed of adjustment towards Long Run Equilibrium. From the results herein, model does not suffer from autocorrelation as the Durbin-Watson Statistical value of 2.00 is well within the standard critical value of 2. The probability of the F-Statistics value is also significant at 0.001 which is below 5% significance level. The Adjusted R² values of 0.65 indicate that the model is jointly significant. Jointly, the variables contribute to the real interest rate in Kenya by 76%.

5.3 Conclusions, Recommendations and Policy Implications

From the results presented in chapter Four, we empirically concluded that the variables included in the study were insignificant except for Consumer Price Index. According to the convention and empirical studies, this contravened the standard requirements. The result of the study soundly explained that Real Interest Rate in Kenya is influenced at least 76% from the chosen economic variables.

As much as there are various facts that represent real interest experiences of countries in general, the real factors that determine this variable remains a complex issue and its regressions are as good as the data that goes into them.

In any economy, the interest rate factor is a significant contributor to growth summary of almost everything that goes into its production function, and that being the case, it may be a challenge to specifically pinpoint a section of factors as key because these may vary from one economy to the other. The analysis in this study was an attempt towards focusing on a section of these factors. Using the ARDL technique we found that variables under study contributed at least 76% to real interest rate over the period of study. The implication here would be that in order to stimulate and sustain this variable in Kenya, policy making process need to be keenly directed towards factors that remarkably contribute a country's growth function.

Atopic for further research in this area is to replicate the used methodology should focus on the nominal interest rate as the component is readily felt in the economy for its role economic activities. The nominal interest rate is usually the opportunity cost for investment and hence should have been put to consideration in this study.

5.4 Limitations of the Study

The present study focused on the factors that determine real interest rate in Kenya, however the results prove otherwise as per the initially advanced hypothesis. The study did not find the important independent variables significant, that is budget deficit and Public Debt not to be significant determinants of Real interest rate in Kenya for the study period chosen. This by extension negated the real interest of the study. An explanation could be advanced therefore that in Kenya, the savings and investment culture could probably be the major reason for this result, in this anticipation therefore, the study could have adopted the nominal interest rate rather than the real interest rate.

5.5 Areas for Further Studies

The study recommends that a similar study can be done on the nominal interest rates in Kenya and other east African countries. Further studies can be done cross country to compare the interstate interest rate regimes and their budget deficits and public debt. Lastly, while this study focused largely on the real interest rates, there is need to look at nominal interest rates and their effects on the sustainability of public debts stocks and the budget deficit financing.

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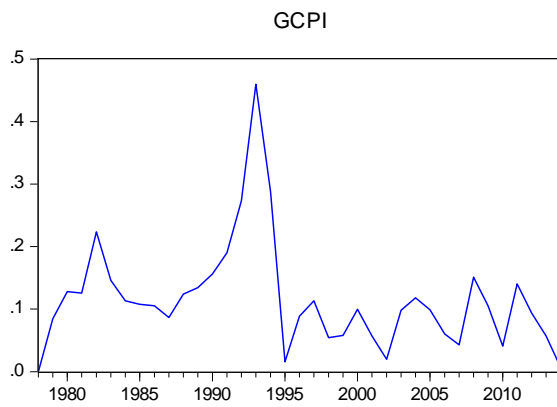
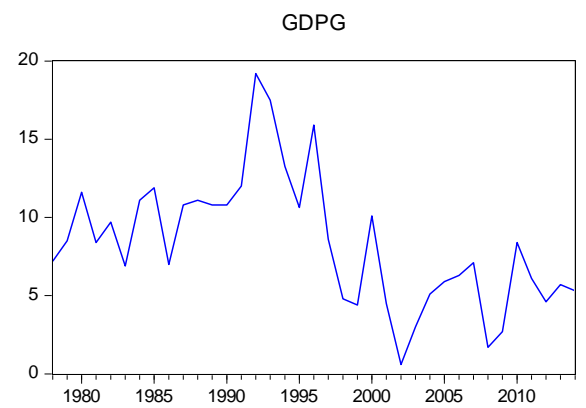
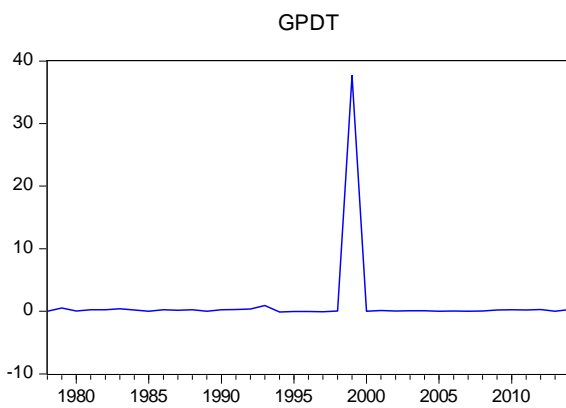
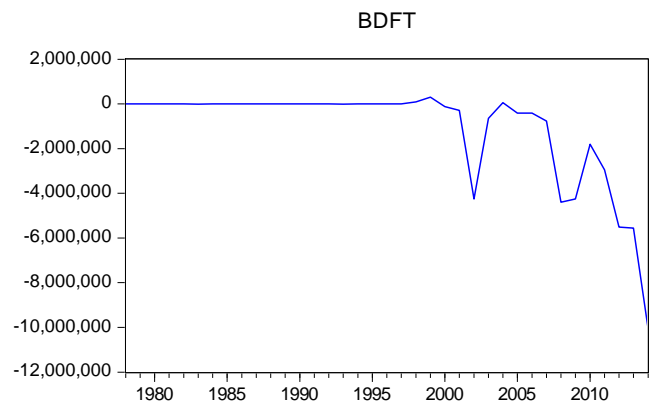
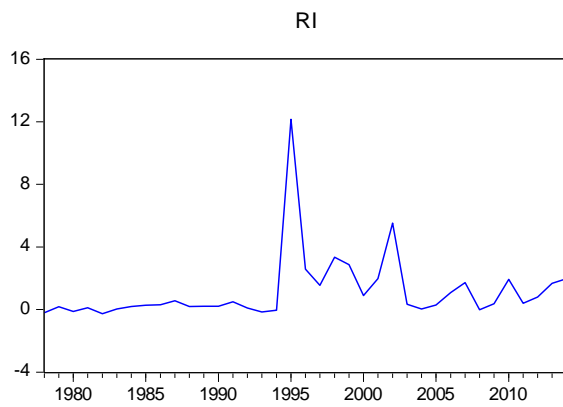
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APPENDIX I: GRAPHICAL ANALYSIS



APPENDIX II: UNIT ROOT TESTS FOR REAL INTEREST RATES a

Null Hypothesis: RI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.062412	0.0002
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RI)

Method: Least Squares

Date: 10/12/15 Time: 12:35

Sample (adjusted): 1979 2014

Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RI(-1)	-0.855941	0.169078	-5.062412	0.0000
C	1.048216	0.421843	2.484847	0.0180
R-squared	0.429798	Mean dependent var		0.060556
Adjusted R-squared	0.413028	S.D. dependent var		2.929100
S.E. of regression	2.244104	Akaike info criterion		4.508443
Sum squared resid	171.2242	Schwarz criterion		4.596416
Log likelihood	-79.15197	Hannan-Quinn criter.		4.539148
F-statistic	25.62802	Durbin-Watson stat		2.001501
Prob(F-statistic)	0.000014			

APPENDIX III: UNIT ROOT TESTS FOR REAL INTEREST RATES b

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

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-5.044572	0.0002
Test critical values:		
1% level	-3.626784	
5% level	-2.945842	
10% level	-2.611531	

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

Residual variance (no correction)	4.756227
HAC corrected variance (Bartlett kernel)	4.547799

Phillips-Perron Test Equation
 Dependent Variable: D(RI)
 Method: Least Squares
 Date: 10/12/15 Time: 12:35
 Sample (adjusted): 1979 2014
 Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RI(-1)	-0.855941	0.169078	-5.062412	0.0000
C	1.048216	0.421843	2.484847	0.0180
R-squared	0.429798	Mean dependent var		0.060556
Adjusted R-squared	0.413028	S.D. dependent var		2.929100
S.E. of regression	2.244104	Akaike info criterion		4.508443
Sum squared resid	171.2242	Schwarz criterion		4.596416
Log likelihood	-79.15197	Hannan-Quinn criter.		4.539148
F-statistic	25.62802	Durbin-Watson stat		2.001501
Prob(F-statistic)	0.000014			

APPENDIX IV: UNIT ROOT TESTS FOR REAL INTEREST RATES c

Null Hypothesis: GPDT has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.039715	0.0000
Test critical values:		
1% level	-3.626784	
5% level	-2.945842	
10% level	-2.611531	

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

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

Method: Least Squares
Date: 10/12/15 Time: 12:36
Sample (adjusted): 1979 2014
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GPDT(-1)	-1.034946	0.171357	-6.039715	0.0000
C	1.241708	1.076871	1.153071	0.2569
R-squared	0.517581	Mean dependent var		0.007768
Adjusted R-squared	0.503392	S.D. dependent var		9.002185
S.E. of regression	6.343876	Akaike info criterion		6.586810
Sum squared resid	1368.322	Schwarz criterion		6.674783
Log likelihood	-116.5626	Hannan-Quinn criter.		6.617515
F-statistic	36.47816	Durbin-Watson stat		2.002801
Prob(F-statistic)	0.000001			

APPENDIX V: UNIT ROOT TESTS FOR PUBLIC DEBT a

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

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-6.041029	0.0000
Test critical values:		
1% level	-3.626784	
5% level	-2.945842	
10% level	-2.611531	

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

Residual variance (no correction)	38.00894
HAC corrected variance (Bartlett kernel)	36.90511

Phillips-Perron Test Equation
 Dependent Variable: D(GPDT)
 Method: Least Squares
 Date: 10/12/15 Time: 12:36
 Sample (adjusted): 1979 2014
 Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GPDT(-1)	-1.034946	0.171357	-6.039715	0.0000
C	1.241708	1.076871	1.153071	0.2569
R-squared	0.517581	Mean dependent var		0.007768
Adjusted R-squared	0.503392	S.D. dependent var		9.002185
S.E. of regression	6.343876	Akaike info criterion		6.586810
Sum squared resid	1368.322	Schwarz criterion		6.674783
Log likelihood	-116.5626	Hannan-Quinn criter.		6.617515
F-statistic	36.47816	Durbin-Watson stat		2.002801
Prob(F-statistic)	0.000001			

APPENDIX VI: UNIT ROOT TESTS FOR BUDGET DEFICIT a

Null Hypothesis: BDFT has a unit root
 Exogenous: Constant
 Lag Length: 5 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	5.664041	1.0000
Test critical values:		
1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(BDFT)
 Method: Least Squares
 Date: 10/12/15 Time: 12:38
 Sample (adjusted): 1984 2014
 Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDFT(-1)	1.242692	0.219400	5.664041	0.0000
D(BDFT(-1))	-1.720624	0.295812	-5.816620	0.0000
D(BDFT(-2))	-1.742931	0.295478	-5.898683	0.0000
D(BDFT(-3))	-1.416729	0.284025	-4.988038	0.0000
D(BDFT(-4))	-1.199598	0.236238	-5.077921	0.0000
D(BDFT(-5))	-1.087094	0.214947	-5.057498	0.0000
C	-54124.33	222010.6	-0.243792	0.8095
R-squared	0.645905	Mean dependent var		-324819.2
Adjusted R-squared	0.557382	S.D. dependent var		1572308.
S.E. of regression	1046050.	Akaike info criterion		30.75462
Sum squared resid	2.63E+13	Schwarz criterion		31.07842
Log likelihood	-469.6966	Hannan-Quinn criter.		30.86017
F-statistic	7.296415	Durbin-Watson stat		2.384374
Prob(F-statistic)	0.000160			

APPENDIX VII: UNIT ROOT TESTS FOR BUDGET DEFICIT b

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

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	1.294730	0.9981
Test critical values:		
1% level	-3.626784	
5% level	-2.945842	
10% level	-2.611531	

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

Residual variance (no correction)	2.07E+12
HAC corrected variance (Bartlett kernel)	1.39E+12

Phillips-Perron Test Equation
 Dependent Variable: D(BDFT)
 Method: Least Squares
 Date: 10/12/15 Time: 12:39
 Sample (adjusted): 1979 2014
 Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDFT(-1)	0.032288	0.145315	0.222194	0.8255
C	-251984.6	276668.7	-0.910781	0.3688
R-squared	0.001450	Mean dependent var		-279800.9
Adjusted R-squared	-0.027919	S.D. dependent var		1460107.
S.E. of regression	1480349.	Akaike info criterion		31.30741
Sum squared resid	7.45E+13	Schwarz criterion		31.39538
Log likelihood	-561.5333	Hannan-Quinn criter.		31.33811
F-statistic	0.049370	Durbin-Watson stat		2.131442
Prob(F-statistic)	0.825492			

APPENDIX VIII: UNIT ROOT TESTS FOR BUDGET DEFICIT c

Null Hypothesis: D(BDFT) has a unit root

Exogenous: Constant

Lag Length: 6 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.902939	0.9941
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(BDFT,2)

Method: Least Squares

Date: 10/12/15 Time: 12:39

Sample (adjusted): 1986 2014

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDFT(-1))	1.043145	1.155277	0.902939	0.3768
D(BDFT(-1),2)	-2.301464	1.093313	-2.105037	0.0475
D(BDFT(-2),2)	-2.342731	0.951994	-2.460866	0.0226
D(BDFT(-3),2)	-2.215468	0.791172	-2.800234	0.0107
D(BDFT(-4),2)	-2.008748	0.603474	-3.328640	0.0032
D(BDFT(-5),2)	-1.857051	0.437272	-4.246906	0.0004
D(BDFT(-6),2)	-0.866771	0.282286	-3.070540	0.0058
C	-183286.1	266557.8	-0.687604	0.4992
R-squared	0.794384	Mean dependent var		-155650.2
Adjusted R-squared	0.725845	S.D. dependent var		2343079.
S.E. of regression	1226832.	Akaike info criterion		31.10672
Sum squared resid	3.16E+13	Schwarz criterion		31.48390
Log likelihood	-443.0474	Hannan-Quinn criter.		31.22485
F-statistic	11.59029	Durbin-Watson stat		2.205949
Prob(F-statistic)	0.000006			

APPENDIX IX: UNIT ROOT TESTS FOR BUDGET DEFICIT d

Null Hypothesis: D(BDFT) has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-6.084785	0.0000
Test critical values:		
1% level	-3.632900	
5% level	-2.948404	
10% level	-2.612874	

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

Residual variance (no correction)	2.06E+12
HAC corrected variance (Bartlett kernel)	1.78E+12

Phillips-Perron Test Equation

Dependent Variable: D(BDFT,2)

Method: Least Squares

Date: 10/12/15 Time: 12:40

Sample (adjusted): 1980 2014

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDFT(-1))	-1.205754	0.197278	-6.111963	0.0000
C	-320464.3	251906.0	-1.272158	0.2122
R-squared	0.530957	Mean dependent var		-128929.9
Adjusted R-squared	0.516744	S.D. dependent var		2127145.
S.E. of regression	1478719.	Akaike info criterion		31.30670
Sum squared resid	7.22E+13	Schwarz criterion		31.39557
Log likelihood	-545.8672	Hannan-Quinn criter.		31.33738
F-statistic	37.35609	Durbin-Watson stat		1.818706
Prob(F-statistic)	0.000001			

APPENDIX X: UNIT ROOT TESTS CONSUMER PRICE INDEX a

Null Hypothesis: GCPI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.150836	0.0316
Test critical values:		
1% level	-3.626784	
5% level	-2.945842	
10% level	-2.611531	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GCPI)

Method: Least Squares

Date: 10/12/15 Time: 12:41

Sample (adjusted): 1979 2014

Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCPI(-1)	-0.449175	0.142557	-3.150836	0.0034
C	0.053315	0.020762	2.567896	0.0148
R-squared	0.226002	Mean dependent var		0.000176
Adjusted R-squared	0.203237	S.D. dependent var		0.081397
S.E. of regression	0.072656	Akaike info criterion		-2.352197
Sum squared resid	0.179485	Schwarz criterion		-2.264224
Log likelihood	44.33955	Hannan-Quinn criter.		-2.321492
F-statistic	9.927765	Durbin-Watson stat		1.635533
Prob(F-statistic)	0.003388			

APPENDIX XI: UNIT ROOT TESTS CONSUMER PRICE INDEX b

Null Hypothesis: GCPI has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.434564	0.0626
Test critical values:		
1% level	-4.234972	
5% level	-3.540328	
10% level	-3.202445	

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

Residual variance (no correction)	0.004618
HAC corrected variance (Bartlett kernel)	0.004279

Phillips-Perron Test Equation

Dependent Variable: D(GCPI)

Method: Least Squares

Date: 10/12/15 Time: 12:42

Sample (adjusted): 1979 2014

Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCPI(-1)	-0.495633	0.142181	-3.485923	0.0014
C	0.093677	0.032114	2.916988	0.0063
@TREND("1978")	-0.001885	0.001163	-1.621028	0.1145
R-squared	0.283088	Mean dependent var		0.000176
Adjusted R-squared	0.239639	S.D. dependent var		0.081397
S.E. of regression	0.070977	Akaike info criterion		-2.373258
Sum squared resid	0.166247	Schwarz criterion		-2.241298
Log likelihood	45.71865	Hannan-Quinn criter.		-2.327201
F-statistic	6.515391	Durbin-Watson stat		1.696869
Prob(F-statistic)	0.004123			

APPENDIX XII: UNIT ROOT TESTS CONSUMER PRICE INDEX c

Null Hypothesis: D(GCPI) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.434384	0.0000
Test critical values:		
1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GCPI,2)

Method: Least Squares

Date: 10/12/15 Time: 12:43

Sample (adjusted): 1981 2014

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GCPI(-1))	-1.477600	0.229641	-6.434384	0.0000
D(GCPI(-1),2)	0.454117	0.160671	2.826372	0.0083
C	0.015718	0.029314	0.536202	0.5958
@TREND("1978")	-0.000927	0.001343	-0.689790	0.4956
R-squared	0.612225	Mean dependent var		-0.002780
Adjusted R-squared	0.573447	S.D. dependent var		0.116869
S.E. of regression	0.076328	Akaike info criterion		-2.197418
Sum squared resid	0.174780	Schwarz criterion		-2.017847
Log likelihood	41.35611	Hannan-Quinn criter.		-2.136179
F-statistic	15.78815	Durbin-Watson stat		1.897793
Prob(F-statistic)	0.000002			

APPENDIX XIII: UNIT ROOT TESTS CONSUMER PRICE INDEX d

Null Hypothesis: D(GCPI) has a unit root

Exogenous: Constant

Bandwidth: 14 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-8.052779	0.0000
Test critical values:		
1% level	-3.632900	
5% level	-2.948404	
10% level	-2.612874	

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

Residual variance (no correction)	0.006417
HAC corrected variance (Bartlett kernel)	0.001121

Phillips-Perron Test Equation

Dependent Variable: D(GCPI,2)

Method: Least Squares

Date: 10/12/15 Time: 12:43

Sample (adjusted): 1980 2014

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GCPI(-1))	-0.996352	0.172309	-5.782366	0.0000
C	-0.002238	0.013947	-0.160481	0.8735

R-squared	0.503280	Mean dependent var	-0.003866
Adjusted R-squared	0.488227	S.D. dependent var	0.115317
S.E. of regression	0.082495	Akaike info criterion	-2.096702
Sum squared resid	0.224581	Schwarz criterion	-2.007825
Log likelihood	38.69229	Hannan-Quinn criter.	-2.066022
F-statistic	33.43576	Durbin-Watson stat	2.012209
Prob(F-statistic)	0.000002		

APPENDIX XIV: UNIT ROOT TESTS GDP a

Null Hypothesis: GDPG has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.588041	0.1047
Test critical values:		
1% level	-3.626784	
5% level	-2.945842	
10% level	-2.611531	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(GDPG)
 Method: Least Squares
 Date: 10/12/15 Time: 12:44
 Sample (adjusted): 1979 2014
 Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG(-1)	-0.335623	0.129682	-2.588041	0.0141
C	2.780349	1.220532	2.277982	0.0291
R-squared	0.164577	Mean dependent var		-0.052778
Adjusted R-squared	0.140006	S.D. dependent var		3.492184
S.E. of regression	3.238507	Akaike info criterion		5.242054
Sum squared resid	356.5895	Schwarz criterion		5.330028
Log likelihood	-92.35698	Hannan-Quinn criter.		5.272759
F-statistic	6.697956	Durbin-Watson stat		2.026454
Prob(F-statistic)	0.014097			

APPENDIX XV: UNIT ROOT TESTS GDP b

Null Hypothesis: GDPG has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.307266	0.0812
Test critical values:		
1% level	-4.234972	
5% level	-3.540328	
10% level	-3.202445	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(GDPG)
 Method: Least Squares
 Date: 10/12/15 Time: 12:44
 Sample (adjusted): 1979 2014
 Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG(-1)	-0.471583	0.142590	-3.307266	0.0023
C	5.999581	2.018009	2.973020	0.0055
@TREND("1978")	-0.111975	0.057129	-1.960045	0.0585
R-squared	0.251693	Mean dependent var		-0.052778
Adjusted R-squared	0.206341	S.D. dependent var		3.492184
S.E. of regression	3.111100	Akaike info criterion		5.187485
Sum squared resid	319.4051	Schwarz criterion		5.319445
Log likelihood	-90.37473	Hannan-Quinn criter.		5.233543
F-statistic	5.549779	Durbin-Watson stat		1.975540
Prob(F-statistic)	0.008362			

APPENDIX XVI: UNIT ROOT TESTS GDP b

Null Hypothesis: GDPG has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.307266	0.0812
Test critical values:		
1% level	-4.234972	
5% level	-3.540328	
10% level	-3.202445	

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

Residual variance (no correction)	8.872365
HAC corrected variance (Bartlett kernel)	8.872365

Phillips-Perron Test Equation
 Dependent Variable: D(GDPG)
 Method: Least Squares
 Date: 10/12/15 Time: 12:45
 Sample (adjusted): 1979 2014
 Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG(-1)	-0.471583	0.142590	-3.307266	0.0023
C	5.999581	2.018009	2.973020	0.0055
@TREND("1978")	-0.111975	0.057129	-1.960045	0.0585
R-squared	0.251693	Mean dependent var		-0.052778
Adjusted R-squared	0.206341	S.D. dependent var		3.492184
S.E. of regression	3.111100	Akaike info criterion		5.187485
Sum squared resid	319.4051	Schwarz criterion		5.319445
Log likelihood	-90.37473	Hannan-Quinn criter.		5.233543
F-statistic	5.549779	Durbin-Watson stat		1.975540
Prob(F-statistic)	0.008362			

APPENDIX XVII: UNIT ROOT TESTS GDP c

Null Hypothesis: D(GDPG) has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.044057	0.0000
Test critical values:		
1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(GDPG,2)
 Method: Least Squares
 Date: 10/12/15 Time: 12:46
 Sample (adjusted): 1981 2014
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPG(-1))	-1.724181	0.244771	-7.044057	0.0000
D(GDPG(-1),2)	0.436398	0.158453	2.754111	0.0098
C	-0.242365	0.550331	-0.440399	0.6627
R-squared	0.685106	Mean dependent var		-0.102941
Adjusted R-squared	0.664790	S.D. dependent var		5.539030
S.E. of regression	3.206951	Akaike info criterion		5.252615
Sum squared resid	318.8205	Schwarz criterion		5.387294
Log likelihood	-86.29446	Hannan-Quinn criter.		5.298545
F-statistic	33.72287	Durbin-Watson stat		2.133436
Prob(F-statistic)	0.000000			

APPENDIX XVIII: UNIT ROOT TESTS GDP d

Null Hypothesis: D(GDPG) has a unit root
 Exogenous: Constant
 Bandwidth: 34 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-13.34990	0.0000
Test critical values:		
1% level	-3.632900	
5% level	-2.948404	
10% level	-2.612874	

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

Residual variance (no correction)	11.68960
HAC corrected variance (Bartlett kernel)	1.279557

Phillips-Perron Test Equation
 Dependent Variable: D(GDPG,2)
 Method: Least Squares
 Date: 10/12/15 Time: 12:46
 Sample (adjusted): 1980 2014
 Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPG(-1))	-1.192539	0.170455	-6.996226	0.0000
C	-0.099680	0.595217	-0.167469	0.8680
R-squared	0.597302	Mean dependent var		-0.048571
Adjusted R-squared	0.585099	S.D. dependent var		5.466438
S.E. of regression	3.521088	Akaike info criterion		5.410862
Sum squared resid	409.1360	Schwarz criterion		5.499739
Log likelihood	-92.69009	Hannan-Quinn criter.		5.441543
F-statistic	48.94718	Durbin-Watson stat		2.161629
Prob(F-statistic)	0.000000			

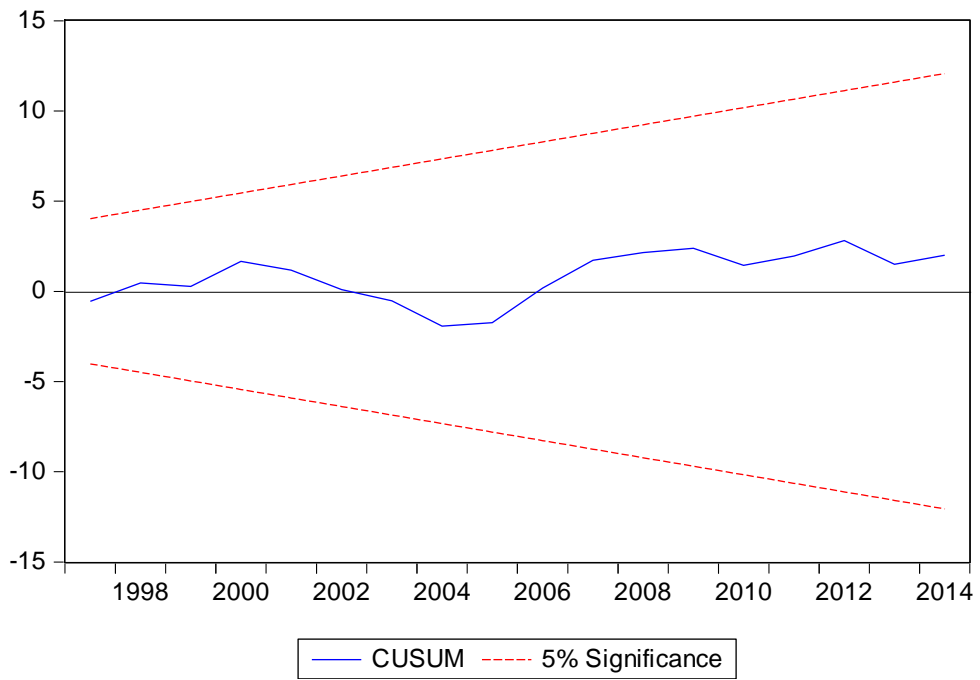
APPENDIX XIX: INITIAL STEP OF ARDL TEST

Dependent Variable: D(RI)
 Method: Least Squares
 Date: 10/12/15 Time: 12:53
 Sample (adjusted): 1981 2014
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.221428	0.953517	-2.329721	0.0317
D(RI(-1))	-0.602833	0.177379	-3.398569	0.0032
D(RI(-2))	-0.139972	0.158959	-0.880552	0.3902
D(BDFT(-1))	2.87E-07	3.49E-07	0.821799	0.4219
D(BDFT(-2))	3.36E-07	2.82E-07	1.193106	0.2483
D(GPDT(-1))	-0.199753	0.062422	-3.200065	0.0050
D(GPDT(-2))	-0.123790	0.042887	-2.886451	0.0098
D(GCPI(-1))	-29.27348	6.686963	-4.377695	0.0004
D(GCPI(-2))	0.188186	7.465902	0.025206	0.9802
D(GDPG(-1))	-0.252983	0.148604	-1.702400	0.1059
D(GDPG(-2))	-0.139006	0.120954	-1.149247	0.2655
RI(-1)	-0.860708	0.263286	-3.269094	0.0043
BDFT(-1)	-4.37E-07	2.77E-07	-1.581615	0.1311
GPDT(-1)	0.220888	0.076827	2.875115	0.0101
GCPI(-1)	14.18749	7.317178	1.938930	0.0684
GDPG(-1)	0.117311	0.146146	0.802701	0.4326
R-squared	0.897650	Mean dependent var		0.062059
Adjusted R-squared	0.812359	S.D. dependent var		3.015421
S.E. of regression	1.306207	Akaike info criterion		3.677320
Sum squared resid	30.71120	Schwarz criterion		4.395608
Log likelihood	-46.51445	Hannan-Quinn criter.		3.922277
F-statistic	10.52450	Durbin-Watson stat		2.234332
Prob(F-statistic)	0.000005			

d(ri) c d (ri (-1)) d (ri (-2)) d (bdft (-1)) d (bdft (-2)) d (gpdt (-1)) d (gpdt (-2)) d (gcpi (-1)) d (gcpi (-2)) d (gdp (-1)) d (gdp (-2)) ri (-1) bdft (-1) gpdt (-1) gcpi (-1) gdp (-1)

APPENDIX XX: STABILITY OF THE INITIAL ARDL MODEL



APPENDIX XXI: HETEROSKEDASTICITY TEST FOR THE INITIAL MODEL

Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.937140	Prob. F(15,18)	0.0912
Obs*R-squared	20.99452	Prob. Chi-Square(15)	0.1370
Scaled explained SS	13.56267	Prob. Chi-Square(15)	0.5589

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 10/12/15 Time: 12:56

Sample: 1981 2014

Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.332837	1.203378	1.938573	0.0684
D(RI(-1))	-0.238965	0.223859	-1.067480	0.2999
D(RI(-2))	0.314781	0.200613	1.569096	0.1340
D(BDFT(-1))	-4.35E-07	4.41E-07	-0.987538	0.3365
D(BDFT(-2))	-1.34E-07	3.56E-07	-0.376237	0.7111
D(GPDT(-1))	0.105012	0.078779	1.333003	0.1992
D(GPDT(-2))	0.093281	0.054125	1.723458	0.1019
D(GCPI(-1))	-24.07546	8.439225	-2.852804	0.0106
D(GCPI(-2))	10.54336	9.422278	1.118982	0.2779
D(GDPG(-1))	0.071871	0.187544	0.383221	0.7060
D(GDPG(-2))	0.282259	0.152649	1.849072	0.0809
RI(-1)	-0.006351	0.332278	-0.019115	0.9850
BDFT(-1)	4.48E-07	3.49E-07	1.282660	0.2159
GPDT(-1)	-0.120935	0.096959	-1.247270	0.2283
GCPI(-1)	9.812922	9.234582	1.062628	0.3020
GDPG(-1)	-0.257079	0.184442	-1.393822	0.1803
R-squared	0.617486	Mean dependent var		0.903270
Adjusted R-squared	0.298724	S.D. dependent var		1.968527
S.E. of regression	1.648488	Akaike info criterion		4.142782
Sum squared resid	48.91522	Schwarz criterion		4.861069
Log likelihood	-54.42729	Hannan-Quinn criter.		4.387738
F-statistic	1.937140	Durbin-Watson stat		1.618051
Prob(F-statistic)	0.091156			

APPENDIX XXII: SERIAL CORRELATION TEST FOR THE INITIAL MODEL

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.780097	Prob. F(2,16)	0.4750
Obs*R-squared	3.020843	Prob. Chi-Square(2)	0.2208

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 10/12/15 Time: 12:57

Sample: 1981 2014

Included observations: 34

Resample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.457818	1.032627	0.443353	0.6634
D(RI(-1))	0.067607	0.191205	0.353585	0.7283
D(RI(-2))	0.148545	0.202424	0.733833	0.4737
D(BDFT(-1))	2.15E-08	3.54E-07	0.060757	0.9523
D(BDFT(-2))	-6.61E-08	2.92E-07	-0.226074	0.8240
D(GPDT(-1))	0.033941	0.068903	0.492588	0.6290
D(GPDT(-2))	0.034567	0.051517	0.670981	0.5118
D(GCPI(-1))	3.032544	7.239446	0.418892	0.6809
D(GCPI(-2))	8.098663	10.05669	0.805301	0.4325
D(GDPG(-1))	-0.023766	0.151813	-0.156546	0.8776
D(GDPG(-2))	0.102083	0.147417	0.692479	0.4986
RI(-1)	0.204611	0.326871	0.625969	0.5402
BDFT(-1)	9.91E-08	2.92E-07	0.339426	0.7387
GPDT(-1)	-0.034641	0.082648	-0.419141	0.6807
GCPI(-1)	-4.405989	8.206953	-0.536861	0.5988
GDPG(-1)	-0.008940	0.149206	-0.059919	0.9530
RESID(-1)	-0.436596	0.391416	-1.115426	0.2811
RESID(-2)	0.267788	0.344810	0.776623	0.4487
R-squared	0.088848	Mean dependent var	-2.58E-16	
Adjusted R-squared	-0.879250	S.D. dependent var	0.964698	
S.E. of regression	1.322464	Akaike info criterion	3.701921	
Sum squared resid	27.98256	Schwarz criterion	4.509995	
Log likelihood	-44.93267	Hannan-Quinn criter.	3.977498	
F-statistic	0.091776	Durbin-Watson stat	2.060717	
Prob(F-statistic)	0.999994			

**APPENDIX XXIII: DETERMINING THE LONG RUN ASSOCIATION AMONG THE VARIABLES
(COINTEGRATION ANALYSIS) USING WALD TEST**

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	4.708378	(5, 18)	0.0063
Chi-square	23.54189	5	0.0003

Null Hypothesis: $C(12)=C(13)=C(14)=C(15)=C(16)=0$
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(12)	-0.860708	0.263286
C(13)	-4.37E-07	2.77E-07
C(14)	0.220888	0.076827
C(15)	14.18749	7.317178
C(16)	0.117311	0.146146

Restrictions are linear in coefficients.

APPENDIX XXIV: NORMAL OLS TO DETERMINE ERROR TERM

Dependent Variable: RI
 Method: Least Squares
 Date: 10/12/15 Time: 13:02
 Sample: 1978 2014
 Included observations: 37

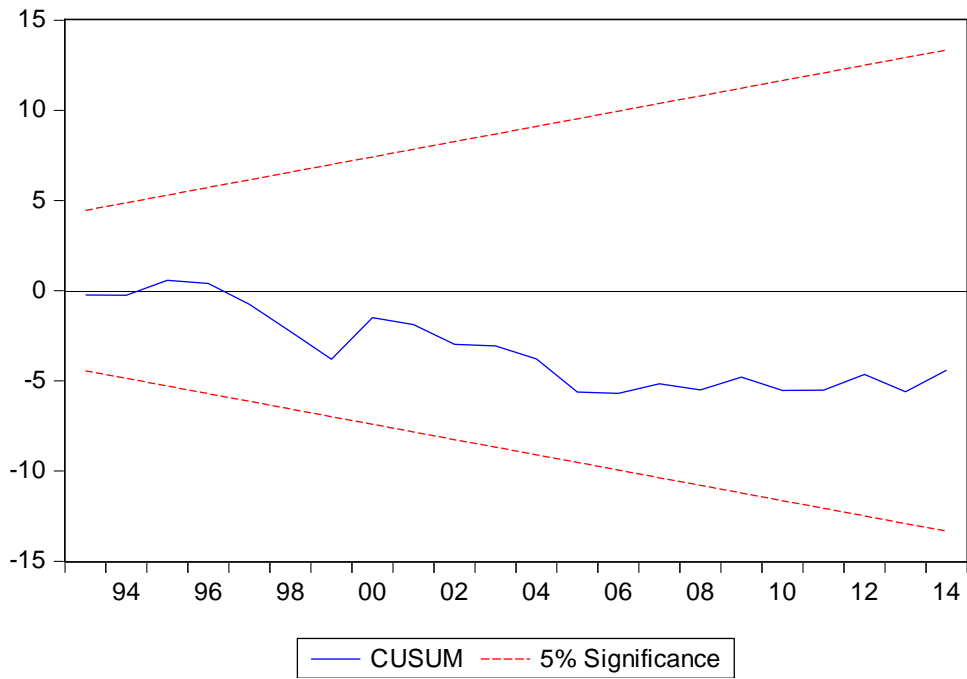
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GPDT	0.040915	0.057602	0.710310	0.4827
BDFT	-7.15E-08	1.76E-07	-0.406060	0.6874
GCPI	-14.26389	4.975945	-2.866569	0.0073
GDPG	0.138491	0.114966	1.204621	0.2372
C	1.536079	0.996091	1.542107	0.1329
R-squared	0.228204	Mean dependent var		1.176216
Adjusted R-squared	0.131729	S.D. dependent var		2.216270
S.E. of regression	2.065144	Akaike info criterion		4.413365
Sum squared resid	136.4742	Schwarz criterion		4.631057
Log likelihood	-76.64725	Hannan-Quinn criter.		4.490111
F-statistic	2.365428	Durbin-Watson stat		1.557305
Prob(F-statistic)	0.073725			

APPENDIX XXV: ARDL MODEL (MAIN MODEL)

Dependent Variable: D(RI)
 Method: Least Squares
 Date: 10/12/15 Time: 13:06
 Sample (adjusted): 1981 2014
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.056157	0.317787	0.176713	0.8614
D(RI(-1))	-0.700788	0.234602	-2.987134	0.0068
D(RI(-2))	0.144010	0.188556	0.763754	0.4531
D(BDFT(-1))	3.29E-08	3.15E-07	0.104521	0.9177
D(BDFT(-2))	1.51E-07	2.93E-07	0.516413	0.6107
D(GPDT(-1))	-0.039954	0.043954	-0.908995	0.3732
D(GPDT(-2))	-0.033389	0.045267	-0.737602	0.4686
D(GCPI(-1))	-17.47465	6.486348	-2.694065	0.0133
D(GCPI(-2))	24.69347	5.700431	4.331861	0.0003
D(GDPG(-1))	-0.088654	0.147579	-0.600723	0.5542
D(GDPG(-2))	0.090317	0.134455	0.671724	0.5088
ECT(-1)	-0.836436	0.244217	-2.963726	0.0084
R-squared	0.766075	Mean dependent var		0.062059
Adjusted R-squared	0.649113	S.D. dependent var		3.015421
S.E. of regression	1.786207	Akaike info criterion		4.268630
Sum squared resid	70.19175	Schwarz criterion		4.807345
Log likelihood	-60.56670	Hannan-Quinn criter.		4.452347
F-statistic	6.549756	Durbin-Watson stat		2.443274
Prob(F-statistic)	0.000097			

**APPENDIX XXVI: STABILITY OF THE MODEL AND DISTRIBUTION OF ERROR TERM IN ARDL MODEL
(MAIN MODEL)**



APPENDIX XXVII: SERIAL CORRELATION TEST IN ARDL MODEL (MAIN MODEL)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.910445	Prob. F(2,20)	0.1741
Obs*R-squared	5.453626	Prob. Chi-Square(2)	0.0654

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 10/12/15 Time: 13:12

Sample: 1981 2014

Included observations: 34

Resample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.105078	0.313346	-0.335342	0.7409
D(RI(-1))	0.023803	0.239750	0.099282	0.9219
D(RI(-2))	0.110974	0.193808	0.572601	0.5733
D(BDFT(-1))	-1.02E-07	3.14E-07	-0.325183	0.7484
D(BDFT(-2))	-8.51E-08	2.90E-07	-0.293753	0.7720
D(GPDT(-1))	0.006128	0.042505	0.144163	0.8868
D(GPDT(-2))	0.020967	0.045025	0.465684	0.6465
D(GCPI(-1))	-4.754821	7.107467	-0.668989	0.5112
D(GCPI(-2))	3.715488	5.838460	0.636382	0.5317
D(GDPG(-1))	0.017846	0.142682	0.125075	0.9017
D(GDPG(-2))	0.114694	0.143585	0.798788	0.4338
ECT(-1)	0.225333	0.333462	0.675738	0.5069
RESID(-1)	-0.596984	0.346642	-1.722191	0.1005
RESID(-2)	0.029213	0.315345	0.092639	0.9271
R-squared	0.160401	Mean dependent var	5.88E-17	
Adjusted R-squared	-0.385339	S.D. dependent var	1.458432	
S.E. of regression	1.716580	Akaike info criterion	4.211446	
Sum squared resid	58.93294	Schwarz criterion	4.839947	
Log likelihood	-57.59458	Hannan-Quinn criter.	4.425783	
F-statistic	0.293915	Durbin-Watson stat	2.081860	
Prob(F-statistic)	0.986198			

APPENDIX XXVIII: CAUSALITY BETWEEN GDP GROWTH AND REAL INTEREST RATES

Dependent Variable: D(GDPG)
 Method: Least Squares
 Date: 10/17/15 Time: 11:26
 Sample (adjusted): 1981 2014
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.209162	0.572957	-0.365058	0.7175
D(RI(-1))	0.499479	0.212436	2.351195	0.0252
D(RI(-2))	0.057311	0.212649	0.269509	0.7893
R-squared	0.165633	Mean dependent var		-0.185294
Adjusted R-squared	0.111803	S.D. dependent var		3.543966
S.E. of regression	3.339983	Akaike info criterion		5.333906
Sum squared resid	345.8201	Schwarz criterion		5.468585
Log likelihood	-87.67640	Hannan-Quinn criter.		5.379835
F-statistic	3.076958	Durbin-Watson stat		2.160007
Prob(F-statistic)	0.060400			

APPENDIX XXIX: CAUSALITY BETWEEN BUDGET DEFICIT AND REAL INTEREST RATES

Dependent Variable: D(BDFT)

Method: Least Squares

Date: 10/12/15 Time: 13:14

Sample (adjusted): 1981 2014

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-297181.5	265753.5	-1.118260	0.2720
D(RI(-1))	13101.53	98533.87	0.132965	0.8951
D(RI(-2))	11339.99	98632.49	0.114972	0.9092
R-squared	0.000707	Mean dependent var		-296266.1
Adjusted R-squared	-0.063764	S.D. dependent var		1502029.
S.E. of regression	1549177.	Akaike info criterion		31.42844
Sum squared resid	7.44E+13	Schwarz criterion		31.56312
Log likelihood	-531.2835	Hannan-Quinn criter.		31.47437
F-statistic	0.010962	Durbin-Watson stat		2.068076
Prob(F-statistic)	0.989101			

APPENDIX XXX: CAUSALITY BETWEEN CPI AND REAL INTEREST RATES

Dependent Variable: D(GCPI)
 Method: Least Squares
 Date: 10/12/15 Time: 13:17
 Sample (adjusted): 1981 2014
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004176	0.013750	-0.303721	0.7634
D(RI(-1))	0.007652	0.005098	1.501004	0.1435
D(RI(-2))	0.008631	0.005103	1.691376	0.1008
R-squared	0.104559	Mean dependent var	-0.003582	
Adjusted R-squared	0.046788	S.D. dependent var	0.082097	
S.E. of regression	0.080153	Akaike info criterion	-2.125660	
Sum squared resid	0.199160	Schwarz criterion	-1.990981	
Log likelihood	39.13622	Hannan-Quinn criter.	-2.079731	
F-statistic	1.809897	Durbin-Watson stat	1.744348	
Prob(F-statistic)	0.180541			

APPENDIX XXXI: CAUSALITY BETWEEN PUBLIC DEBT AND REAL INTEREST RATES

Dependent Variable: D(GPDT)
 Method: Least Squares
 Date: 10/12/15 Time: 13:18
 Sample (adjusted): 1981 2014
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007607	1.627670	0.004674	0.9963
D(RI(-1))	0.165465	0.603494	0.274179	0.7858
D(RI(-2))	-0.287691	0.604098	-0.476233	0.6372
R-squared	0.015867	Mean dependent var		0.006494
Adjusted R-squared	-0.047626	S.D. dependent var		9.270115
S.E. of regression	9.488296	Akaike info criterion		7.422092
Sum squared resid	2790.860	Schwarz criterion		7.556771
Log likelihood	-123.1756	Hannan-Quinn criter.		7.468022
F-statistic	0.249899	Durbin-Watson stat		3.076163
Prob(F-statistic)	0.780433			