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COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES

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IMPACT OF TOTAL GOVERNMENT EXPENDITURE AND ITS BREAK DOWN ON GROWTH IN AGRICULTURAL VALUE ADDED

BY

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DECLARATION

I, **NABASIRYE RACHEAL** hereby declare that this dissertation entitled "Impact of total government expenditure and its breakdown on agricultural value added" is my original work and has not been presented by anyone for the award of a degree in any other university.

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APPROVAL

This Research Report has been submitted for the award of the degree of Master of Arts in Economic Policy and Planning with my approval as the university supervisor.

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DEDICATION

I dedicate my work to my late mother Victoria Namyenya Ssedawula who raised me, loved me and also ensured that I didn't lack anything during my young age. I wish you were here to share with me this special achievement. Continue to rest in peace mummy, love you so much.

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LIST OF ABBREVIATIONS

ACF	:	Agricultural Credit Facility
ADF	:	Augmented Dickey Fuller
ARDL	:	Autoregressive Distributed Lag
BOP	:	Balance of Payment
CUSUM	:	Cumulative Sum
ECM	:	Error Correction Model.
FY	:	Financial Year
GAVA	:	Growth in Agriculture Value Added
INF	:	Inflation
LF	:	Labor Force
LR	:	Lending Rate
MAAIF	:	Ministry of agriculture, animal husbandry and fisheries
MFPED	:	Ministry of Finance, planning and Economic Development.
NAADS	:	National Agricultural Advisory Service
NARO	:	National Agricultural Research Organisation.
NDP	:	National Development Plan
NIDP	:	National industrial development policy
PAM	:	Plan for Modernisation of Agriculture
PP	:	Phillips-Perron
R&D	:	Research and Development
REER	:	Real Effective Exchange Rate
RESET	:	Regression Equation Specification Error Test
UBOS	:	Uganda Bureau of Statistics
UNHS	:	Uganda National Household Survey
UNLFS	:	Uganda National Labour Force Survey
VECM	:	Vector Error Correction Model

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ABSTRACT

Agriculture remains the mainstay for the majority of Ugandans and over the past decade, government expenditure to the agricultural sector has been increasing though it is still below the 10% target recommended by the Maputo declaration (2003) which emphasised the need for all African countries to increase their budgetary allocation to the agricultural sector. On the contrary, growth in agricultural value added has exhibited a constant trend. This study was conducted to examine the factors influencing agricultural value added including: total government expenditure to the agricultural sector, development expenditure to the agricultural sector, recurrent expenditure to the agricultural sector, capital stock, labour force, real effective exchange rate, trade openness and lending rate. Annual time series data (1988-2018) and the autoregressive distributive lag (ARDL) model augmented by the bounds test were used for estimation.

The study revealed that in the long-run total government expenditure allocated to the agriculture sector and agricultural development expenditure had a significant positive impact on growth in agricultural value added with elasticities of 0.19 and 016 respectively while recurrent expenditure had an insignificant negative relationship. Other variables found to have a significant impact on growth in agricultural value added in the long run included: capital stock, labour force, trade openness, and lending rates with capital stock having a positive relationship while lending rate and labour force had a negative impact. In the short run, trade openness, labour force and development expenditure had a significant positive relationship with growth in agricultural value added while lending rate and real effective exchange rate had a significant negative relationship with growth in agricultural vale added.

Based on the findings, the study recommends the government to increase the amount allocated to the agricultural sector and to ensure that the largest portion is assigned to agricultural development expenditure. The study further recommends an increase in agricultural capital stock and trade openness.

CHAPTER ONE

INTRODUCTION

This chapter introduces the background of the study, the problem statement, objectives of the study. The hypothesis to be tested, significance of the study, scope of the study and the organisation of the study.

1.1 Background of the study

The agricultural sector is the backbone of Uganda's economy and plays a predominate role in the economic development process through its contribution towards Gross Domestic Product (GDP), it contributed 64.1 percent in 1985, 41 percent in 2001, 26 percent in 2015 and 21 percent in the 2017/18 (Uganda Bureau of statistics, UBOS data). It is important to note that agriculture is a major contributor to GDP though its contribution towards GDP has been declining over years. The sector is very vital in supporting other sectors of the economy like manufacturing through provision of raw materials and it also provides market to their outputs.

According to Ssewanyana and Kasirye, 2013, the agricultural sector is the most important sector of any developing economy in terms of output (food for both the domestic and external markets) and employment generation as compared to other sectors. Indeed, the world development indicators, 2017 revealed that employment in the agricultural sector as a percentage of the total employment was 68.96% as compared to the service and manufacturing sectors which only employed 24.1% and 6.94% of the total employment respectively.

Although the agricultural sector has contributed most in terms of employment level, the income levels of the people employed in the sector are still low and their living standards are below the international set targets. Estimates from the Uganda National Household Survey (UNHS) 2016/2017 indicate that the proportion of the population living below the poverty line rose from 20% in Financial Year (FY) 2013 to about 21.4% in FY2017. According to the UNHS poverty among those who are self-employed was 21.2 and poverty among the paid casual labourer in agriculture was 42.4% percent, indicating that a deterioration in agricultural activity could severely deprive such individuals.

Agricultural products form 80% percent of export earnings thus contributing a larger proportion to Uganda's foreign exchange earnings with coffee contributing the largest percentage of 19% of the country's exports followed by tea, Cotton, oil and fish. Despite being the major contributor of Uganda's exports, most of the agricultural products are exported in raw form with no or little value added thus the share of Uganda in total world exports is still low with a low trade growth rate of 1.12% as compared to the world growth of 1.5% (World Bank, 2017). Lack of value addition has resulted into the export of raw materials leading to high trade deficits which in turn bring about declining prices of agricultural products in the global market. Uganda had a trade deficit of $3.7 billion in 2016 and $192M in 2018 (UBOS, 2018). Due to this, the government framed the second National Development Plan (NDP11) which is conscious to increase agro-processing, investment in agricultural value addition and marketing in order to expand the country's GDP and to improve balance of payment (BOP) deficits.

Nonetheless, that there has been a big change in Uganda's export sector which has come from the growth in the service exports, in 1995 services made up about 15% of all exports, a value that has since risen to 42% in 2017/2018. Structural changes in the export/portfolio have gone hand in hand with structural changes in the Ugandan economy. Services now produce 55% of value addition in the economy from 36% in 1995. At the same time agriculture's significance has nearly halved, from 49% of value added to 25% (World Development Indicators, 2016).

In quest to improve agricultural productivity and agricultural value addition, the government of Uganda designed the Plan for Modernisation of Agriculture (PAM) which was issued in 2000 aiming at eradicating poverty focusing on the agricultural sector. PAM initiated several agricultural reforms, policies and regulatory measures and these included: policies on irrigation and seeds; new agricultural finance mechanism; diverse agribusinesses particularly along the dairy, maize and coffee value chains; linkages between farmers and inputs and reforms in agricultural marketing, among others in order to increase agricultural value added.

Despite all the initiatives, growth in agricultural value added has remained stagnant ranging between 25 percent and 20 percent for the previous years while the share of agriculture in the gross domestic product has registered a steady decline. Agriculture growth has remained lower than the growth rates witnessed in the industrial and service sector. Agriculture grew by 3.2 percent in 2017/2018 from 1.6 percent in 2016/2017, industry grew by 6.2 percent in 2017/2018 compared to 3.4 in the 2016/2017 while service sector growth was 7.3 percent in 2017/2018 compared to 5.4 percent in 2016/2017 (UBOS 2018). Although Uganda's agricultural sector has registered very slow growth in the recent years 2000-2010 compared to other sectors that is, 2% per annum, compared to 8% and 13% for the manufacturing and services sectors, respectively, Agriculture remains the mainstay for the majority of Ugandans as the number of people dependent on agriculture for their food and livelihood has remained unchanged (Kasirye, 2013).

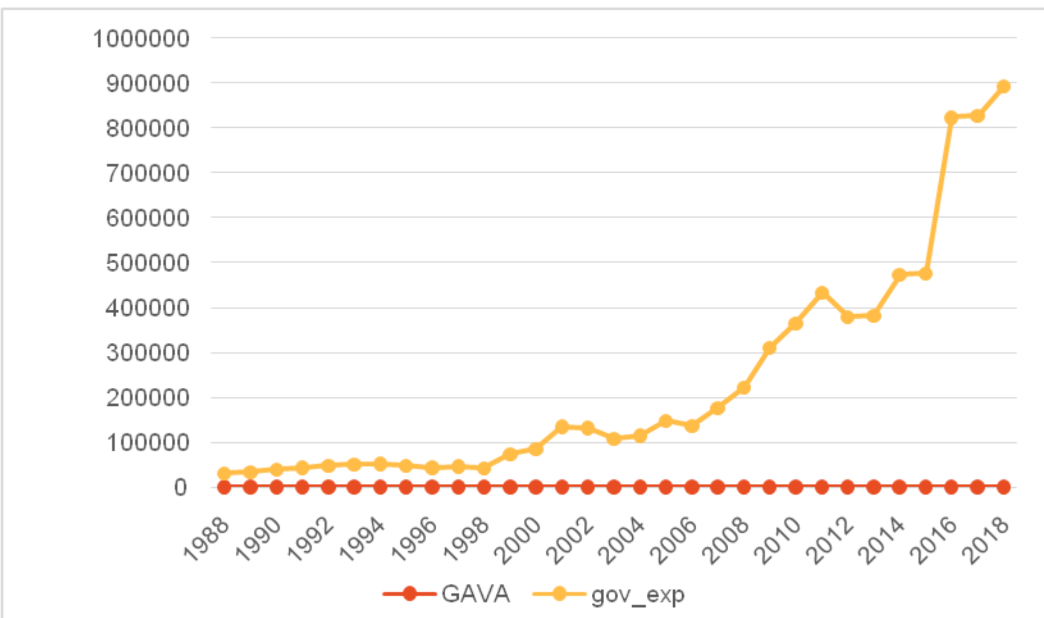
The Agricultural sector's importance to economic growth and poverty alleviation particularly in Africa and the corresponding under-investment in the sector was acknowledged in the African Union's Maputo Declaration of 2003, under which signatory nations committed to allocate 10% of budgetary allocation to agriculture and rural development. Indeed, over the last decade, countries such as Ethiopia, Mali and Niger have increased investments in agriculture as per Maputo declaration targets and in turn these countries have seen reductions in hunger and poverty as well as increase in agriculture value addition and productivity (FOA, 2015). Much as Uganda indorsed the Maputo declaration, public expenditure towards the agricultural sector has been fluctuating between 3.5% to 5% of the national budget, this is significantly below the set target as per the Maputo declaration.

Noteworthy is the fact that over the years, public expenditure to the agriculture sector has been steadily rising though still lagging behind the nationally and internationally recommended sectoral expenditure target (Lukwago, 2010). The Government has recently increased its allocation to the sector in terms of volume from UGX 735.839 billion (bn) in FY 2016/17 to UGX 865.202 bn in FY 2017/18, UGX 873.589 bn in FY 2018/19 and 1,054.6 bn in FY 2019/2020. According to the MFPED (2018), the government splits its expenditure to the agricultural sector into recurrent and development expenditure, the amount allocated to each has been increasing over the years. Recurrent expenditure increased from 39.77 bn in FY 2008/2009 to 209.63 bn in FY 2016/2017 and 317.42 in FY 2019/2020. Likewise, the amount allocated towards development expenditure has been increasing, that is., from 182.68 bn in FY 2008/2009 to 613.73 bn in FY 2016/2017 and 736.1 bn in FY 2019/2020 and the sector's development spending accounts for around 85% of the total sector's spending.

Although government expenditure to the agricultural sector has been increasing in absolute terms for the past years, the increase is less than the growth in the total national budget therefore the government of Uganda has over time reduced commitment to increase spending in agriculture as approved budget allocations to the sector are more or less stagnant and actual spending is declining. Low public expenditure on agriculture has a negative effect on agricultural research, formulation and implementation of quality control, rural infrastructure, regulation standards, marketing and dampens the environment for agribusiness which is essential for agriculture value addition. (Action Aid, 2013).

The figure below shows total government expenditure to the agricultural sector measured in billion shillings and the corresponding Agricultural value added for a period of 30 years (1988 to 2018).

FIGURE 1: GOVERNMENT EXPENDITURE AND GROWTH IN AGRICULTURAL VALUE ADDED.



Agricultural value addition has been receiving increasing attention as a way of enhancing the economic value of agricultural products, increasing incomes as well as promoting backward and forward linkages between agriculture and industry. The government has put in place several policies, extension services and programmes tailored to increase agricultural value addition, these include, National Agricultural Advisory Services (NAADS), the National Agricultural Research Organisation (NARO), National industrial development policy (NIDP), Agriculture Credit Facility (ACF), NDP11, and the Soroti fruit processing plant. The government set up NAADS with the intention of transforming the agricultural sector from a predominantly subsistence to commercial agriculture since commercial agriculture relates with high levels of agricultural value addition. NARO was also set up as an institution responsible for agriculture R&D and disseminating technology aimed at increasing productivity and agriculture value addition, NIDP emphasised the need for agricultural led industrialisation with a focus on value addition and linkages development.

The government has further initiated policies such as ACF which was implemented to facilitate the provision of medium and long-term financing to projects in agriculture and agro-processing with its focus on commercializing and value addition in agriculture. The Soroti fruit processing plant was established to help farmers add value to their fruits so as to produce wine, sweets and other products. The government has also distributed high quality seeds and machinery, trained farmers, enhanced postproduction infrastructure and improved market information.

Widely accepted and detailed analysis of the historical experience of agriculturally dependent countries suggest that it will be very difficult to have economic growth or diversification into industry in these countries without widespread fundamental improvements and investment in agricultural productivity growth and agricultural value addition.Benin (2008) further emphasised the need for increased government expenditure in Uganda's agricultural sector by indicating that with a 6% annual agricultural growth 2.9m Ugandans were to be uplifted above the poverty line by 2015.

Other factors that may affect growth in agricultural value added include; capital stock; labour force; lending rates; trade openness; inflation; foreign direct investment and real effective exchange rate also affect agricultural value addition in Uganda. An increase in the amount of capital invested in the agricultural sector leads to an improvement in agricultural value added since capital formation results into increased investment in capital equipment that enhance production. on the other hand, trade openness creates wider markets and enhances competition which results into increased agricultural value addition (Nabbumba and Bahiigwa, 2003). Capital stock to the agricultural sector has been increasing over the years, for instance, it increased from 3,010,910m in 1990 to 5529242m in 2001 and 18,352,708m in 2015. Lending rates have been fluctuating between 20 percent to 19 percent in the past 30 years while labour force has exhibited an increasing rate for example, labour force proxied by rural labour increased from 15974M in 1990 to 19927M in 2000 and 33745M in 2018.

1.2 Problem statement

Government expenditure can directly or indirectly influence agricultural output, productivity and value addition. The government allocates 85% of the agricultural budget to development expenditures and 15% to recurrent expenditures. The amount allocated to the agricultural sector increased by 5.7% in FY 2005/2006 and in FY 2019/2020 there was a 12% increase from the prior year FY 2018/2019. However, the growth in agricultural value added has been fluctuating between 25% and 20% from 1988 to 2018.For example, growth in agricultural value added amounted to 24% in 2010, 22% in 2013 and 21% in 2018 (FAO,2018) and the sector's share in Uganda's economy has reduced from over 50% in 1986 to 22% in 2018. This suggests that either the increase in government expenditure to the agricultural sector is still less than required or the problem is with distribution of government expenditure between recurrent and development expenditure. It is due to this view, that the study is intended to examine how total government expenditure to the agricultural sector and its distribution between recurrent and development impact on the performance of the agricultural sector using agricultural value addition as the measure of performance.

1.3. Objectives of the study

1.3.1 General Objectives

1. To determine the impact of total government expenditure on growth in agricultural value added in Uganda and the impact of its component (recurrent and development expenditure) on growth in agricultural value added.

1.3.2 Specific Objectives

1. To examine the long run and short run impact of recurrent and development expenditure for the agricultural sector on growth in agricultural value added as well as the impact of total government expenditure on growth in agricultural value added.

2. To examine other factors that affect growth in agricultural value addition in Uganda.

1.4 Hypothesis of the study

1. Increase in recurrent expenditure for the agricultural sector and lending rate have a negative impact on growth in agricultural value added.
2. Increased amount of development expenditure allocated to the agricultural sector and capital stock lead to an increase in growth in agricultural value added.
3. Liberalization of the agricultural sector and the positive shifts in exportation of value-added products lead to increase in growth in agricultural value addition.

1.5 Significance of the study

The findings of the study will enable us to assess the impact of government expenditure allocated to the Agricultural sector on growth in agricultural vale added. That is to say, to what extent does total government expenditure and its breakdown between development expenditure for the agricultural sector and recurrent expenditure for the agricultural sector contribute to growth in agricultural value addition. The findings of this research paper will guide public policy decisions with regards to allocation of public expenditure and its proper spending to accomplish increased growth in agricultural value added.

The research also contributes empirically to the body of knowledge (literature) by using agriculture value added as a measure of sector performance; many other studies used agricultural output, productivity and sectoral contribution to GDP as the measure of performance of the agricultural sector. The study analyses time series data on agricultural value added to examine the impact that total government expenditure, recurrent expenditure for the agricultural sector and development expenditure for the agricultural sector have had on growth in agricultural Value added by using the autoregressive distributed Lag model.

1.6 Scope of the study

The study investigates the impact of government expenditure on growth in agricultural value added in Uganda. The study considers a period of 30 years from 1988 to 2018.

1.7 Organisation of the study

The study is organized into five chapters. Chapter one is the introduction part of the study. It comprises of the background of the study, the problem statement, the objectives of the study, the scope of the study and the significance of the study. Chapter two reviews the relevant literature about the impact of government expenditure on the performance of the agricultural sector. Chapter three presents the methodology adopted for the study encompassing the theoretical framework, specification of the empirical model, definition and explanation of the variables used in the empirical analysis, estimation procedure, and the data types and sources. Chapter four reviews the estimated results and their interpretation. And lastly; chapter five gives conclusions, recommendations, limitations of the study and the area of further research.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews the theoretical and empirical literature. The theoretical literature reviews the theories of government expenditure and explores the various theoretical views concerning the reasons as to why the government increases its expenditure while the empirical literature looks at other research works regarding government expenditure to the agricultural sector and other factors that influence value addition like capital, labour, trade openness and real effective exchange rate is reviewed. The chapter concludes by presenting the summary of the literature and the knowledge gap.

2.1 Theoretical Literature

There are various theories of government expenditure propounded by different economists at different times and these are sub-divided into two broad theories, the macro and micro models. The macro models explain the broad patterns of government expenditure with regards to aggregate variables like GDP and they attempt to justify the long-term growth of government expenditure. Such models include Wagner's law (Wagner, 1883), Musgrave theory of public expenditure (Musgrave and Musgrave, 1989), Peacock Wiseman hypothesis (Peacock and Wiseman, 1961)and the Samuelson's pure theory of public expenditure (Samuelson, 1958). On the other hand, the micro theories focus on the decision-making behavior of public individuals and institutions. They attempt to explain changes in specific components of government expenditure, whether caused by increasing demand for individual services or by changes in their cost structures.

Wagner's law of increasing expenditure (Wagner, 1883), propounded by Adolph Wagner in 1883 asserted that there is a long run propensity for the scope of government expenditure to increase with higher levels of economic development thus public expenditure increases as per capita income increases. This is because the demand for goods supplied by the public sector has a high positive income elasticity. Wagner (1883) noted that as, economies grow industrialisation, modernization and urbanisation also grow, which inevitably put pressure on the demand for social, education, health, infrastructure and security services therefore causing the need for government to play a significant administrative and productive capacity role by expanding these services resulting into higher government expenditure.

Musgrave approach to government expenditure (Musgrave and Musgrave, 1989) differs from Wagner's opinion. They believed that public expenditure increases when an economy develops from traditional economy to an industrialized economy. They emphasized that government expenditure is a prerequisite of economic development, its level being directly related to the stage of development a country has reached. They based their explanations of increasing public expenditure on the need to provide social amenities for growth and development. They further acknowledged that at the development stage of an economy, some capital projects are needed to accelerate growth and development of the country.The investment in education, health, roads, electricity, and water supply are necessities that can launch the economy from the traditional stage to the take off stage of economic development making government to spend an increasing amount with time in order to develop an egalitarian society (Ogba, 1999).

Peacock and Wiseman theory of public expenditure (Peacock and Wiseman, 1961) is based on the political theory of public expenditure determination which states that "the government wants to spend more money, but citizens do not like to pay more taxes thus the government needs to pay some attention to the aspiration and wishes of their people". They focused on the pattern of public expenditure and according to them government expenditure does not follow a smooth trend but the increase in government expenditure takes place in steps coinciding with social upheavals, notably wars, among others. The occurrence of unexpected social disturbance would necessitate an increase in government expenditure (Ajibola, 2005)

Samuelson's pure theory of public expenditure (Samuelson, 1958) is particularly concerned with the proper way of allocating resources between the public and private sectors. Samuelson 1958 assumed that there are two kinds of goods, namely, private good M and public good Y and two individuals' G and P. He upheld that the model of budget determination is based on individual preference function thus the government will spend depending on a combination of private and public goods demanded by the nation.

2.2 Empirical Literature

Wangusi and Muturi (2015) examined the impacts of agricultural public spending on the agricultural sector in Kenya over the period 1973 to 2012. The study adopted a descriptive research design and used a simple regression model. The analysis found a positive and significant relationship between public spending and the performance of agricultural sector in the long run using agricultural value added as a measure of performance. The results showed that an increase in agricultural public spending led to 0.034 increase in agricultural value addition and they recommended the government to expand agricultural public spending since it had a significant increasing effect on agricultural value added.

In the context of Nigeria, using time series data, Obi and Bidemi (2016) established the relationship between government capital spending, recurrent spending and agricultural output using a multiple regression model and agricultural output as a measure of performance of the agricultural sector. They study revealed that government expenditure was positively related to agricultural output with elasticity of 0.53 and they recommended the government to increase its spending to the agricultural sector.

Similarly, Uremadu, Ariwa and Duru (2018) conducted a study that examined the effect of government agricultural expenditure on agricultural output in Nigeria using time series data (1981 to 2014), Unit root test, co-integration test and vector error correction model methods of data analysis. The results indicated that agricultural output adjusted positively to changes in total government expenditure with elasticity of 0.29 and they recommended that the government should not only adequately fund agriculture via maintaining a healthy population but also encourage a mechanized agricultural system by use of modern technology and inputs to boost yields in local agricultural products and to increase agricultural value addition.

Chauke, Manyise and Maiwanashe (2015) carried out a comparative study on the impact of public expenditure on agricultural growth in South Africa and Zimbabwe, using agricultural GDP as the dependent variable. Their study employed co-integration tests together with Vector Error correction model (VECM) and the results showed that capital expenditure was positively related to agricultural growth in both the short-run and long-run, in both countries. In the long run, the increase in government expenditure for the agricultural sector led to a 0.09 and 0.26 increase in agricultural growth for South Africa and Zimbabwe, respectively.

In the same way, a study conducted in Zimbabwe by Saungweme and Matandare (2014) tested the effects of central government expenditure on the agricultural sector using agricultural value added as a measure of performance using time series data. The results indicated that a 1% increase in central government expenditure increased agricultural value added by 2.56 hence they concluded that increased agricultural expenditure boosted agricultural value addition and strengthened forward and backward economic linkages. They further recommended the government to continuously increase public spending to the agricultural sector.

Ajao (2000) carried out a study examining the effect of agriculture expenditure on agricultural productivity for Sub-Saharan African countries. Time series data for a thirty-year period (1970-1999) was used and it consisted of information on agriculture production and means of production. Agricultural contribution to gross domestic product was used as a measure of performance and the findings revealed that an increase in agriculture expenditure led to 0.035 increases in economic growth and development poverty in Sub-Saharan African countries.

Adekunle and Ndukwe, 2018 investigated the effect of real exchange rate dynamics on agricultural output performance in Nigeria over the period of 1981 to 2016 by collecting data from secondary sources. The study employed a combination of stationary and non-stationary variables as found out through the ADF unit root test. Based on the Bounds test for cointegration, a positive long-run relationship was present between the increase in exchange rate and agricultural output with elasticity of 0.18 and they recommended the government to consciously manage changes in the exchange rate.

Obayelu and Salau (2010) applied the techniques of cointegration and VECM to explore the response of agricultural output to changes in prices and exchange rate between 1970 and 2007. They reported that in the short run and long run, total agricultural output responded positively to increases in exchange rate (that is, exchange rate depreciation) with elasticities of 2.02 and 3.21 for the short run and long run respectively and they recommended the government to always ensure that there are appropriate measures to control exchange rate volatilities.

Using time series data between 1980 to 2013, Asif (2017) analyzed agricultural Productivity growth and the role of capital in South Asia (that is., Bangladesh, Pakistan, India and Nepal). The study adopted the O’Donnell (2014) to measure total factor productivity and the results revealed that all countries sustained agricultural productivity growth at variable rates with Bangladesh experiencing highest rates estimated at 1.05% per annum, followed by India (0.52), Pakistan (0.38) and Nepal (0.06) thus indicating a positive relationship between capital stock and agricultural productivity. Policy recommendations suggested by Asif, 2017 included, smooth operation of the

land rental market to improve natural capital, investments in education to improve human capital and agricultural R&D to enhance technology capital to boost
Agricultural productivity growth in South Asia.

Sotamenou and Nehgwelah(2018) investigated the impact of free trade on agriculture in Cameroon. Agricultural value added was used as a measure of performance and time series data from 1980-2015 extracted from the World Development Indicators (WDI) was used. The elasticity of free trade to agricultural valued added was 0.392 indicating a positive and significant relationship between trade openness/liberalization and agricultural value added in Cameroon. They urged the government to set minimal trade tariffs since trade openness leads to a larger market share for agricultural products and increases the competitiveness of processed good.

Ewubare and Eyipote (2015) employed time series data to examine the effect of public expenditure on agricultural output in Nigeria. They used a multiple regression, the Johansen co-Integration techniques and error Correction Model. The result of the study showed that agricultural funding with an elasticity of 0.18 had a positive relationship with the performance of the agricultural sector in Nigeria. The study further indicated that the agricultural sector contributes significantly to the Nigerian economy as a major source of sustainable employment generation in Nigeria and thus the share of government expenditure to the agricultural sector should be increased.

Chandio, Jiang and Jingdong (2016) examined Pakistan's government expenditure and the degree of impact it had on the agricultural sector and economic growth. They employed the Augmented Dickey–Fuller (ADF), Johansen co-integration test and ordinary least square (OLS) technique as analytical tools. The Johansen co-integration test results showed the existence of a positive long-run relationship between government expenditure on agriculture sector, agricultural value addition, agricultural outputs and economic growth with elasticities of 0.26, 1.23 and 1.89 respectively. They recommended that the Pakistan government should increase public spending in the agricultural sector.

Utpal and Dkhar (2018) examine the short and long run relationship that government expenditure on agriculture and its sub-sector had on agricultural output of Meghalaya India. Agricultural output was used as a measure of performance of the agricultural sector and government expenditure in different sectors including agriculture education, transport, health and development were used as the independent variables. Using the ARDL approach to co integration and an error correction, the result of the Bounds test indicated the presence of a long-run co integrating relationship between government expenditure, education and transport with agricultural output. Their elasticities were 0.45, 1.20 and 0.68 respectively, they recommended the government to reduce spending in unproductive sectors but increase their spending to the agricultural sector, education and rural development

Contrastingly, a study in Nigeria by Ndubuaku, Kabiru, and Chaiaka (2018) found that government funding to agriculture and agriculture guarantee scheme fund had a non-significant impact on agricultural contribution to GDP. On the other hand, the study found that commercial banks' credit, loans and advances to the agricultural Sector had a positively significant impact on Agricultural sector contribution to GDP with an elasticity of 1.89. His study conformed to those study of Ibe (2014), Andrew(2015), Friday and Ikechukwu (2016) whose studies concluded that government funding to agriculture did not have any significant impact on agricultural sector contribution to GDP in Nigeria.

Blake, Mckay and Morissey (2002) investigated the Impact that Trade Liberalisation had on Uganda's Agricultural sector using agricultural exports as a measure of performance. Time series data extracted from World Development Indicators was used and they focused on cash crops (Coffee, Tea, Tobacco and cotton). The long run results showed that trade openness had a positive and significant effect on the agricultural sector with elasticity of 3.2. Their results conform to the findings of Ojeyinka and Adeboye (2017).

Similarly, Anowor (2013) examined the impact of trade liberalisation on the agricultural sector (model 1) and its export sub-sector (model 2) focusing on processed agricultural products. The error correction model of ordinary least square (OLS) results from the time -series analysis confirmed that agricultural degree of openness and agricultural export to import price ratio were significant in the both models with elasticities of 0.766 and 0.382 for models 1and 2, respectively. He therefore recommended the government to further reduce the trade tariffs since trade liberalisation had a positive relationship with the performance of the agricultural sector and on its export sub-sector.

Okoboi, Kuteeesa and Barungi (2013) studied the impact of public- private agricultural extension services on the performance of the agricultural sector in Uganda. The study used panel data based on UNHS 2005/6 and Uganda National Panel Survey (UNPS) 2009/10. The results indicated that agricultural extension services had a positive impact on the agricultural sector. They recommended the government to increase its spending on agricultural extension services. Additionally, using time series data Mwesigwa, Sserunjogi and Mbowa (2017) indicated that one of the major constraints to the agricultural sector is farmer's limited access to credit and capital which hinders them from accessing equipment to be used in production and value addition. They urged the government to devise means of increasing the capital stock in the agricultural sector.

To ascertain the relationship between capital stock and economic development, Jhingan (2006) asserted in his work that capital could not only result into the investment in capital equipment that leads to increase in production but again lead to employment opportunities. He further stressed that capital stock leads to technical progress which helps realise the economies of large-scale production and/or increases specialization and/or thus provides machines, tools and equipment for the growing labour force. He further linked capital stock to the different sectors of the economy and concluded that there was a positive relationship between capital stock and the economy's sectors of which the agricultural sector was among the key sectors assessed.

Bhattacharyya and Mukherjee (2019) investigated the impact of skill development on India's agriculture. They asserted that skill development in food processing, value addition, branding and packaging can not only ensure a secure monthly income during lean seasons but also provide enhanced productivity, remunerative prices, good marketing and enhanced income and make agriculture a profitable venture which will prevent rural people from migrating into urban areas in search of employment and income. They advised the government to set up an Institutional Arrangements for skill development in agriculture and National skill development Corporation to ensure that farmers have enough skills needed in agricultural value addition process. The results confirm to those of Dubey (2016) who investigated the impact of skilling the workforce in agriculture .

Topouzis and Guerny (1999), conducted research on Sustainable Agricultural/Rural Development, labour productivity and its vulnerability to the AIDS Epidemic in developing countries. Using time series data from the World Development Indicators (WDI, 1998), the results indicated that the AIDS epidemic had a negative impact on agricultural labour productivity thus affecting the agricultural sector negatively. They recommended the governments of developing countries to find means of reducing the spread of AIDS so to increase agricultural labour productivity.

Lukwango (2010) noted that the growth strategy for Uganda has not been anchored on getting agriculture moving. He noted that the agricultural sector has suffered from low budget allocation and poor prioritization of the limited resources it is allocated. The sector receives less than the 10% recommended by the Maputo declaration. He emphasised that the low levels of agriculture spending are totally insufficient to sustain any major or substantial investments that can create the necessary institutional and physical infrastructure required to transform the economy. The Uganda national budget for 2009/2010 ranked roads and works, education and public administration as the top three prioritized sectors and the agricultural sector was among the lowest ranked sectors.

Benin (2008) conducted a study at the international Food Policy Research institute (2008) and he emphasised the need for Uganda to at least allocate 14% of its budget on agriculture by 2015. He further stated that if Uganda was to achieve 6% annual agriculture growth, an addition of 2.9 million Ugandan would be uplifted above the poverty line by 2015.

In a pivotal contribution, Ssewanyana, Matovu, and Twimukye (2011) urged that agriculture in Uganda is still characterized by low productivity and value addition mainly because of poor inputs, fluctuating prices, undeveloped value chains, and low public and private investment in the sector. Kasirye (2013) also noted that farmers who are constrained in terms of credit find it difficult to adopt new technologies essential for engaging in intensive agricultural practices that would increase agricultural output and agricultural value addition.

CHAPTER THREE

METHODOLOGY

This chapter describes the estimation techniques adopted for the study of the impact of government expenditure on the performance of the agricultural sector in Uganda. It specifies the theoretical framework and the empirical model, empirical analysis procedures, description of the variables and their measurements. The chapter concludes by describing the data types and sources used in the study.

3.1 Theoretical framework

The theoretical framework of this study follows the neoclassical framework. Solow (1956) attempted to explain the long-run economic growth by looking at capital accumulation, labour or population growth and increase in productivity commonly referred to as technological progress. According to Solow (1956), output is determined by the amount of capital stock and labour force. That is;

$$Y_f = f_t(K, L) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (3.1)$$

Where Y is output, K is for capital stock and L is for Labour force. Using a Cob-Douglas production function, the above equation is expressed as;

$$Y_f = AK_t^{\alpha} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (3.2)$$

where, A is autonomous technology, α and β are constants between 0 and 1. When α +β >1 there are increasing returns, α+β=1 indicates constant returns to scale and if α+β< 1, are decreasing returns to scale. The growth rate of agricultural value added can be computed by taking logs and then differentiating with respect to time,

$$lnY = lnA + \alpha lnK_t + \beta lnL_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (3.3)$$

$$\frac{1}{Y}\frac{dY}{dt} = \alpha K + \beta L \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (3.4)$$

In equation (3.4), $\frac{1}{Y}\frac{dy}{dt}$ is the growth rate of Agricultural value added ,K is capital stock, and L is labour force. For simplicity.

Adapting the model in (3.4) to the agricultural sector (A)

$$\frac{\dot{Y}^A}{Y} = \alpha K^A + \beta L^A \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.5)$$

Where $\frac{\dot{Y}^A}{Y}$ is the growth rate in agricultural value added (GAVA), $K^A\ andL^A$respectively are capital and labour dedicated to the agricultural sector.Equation (3.5) indicates that the growth rate of agricultural value added directly depends on capital stock dedicated to the sector and agricultural labour force.

3.2 Empirical model

The study amends the model in equation (3.5) by introducing total government expenditure invested in the agricultural sector, lending rate, trade openness and real effective exchange rate as the key factors affecting agricultural value addition. Therefore, equation (3.5) is modified to:

$$\text{GAVA} = \text{f (KS, LF, OPEN, LR, REER,TGE)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.6)$$

where,

GAVA	=	growth in agricultural value added
KS	=	capital stock,
LF	=	agriculture Labour Force,
LR	=	lending rate
OPEN	=	trade openness.
REER	=	real effective exchange rate
TGE	=	total government expenditure for the agricultural sector.

Logarithms were used in order to estimate the elasticities directly. The logarithm transformation implies that the change in logarithm dependent variable per unit change in logarithm independent variable remains the same no matter the logarithm independent variable (constant elasticities). Logarithm transformation also reduces heteroscedasticity (Byanyima, 2011).

$$lnGAVA_t = \alpha_0 + \alpha_1 lnKS_t + \beta lnLF_t + +\delta lnOPEN_t + \sigma LR_t + \infty lnTGE_t + \theta REER + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.7)$$

Where, ε_t is the error term, In implies Logarithm, α_0 is the intercept, $_{1}$, $\beta, \delta, \sigma, \infty$ *and* θ are agricultural value added elasticities with respect to capital stock, stock of labour force, openness, lending rate, total government expenditure and real effective exchange rate respectively

The corresponding equations for the disaggregated government expenditure are as follows,

GAVA=f (KS, LF, RE, DE, OPEN, REER, LR) …. (3.8)

$lnGAVA_t = \alpha_0 + \alpha_1 lnKS_t + \beta lnLF_t + \emptyset lnRE_t + \partial lnDE_t + \delta lnOPEN_t + \theta REER + \sigma$ 楳$R_t +$
ε_t … (3.9)

Where,

GAVA = growth in agricultural value added

KS = capital stock,

LF = agriculture Labour Force,

LR = lending rate

OPEN = trade openness.

REER = real effective exchange rate

RE = recurrent expenditure for the agricultural sector

DE = development expenditure for the agricultural sector

ε_t is the error term, In implies Logarithm, α_0 is the intercept,α_1 , β, $\emptyset, \partial, \delta, \sigma$ *and* θ are agricultural value added elasticities with respect to capital stock, stock of labour force, recurrent expenditure for the agricultural sector, development expenditure for the agricultural sector , openness, lending rate and real effective exchange rate respectively.

3.3 Definition of the variables and expected signs

Growth in agriculture value added is the dependent variable and it's used in this study as a measure of performance of the agricultural sector. The independent variables used in the model include total government expenditure allocated to the agricultural sector, development expenditure allocated to the agricultural sector, recurrent expenditure allocated to the agricultural sector, lending rate, capital, labour, Real effective exchange rate and trade openness. These are described below,

Growth in Agricultural Value added (GAVA)

Agricultural value addition is described as the process that transforms the raw agricultural product into something new through packaging, processing, cooling, drying, extracting, and other processes that change a product from its original raw form. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural (World Bank Development Indicators, 2018). Growth in agricultural value addition is key in increasing the customer base of a product and at the same time it expands the revenue sources for the producer (Orden ,2018).

Total Government Expenditure for the Agricultural sector

It is the share of total government expenditure allocated to the agricultural sector and it comprises of recurrent expenditure and development expenditures. It is key for the smooth running of the agricultural sub-sectors and functions which impact agricultural value addition positively through improved extension services and increased research and development (Lukwango, 2010). Based on empirical findings, it is expected that total government expenditure to the agricultural sector will have a positive impact on growth in agricultural value added.

Government Development Expenditure allocated to the agricultural sector (DE)

It involves expenditure used for the purchase of items that will last and will be used time and time again in the provision of a good or service, Modebe, et al (2012). Such expenditure includes spending on capital goods and projects that are meant to increase the national output and agricultural value added. In Uganda, development expenditure comprises of government development and donor development expenditure. Accordingly, the study expects a positive relationship between government development expenditure and growth in agricultural value added and this will be in line with the findings of Edet and Agom (2016).

Government Recurrent Expenditure allocated to the agricultural sector (RE)

Recurrent expenditure refers to spending which doesn't result in the creation or acquisition of fixed assets (new or second hand). It consists of expenditures mainly on wages, employer contributions, interest payments, fuel and lighting, subsides and transfers. In the study recurrent expenditure will comprise of wages and non-wages. According to Lotto (2011) and Devarajan (1983) some aspects of recurrent sectoral expenditure have positive effects while others have negative effects. The study expects a negative relationship between government recurrent expenditure and growth in agricultural value added.

Openness (OPEN)

This refers to the degree of integration of the economy to international trade/external markets and it is measured as a ratio of the sum of trade (exports plus imports) to GDP. According toAnowor, 2013 openness is a key variable that affects agricultural value addition and it was included into the model since Uganda is an open economy. With trade openness, producers of agricultural products gain by selling to a wider market as their products can compete effectively with those from other countries while at a country level it eases access to modern technology. Furthermore, investment funds intended to improve agricultural value addition can move unimpeded from industrialized countries to Uganda. The study expects a positive relationship between trade openness and growth in agricultural value added.

Capital stock (KS)

This is a measure of net investment in the agricultural sector. Capital stock includes goods which are used in the production of other goods, these include machinery, tools, and buildings. Capital stock will be proxied by the growth rate of gross capital formation based on constant local currency since. The study expects that an increase in the amount of capital invested in the agricultural sector will lead to an improvement in the value added to agricultural products, this is because capital formation results into increased investment in capital equipment that enhance production Asif (2017). Based on the empirical findings, the study expects a positive relationship between capital stock and growth in agricultural value added.

Labour Force (LF)

This measures the quantity of labour employed in the agricultural sector and is proxied by rural population. The relationship between agricultural labour force and agricultural value addition is uncertain depending on the agricultural value added per worker. Labour force can affect the agricultural sector either positively or negatively and this depends on factors like education, mind-set, skills, labour productivity and health among others. Bhattacharyya and Mukherjee(2019) explained that an increase in labour force can affect agricultural value addition positively where the increase in labour force is productive with adequate skills needed in the agricultural value addition process. However, on the other hand, the relationship between the two could also be negative where the increased labour force is unproductive with no skills to add value to agricultural products. Dubey, (2016) explained that excellent packaging, storage and transport is required to ensure that perishable agricultural produce are not spoilt and meet international standards thus farmers need to have appropriate skills to reduce wastage or deterioration of quality of the produce. The study expects a positive relationship between growth in agricultural value added and labour force.

Lending rate (LR)

This refers to the interest that farmers must pay back to a bank or financial institution on borrowed funds. Farmers tend to borrow money to invest into their farms so as to increase their farm productivity and value addition therefore it’s important for them to have access to credit. High lending rates make credit expensive thus less affordable to farmers, the high cost of borrowing discourage prospective farmers from investing in the agricultural value addition due to increased prices of inputs needed in value addition. Furthermore, high interest rates reduce the retained earnings of the farmers thus limiting their ability to reinvest. Mghenyi (2015) found a negative relationship between lending rates and agricultural value addition in Kenya. Based on the empirical findings it is expected that there will be an inverse relationship between interest rates charged on agricultural credit and growth in agricultural value added in Uganda.

Real Effective Exchange Rate

Real Effective Exchange Rate (REER) is the weighted average of nominal exchange rates, adjusted for inflation. REER affects the prices of agricultural products and agricultural inputs both within and outside the country. A depreciation of a currency tends to increase a country's exports by improving the competitiveness of domestic goods in foreign markets while making foreign goods less competitive in the domestic market by becoming more expensive. However, on the other hand, appreciation of a country's currency in relation to foreign currencies, foreign goods become cheaper in the domestic market thus those involved in the agricultural sector can have access to essential equipment and machinery needed to in the agricultural value addition process. (Hossain, 2014). The study expects a positive relationship between REER and growth in agricultural value addition.

3.4 Estimation procedures

3.4.1 Unit root tests

Before estimating any relationship between growth in agricultural value added and its explanatory variables, there is need to check for the stationarity of each time series since many times time series are not stationary at levels**.** Testing the stationarity of economic time series is of great importance since estimation of a time series model without testing for stationarity can easily result in a spurious regression. Consequently, the usual statistical tests are likely to be inappropriate and the inferences drawn are likely to be erroneous and misleading. The study adopted the Augmented Dickey fuller (ADF) and the Phillips-Perron (PP) tests for unit root and these were run on each variable. In each case the null hypothesis was that, there is a unit root implying (non-stationary, H_0), against the alternative hypothesis (H_1) of stationary.

Augmented dickey fuller Test (ADF)

The ADF is a modified version of the Dickey Fuller test (Gujaarati, (2004), it deals with a larger and more complicated set of time series models. It ensures that the unit root is valid even in the presences of serial correlation of unknown form. To get the specification of the ADF test, the ordinary Dickey Fuller equation is modified by adding lagged values of the differenced dependent variables as shown below,

$$\Delta Y_t = \alpha_0 + \alpha_2 + \tilde{n} Y_{t-1} + \sum_{i=1}^{M} \beta_i \, \Delta Y_{t-1} + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.10)$$

Where Y_t is the time series being tested, M is the optimal number of lags, U_t is the error term.

Phillips-Perron (PP) Test

It is a more comprehensive theory of unit root non-stationarity that was propounded by Philips and Perron in 1988**.** The Phillips-Perron unit root tests differ from the ADF tests mainly in how they deal with serial correlation and heteroscedasticity in the errors but similar in terms of the null hypothesis, the alternative hypothesis and the decision rule.

The test is based on the following first order auto-regressive process,

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + u_t \dots \dots \quad (3.14)$$

The Phillips-Perron test is more robust to general forms of heteroscedasticity and auto correlation in error term U_t and the user does not have to specify a lag length for the test regression. The PP test differs from the ADF test in that it does not assume white noise residuals but corrects the problem of serial correlation in the residuals.

3.4.2 Co-integration Test

After testing for stationarity for each time series, the next step is to search for co-integration among the variables. Co-integration refers to the existence of a long-run equilibrium relationship between variables. The idea of long-run equilibrium implies that two or more variables may wander away from each other in the short-run but move together in the long-run (Enders, 1995). In the literature, three approaches have been used to test for existence of long run relationship among the variable (co-integration), that is, Engle and Granger(1987) two step approach, Johansen and Juselius (1990) procedure and the ARDL bounds test by Pesaran et al (2001.)

The Engle Granger approach is a two-step approach which uses ordinary least squares to test for Co-integration. In the first step, the model is estimated using OLS and the residuals predicted, then unit root test is conducted on the residuals based on the standard ADF test. Absence of unit root in the residuals is an indicator that the variables are co-integrated. When this happens, the Granger representation theorem says that there is some valid error correction representation of the model which describes how the dependent variable and the independent variables behave in the short run and long run Shin and Pesaran (1995). The second step therefore involves estimation of the error correction model with the lagged residuals from the first step included as error correction term.

The Engle Granger approach is, however, limited in a way that the error made in the first step is carried forward into the second step which leads to poor estimation.

In order to resolve the inadequacies of the Engle granger approach, Johansen and Juselius (1990) developed a method that is based on maximum likelihood estimation. This approach is based on vector auto regressive model (VAR) and the maximum Eigen value or the likelihood ratio. The Johansen and Juselius (1990) approach can estimate and test even in the presence of multiple co-integrating vectors. However, the technique requires all variables to be integrated of the same order (preferably of order one, I (1)) and there arises identification issues when using the method. More so, the number of co-integrating relations depends on the number of lags chosen (Greene, 2007).

The study adopts ARDL bounds approach to co-integration over other approaches because the approach is not as restrictive in terms of the meeting of integration of the same order as in Johansen. Secondly, it produces unbiased estimates even in the presence of endogenous covariates. Thirdly, the method can be applied even when the variables have different optimal number of lags Harris and Sollis, (2003).

Bounds test

To test for existence of a long run relationship, bounds test is applied. This is a Wald test (F statistics) that tests whether all the long run coefficients are statistically equal to zero. It is performed under the null; hypothesis of "no co-integration among the variables in the model". The null and alternative hypotheses are stated as follows:

$$H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$$

$$H_1: \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq 0$$

The computed F-statistic is compared with the critical F-values provided by pesaran et al (2000). If the computed F-statistic exceeds the upper critical value, the null hypothesis is rejected indicating that the variables are co-integration. If the computed F-statistic is lower than the lower bound critical value, we fail to reject the null hypothesis, and conclude absence of co-integration.

3.4.3 Model Estimation

In time series the appropriate estimation technique depends on the integration level of the variables thus variables integrated at level I (0) and at order one I (1) are treated differently. We use ordinary least squares (OLS) if all variables are I (0). If all variables are I (1) we use the vector auto regressive model (VAR) in absence of co-integration, use the vector error correction model (VECM) estimation in presence of co-integration. In case variables are I (1) or a combination of both I (0) and I (1) we consider autoregressive distributed lag model (ARDL).

Ordinary least square equation (OLS) for model 1 with total government expenditure

In case variables are stationary at level I (0) then the OLS is used. This is given as follows;

$$\text{GAVA} = f(GRE, GDE, GKS, GLF, OPEN, LR, TGE, REER) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (3.11)$$

$$GAVA_t = \alpha_0 + \alpha_1 GKS_t + \beta GLF_t + \delta OPEN_t + \sigma LR_t + TGE_t + \theta REER + \varepsilon_t \dots \dots \dots \dots \dots \dots (3.12)$$

Non-stationary I (1) for model 1 with total government expenditure mode

$$\Delta GAVA_t = \alpha_1 \Delta GKS_t + \alpha_2 \Delta GLF_t + \alpha_5 \Delta OPEN_t + \alpha_6 \Delta LR_t + \Delta TGE_t + \theta REER + \varepsilon_{t.} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (3.13)$$

The corresponding Ordinary least square equation (OLS) using disaggregated government expenditure model is presented below.

In case variables are stationary at level I (0) then the OLS is used. This is given as follows;

$$GAVA_t = \alpha_0 + \alpha_1 GKS_t + \beta GLF_\tau + \emptyset GRE_t + \partial GDE_t + \delta OPEN_t + \sigma LR_t + \theta RER + \varepsilon_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3.14)$$

Non-stationary I (1) for model 2 with disaggregated government expenditure

$$\Delta GAVA_t = \alpha_1 \Delta GKS_t + \alpha_2 \Delta GLF_t + \alpha_3 \Delta GRE_t + \alpha_4 \Delta GDE_t + \alpha_5 \Delta OPEN_t + \alpha_6 \Delta LR_t + + \theta REER + \varepsilon_{t.} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (3.15)$$

Unrestricted vector auto regressive model (VAR)

In case variables are stationary at I (1) and are not co-integrated, the VAR estimation is used and given as follows;

$$AZ_t = \beta_0 + \beta_1 Z_{t-1} + \dots\dots..+\beta_p Z_{t-p} + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.16)$$

Where,Z_{t-1} are the independent variables,$\beta_0$is a k-vector of constants (intercepts), β_i is a time-invariant (k × k)-matrix and $\mu_t$is a k-vector of error terms

Vector error correction model (VECM)

VECM is one of the time series modeling which can directly estimate the level to which a variable can be brought back to equilibrium condition after a shock on other variables. VECM is very useful in estimating the short-term effect for both variables and the long run effect of the time series data.

We use the VECM when the variables are the stationary as at ordered I (1) and there is a co-integration relationship, the VECM is used. This is given as follows;

$$\Delta y = \theta_0 + \alpha(y_{t-1} - \alpha_0 - \alpha^1 x_{t-1}) + \sum_{i=1}^{q} \theta_i^1 \Delta x_{t-i} + \sum_{i=1}^{r} \Delta s_{t-i} + \theta_0^1 \Delta x_t + \varepsilon_t \dots\dots\dots\dots (3.17)$$

Where s= $(y_t x_t^1)$

Auto regressive distributed lag model (ARDL)

An autoregressive distributed lag (**ARDL**) model is an ordinary least square (OLS) based model which is applicable for both non-stationary time series as well as for times series with mixed order of integration.

If variables are of I (1) or a combination of both I (0) and I (1) and are co-integrated, the autoregressive distributed lag (ARDL) model is used. The general equation is as follows;

$$y_t = \beta_0 + \sum_{=1}^{p} \phi\, y_{t-1} + \sum_{i=0}^{q} \psi_i^1\, x_{t-i} + e_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.18)$$

Where, y_t is the independent variable (Growth in Agricultural value added), β_0 is the intercept, y_{t-1} independent variables including time lag and e_t is the error term

3.4.4 Estimation Technique

The impact of total government expenditure allocated to the agricultural sector and its disaggregation between recurrent and development expenditure on agricultural value added were investigated by means of Autoregressive Distributed Lag model (ARDL). First the appropriate lag length for each of the underlying variables in the ARDL model was determined. This was very important because to have Gaussian error terms (that is, standard normal error terms that do not suffer from non-normality, autocorrelation, heteroscedasticity). In order to select the appropriate model of the long run underlying equation, it was necessary to determine the optimum lag length by comparing the proper model order selection criteria of the Schwarz Bayesian Information Criterion (SBIC) and Akaike information criterion (AIC).

The General ARDL equation is given as;

$$y_t = \beta_0 + \sum_{i=1}^{p} \phi\, y_{t-1} + \sum_{i=0}^{q} \psi_i^1\, x_{t-i} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.19)$$

3.4.5 Diagnostics tests

Diagnostic tests are carried out to check if the model satisfies the assumption of the classical liner regression model. In this study, the following diagnostic tests are considered, serial correlation, heteroscedasticity, stability (CUSUM) test, normality, multicollinearity, and specification test (Ramsey reset test).

Heteroscedasticity tests.

Heteroscedasticity results from wrong specification of the model, wrong functional form of the model and wrong data samples used. The two commonly used tests for detecting heteroscedasticity are the white test and Breush Pagan test.

The study adopted Breush-Pagan test also known as the Lagrange multiplier test for heteroscedasticity over the white test because the white test may reveal heteroscedasticity when in actual sense the model suffers from specification errors not heteroscedasticity (since white test is for both heteroscedasticity and specification errors). Moreover, the test is non-constructive that is, if the null hypothesis is rejected, the test gives no indication of what to do next (Greene, 2007)

Serial correlation test

Serial correlation refers to the relationship between the particular errors of different variables. It occurs if the error term in the model is serially correlated with one of the explanatory variables in the model. Serial correlation/auto correlation is due to omitted variable errors, measurement errors in the data and misspecification of the functional form of the model which in turn lead to biased estimates. Durbin Watson, Durbin H and the Breush Godfrey tests are the commonly used tests to detect serial correlation.

Durbin Watson involves calculating the expected values of Y in the OLS model $y_i = \beta_0 + \beta_i x_i + \beta_2 x_i + \varepsilon_i$, the difference between the actual Y values versus the expected Y, then the errors are summed up and squared and the quotient of the squared errors gives you the Durbin Watson which always has values between 0 to 4. Values from 0 to less than two indicate positive auto correlation and 2 to 4 indicate negative auto correlation.

Breush Godfrey test involves testing for auto correlation using an auxiliary where the residuals are used as the dependent variables in the model and R^2 is computed to calculate the chi-square. The Breush Godfrey test equation is given below,

$$\varepsilon_t = p_1 \varepsilon_{t-1} + p_2 \varepsilon_{t-2} \dots \dots \dots \dots . + V_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3.20)$$

where V_t is the white noise error term.

Breusch-Godfrey test was applied to test for serial correlation. It makes use of the residuals from the model being considered in a regression analysis and a test statistic is derived from these, this was preferred over the Durbin-Watson test because the Durbin Watson is not reliable in presence of stochastic regressors (Greene, 2007).

Multicollinearity test

It refers to the existence of a perfect or exact linear relationship among some or all the explanatory variables of the model. It arises due to the wrong functional form of the model, the data collection method employed, an overly determined model (where the regression model has more explanatory variables than the number of observations). The existence of multicollinearity consequently leads to inefficient estimates, large variances and standard deviations. (Gujarati, 2004)
The multicollinearity equation is given as;

$$\alpha_1 x_1 + \alpha_2 x_2 + \ldots\ldots + \alpha_k x_k + v_i = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.21)}$$

where $\alpha_2, \alpha_2, \ldots., \alpha_k$ are constants in that all of them are zero at the same time.

The model adopted the Variance Inflation Factor (VIF) given as

$$VIF_I = \frac{1}{1-R_I{}^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.22)}$$

where, $R_I{}^2$ is thecoefficient of determination and if$R_I{}^2$ is large then VIF is also large.

Stability tests

The study employed the cumulative sum (CUSUM) and CUSUM squared to test for the stability of the models and these must be within the 5% critical bands.

Specification test

The Ramsey reset test was adopted to test whether the non-linear combinations of fitted values help to explain the response variables. The intuition behind the test is that if the non-linear combination of explanatory variables has any power in explaining the response variables the model is mis-specified in the sense that the data generating process might be better approximated by using a non-linear functional form. The Ramsey reset test equation is given as,

$$y = E(y, x) = \beta x_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.23)}$$

it tests whether $\beta x_1{}^2$,$\beta x_1{}^3$ has any power in explaining y.

Normality Test

These are used to determine if a data set is well modelled by a normal distribution and used to compute how likely it is for a random variable underlying the data set to be normally distributed. The Jarque- Bera test was carried out for normality of residuals so as to increase chances of finding significant results. The null was that data follows a normal distribution against the alternative that data do not follow a normal distribution. The Jarque- Bera test equation is given as;

$$JB = \left[\left(\frac{S^2}{6} + \frac{(K-3)^2}{24}\right)\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.24)$$

where;

JB= Jarque- Bera test

S= skewness

K= kurtosis

N= sample size

3.5 Data Types and sources

The study employed secondary and quarterly data running from 1988 to 2018. The data on government expenditure was sourced from Ministry of Finance, Planning and Economic Development (MFPED) for years 1988-2018, data on trade openness (OPEN), real effective exchange rate (REER), lending rates (LR), and growth in agricultural value added (GAVA) was obtained from World Bank database (WDI, 2018) while data on capital stock (KS) and labour (LF) was obtained from Food and Agricultural Organization (FAO, 2018

CHAPTER FOUR

EMPIRICAL DATA ANALYSIS, DISCUSSION AND INTERPRETATION

4.1 Introduction

Specifically, this chapter presents: the descriptive statistics; pair wise correlation matrix; ARDL models and diagnostic tests for both model 1 and 2.

4.1.1 Descriptive data analysis and statistical tests

The results of data description are shown in table 1 below.

Table 1: Descriptive Data Analysis and Statistical Tests

Stats	LF	GAVA	KS	RE	DE	OPEN	LR	TGE	REER
N	30	30	30	30	30	30	30	30	30
Mean	10.07	0.10	15.63	9.94	11.68	3.53	23.70	11.86	4.79
Median	10.08	0.08	15.67	9.65	11.58	3.56	21.32	11.81	4.68
Std dev	0.27	0.08	0.89	1.44	0.97	0.23	6.21	21.64	0.31
Se(mean)	0.05	0.02	0.16	0.26	0.18	0.04	1.13	0.19	0.06
Max	10.48	0.30	16.91	12.50	13.34	3.94	40	13.70	3.95
Min	9.62	-0.03	12.96	7.75	10.36	3.09	18.70	10.44	4.51
Coef-var	0.03	0.83	0.15	0.08	0.08	0.06	0.26	0.09	0.06
Skewness	-0.08	0.77	-0.83	0.34	0.23	-0.27	1.76	0.29	2.29
Kurtosis	1.76	2.89	4.05	1.79	1.74	2.41	4.70	1.76	8.53
Variance	0.07	0.01	0.80	2.07	0.94	0.05	38.53	1.09	0.09
Jar. bera	1.97	2.96	4.84	2.42	2.24	0.81	19.07	2.33	24.4

Source: Own Computation

The results show that the mean and median of all the variables fall within the maximum and minimum values implying that they are good measures of central tendency and there are no outliers. For instance; growth in agricultural value added (GAVA) range from -0.03 to 0.30 percent with mean of 0.100 and median of 0.08; and capital stock ranges from 12.96 to 16.91 percent with mean of 15.63 and median of 15.67. Growth in agricultural value added has the highest coefficient of variation (CV) of 0.83 while labour force has the lowest coefficient of variation of 0.03 indicating that the ratio of standard deviation to the mean for growth in agricultural value added (GAVA) is high thus it has a greater level of dispersion around the mean.

The skewness, kurtosis and Jarque-Bera (Jb) test statistics show that most variables were normally distributed except KS and LR which were not since they had high values for kurtosis and skewness. This indicated that there was need to carry out further tests like the normality tests to ascertain if they were normally distributed.

4.1.2 Correlation of variables

The correlation matrix as indicated in Appendix A was used to determine the relationship between the different variables. The results indicate that there is a positive correlation between labour force and all the variables expect lending rate and real effective exchange rate. They further reveal that capital stock had a significant relationship with all other variables expect agricultural value addition.

As expected recurrent expenditure and development expenditure for the agricultural sector were correlated to total government expenditure allocated to the agricultural sector since total government expenditure is the sum of the two. Multicollinearity tests were carried out to verify that these variables are not collinear and simultaneity tests were carried out to ascertain if one (or more) independent variable is jointly determined with the dependent variable.

4.2 Tests for stationarity

To avoid instances of spurious regression, unit root tests were carried out to ascertain the stationarity properties of the data. Augmented Dickey Fuller and Phillips-Perron tests were used.

The results showing stationarity of variables are presented in table 2.

Table 2: Unit root tests at level and at first difference

Variable	ADF at levels	ADF at first difference	PP at levels	PP at first difference	Level of integration
GAVA	-4.13	-6.51	-6.07	-12.24	1(0)
KS	-2.92	-4.40	-7.92	-9.06	1(0)
REER	-3.66	-3.88	-5.62	-4.54	1(0)
LF	2.44	3.63	3.62	6.02	1(0)
RE	0.29	-5.40	-0.08	-5.86	1(1)
DE	0.06	-4.37	0.02	-5.97	1(1)
OPEN	-2.08	-4.18	-1.85	-4.47	1(1)
LR	-2.79	-4.57	-2.39	-4.96	1(1)
TGE	0.38	-3.82	0.29	-5.52	1(1)
Critical value at 5%	-3.59	-3.59	-3.58	-3.59	

Source: Own Computation

The results of the unit root test for both Augmented Dickey Fuller and Philips-Perron as indicated in table 2 show that growth rate in agricultural value added (GAVA), real effective exchange rate and capital stock are stationary at levels since the Dickey Fuller tau-statistic and Philips -Perron exceeds the critical value (in absolute terms) at 5 percent level of confidence. Labour force is stationary with the Philips-Perron at level and since its superior than the Augmented Dickey fuller the study will take labour force to be stationary at level. Recurrent government expenditure (RE), development government expenditure (DE), lending rate, openness and total government expenditure are all non-stationary at level but stationary after first difference. The results therefore mean that there is a mixture of both I (0) and I (1) variables thus implying that the ARDL model is the suitable model since the variables in the model are either I (0) or I (1). Therefore, the ARDL model was used to estimate short run and long run coefficients.

4.3 Presentation of ARDL results

This presents the ARDL results with two sub sections; 4.3.1 presents the results for equation 3.7 on page 19 with total government expenditure (model 1) while 4.3.2 presents the results for equation 3.9 on page 20 with disaggregated government expenditure (model 2). The corresponding diagnostic tests for model 1 and 2 are also presented.

4.3.1 ARDL for Model 1

Optimal lags for the variables in equation 3.7 were selected using the Akaike information criterion **(**AIC) with maximum lag length of three and for model one a maximum lag length of two was chosen. The model selected by AIC is ARDL (2, 1, 1, 0, 2 ,1 ,2) for growth in agricultural value added, labour force, capital stock, total government expenditure for the agricultural sector, openness, lending rate and real effective exchange rate. Table 3 presents the results for model 1 while table 4 and 5 present the corresponding diagnostic tests.

Table 3: ARDL for Model 1(total government expenditure)

Variable	coefficients	t-statistics	Probability value
ECM (-1)	-0.84	-3.83	0.013**
Long Run			
LF	-1.76	-4.06	0.002***
KS	0.36	3.62	0.004***
TGE	0 .19	3.29	0.006 ***
LOPEN	0.12	1.00	0.338
LR	-0.02	-3.94	0.002 ***
REER	0.03	0.35	0.731
Short Run			
LD. GAVA	-0.21	-1.58	0.140
LF	2.59	3.30	0.006***
KS	-0.21	-1.11	0.287
D1. LOPEN	0 .40	2.42	0.032 **
LD. LOPEN	0. .24	2.04	0.064*
D1.LR	-0.02	-3.20	0.008 ***
DI.REER	-0.41	-2.61	0.023**
LD. REER	-0.51	-3.35	0.006 ***
_cons	8.28	2.09	0.07*
R-Squared	0.95		
Adjusted R-squared	0.88		
F-Statistics	12.82		
Probability(F-statistic)	0.0001****		

Source: Own Computations***;*** **, *** and *** represents significance at level 10%, 5% and 1% levels of significance.*

The coefficient of determination (R-Squared) for model 1 is 0.9470 implying that the variation in the independent variables explain 95% of the variation in the dependent variable (Growth in agricultural value added) and Adjusted R-squared shows that 88% of the deviations in GAVA are explained by the regressors. The overall model is significant with the F-Statistic of 12.82 and probability 0.0001 making it significant. These two results indicate that model 1 is a good fit.

Diagnostics tests for model 1

Diagnostic tests were carried out to check if model 1 satisfies the assumption of the classical liner regression model. The following diagnostic tests were undertaken: serial correlation, heteroscedasticity, stability (CUSUM) test, normality, multicollinearity, simultaneity test (Durbin–Wu–Hausman test) and specification test (Ramsey reset test) and the results are presented in table 4 below,

Table 4: Diagnostic tests for Model 1

TEST	PROBABILITY VALUE	CHI-SQUARE	F- STATASIC
Breusch-Godfrey LM	0.25	1.33	
Ramsey (RESET)	0.19		1.94
Jarque-Bera normality test	0.33	0.98	
Durbin–Wu–Hausman test	*0.42*		
Breusch-Pagan/Cook-Weisberg test	0.39	0.72	
LM test for autoregressive conditional heteroskedasticity(ARCH)	0.92	0.01	

Source: Own Computations

From the results presented in table 4, the residuals of the estimated model do not suffer from serial correlation since the p-value associated with the chi-square statistics of the Breusch-Godfrey test are highly significant. The Breusch-Godfrey LM test probability of 0.25 for model 1 is above 0.05 indicating that there was no serial correlation. The LM test for autoregressive conditional heteroscedasticity (ARCH) with probability of 0.92 for model 1 which is above 0.05 indicates no autocorrelation. The multicollinearity test yielded a variance inflation factor (VIF) of 8.36 which was less than 10 indicating no multicollinearity. The Breusch Pagan/ Cook test had a probability of 0.39 which was greater than 0.05 implying that the estimated model doesn't suffer from heteroscedasticity. The Durbin–Wu–Hausman test with probability of 0.42 which was greater than

0.05 indicated that there was no endogeneity among the variables. The Ramsey Regression Equation Specification Test (RESET) with a probability of 0**.**19 which is greater 0.05 revealed that the model was correctly specified. The Jarque-Bera test for normality performed on the residuals yielded a probability of 0.33 and since it is greater than 0.05, it was concluded that the error terms were normally distributed. Finally, the cusum and cusum squared stability tests were carried out, both cusum and cusum squared did not move outside the 5% critical bands showing that the parameters are stable (See appendix B).

The results of the bounds test for model 1 confirmed the existence of a level relationship among the variables since the F-statistics (F value for model 1 = 14.6) is above the upper bound at 5% level of significance suggesting the rejection of the null hypothesis of no level relationship. Having confirmed the existence of long run relationship, it is okay to proceed and estimate short run and long run results. The results are presented in table 5 below.

Table 5: Bounds test for Model 1

Level of significance	lower	upper
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: Own Computations

4.3.2 ARDL for Model 2

Optimal lags for the variables in equation 3.9 (disaggregated government expenditure) were selected using the Akaike information criterion **(**AIC) with maximum lag length of three and for model one a maximum lag length of two was chosen. The model selected by AIC is ARDL (2, 1, 0, 0 ,0 ,1, 1, ,2) for growth in agricultural value added, labour force, capital stock, development expenditure for the agricultural sector, recurrent expenditure for the agricultural sector, openness, lending rate and real effective exchange rate. Table 6 presents the results for model 1 while table 7 and 8 present the corresponding diagnostic tests.

Table 6: ARDL for model 2(disaggregated government expenditure)

Variable	coefficients	t-statistics	Probability value
ECM (-1)	-.66	-4.80	0.001***
Long Run			
LF	-1.46	-3.28	0.006***
KS	0.32	3.18	0.007 ***
DE	0.16	2.73	0.017**
RE	- 0.01	-0.33	0.747
OPEN	0.14	1.21	0.247
LR	-0.01	-2.58	0.023**
REER	0 .02	0.18	0.860
Short Run			
LD. GAVA	-0.18	-1.18	0.260
D1.LF	2.13	2.31	0.038 **
D1. LOPEN	0.31	1.77	0.100
D1.LR	-0.02	-2.95	0.011**
DI. REER	-0.28	-1.91	0.079*
LD. REER	-0.33	-1.89	0.082*
_cons	8.77	2.44	0.030 **
R-squared	0.93		
Adjusted R-squared	0.85		
F-statistics	10.21		
Probability(F-statistics)	0.0000***		

Source: Own Computations; **, *** and *** represents significance at level 10%, 5% and 1% levels of significance.*

From the results, the error correction term is negative as require while the coefficient of variation is statistically. Coefficient of determination (R-squared) of 0.93 implied that the variation in the independent variables explain 93% of the variation in the dependent variable (Growth in agricultural value added) and Adjusted R-squared shows that 85% of the deviations in GAVA are explained by the regressors. The overall model is significant with the F-Statistic of 10.21 and probability 0.0000 making it significant. These two results indicate that model 2 is a good fit.

Diagnostics tests for model 2

Diagnostic tests were carried out to check if model 2 satisfies the assumption of the classical liner regression model. The following diagnostic tests were undertaken: serial correlation, heteroscedasticity, stability (CUSUM) test, normality, multicollinearity, simultaneity test (Durbin–Wu–Hausman test) and specification test (Ramsey reset test) and the results are presented in table 7 below,

Table 7: Diagnostic tests for Model 2

TEST	PROBABILITY VALUE	CHI-SQUARE	F- STATASIC
Breusch-Godfrey LM	0.36	0.83	
Ramsey (RESET)	0.13		6.11
Jarque-Bera normality test	0 .39	0.82	
Breusch-Pagan/Cook-Weisberg test	0.31	1.01	
Durbin–Wu–Hausman test	0.25		
LM test for autoregressive conditional heteroskedasticity(ARCH)	0.28	1.18	

Source: Own Computations

From the results presented in table 7, the residuals of the estimated model do not suffer from serial correlation since the p-value associated with the chi-square statistics of the Breusch-Godfrey test are highly significant. The Breusch-Godfrey LM test probability of 0.36 for model 2 is above 0.05 indicating that there was no serial correlation. The LM test for autoregressive conditional heteroskedasticity (ARCH) with probability of 0.28 for model 2 which is above 0.05 indicates no autocorrelation. The multicollinearity test yielded a variance inflation factor (VIF) of 7.23 which was less than 10 indicating no multicollinearity. The Breusch Pagan/ Cook test had a probability of 0.31 which was greater than 0.05 implying that the estimated model doesn't suffer from heteroscedasticity. The Durbin–Wu–Hausman test with probability of 0.25 which was greater than 0.05 indicated that there was no endogeneity among the variables. The Ramsey Regression Equation Specification Test (RESET) with a probability of 0.13 which is greater 0.05, revealed that the model was correctly specified. The Jarque-Bera test for normality performed on the residuals yielded a probability of 0 .39 and since it is greater than 0.05, it was concluded that the error terms were normally distributed. Finally, the cusum and cusum squared stability tests were carried out, both cusum and cusum squared did not move outside the 5% critical bands showing that the parameters are stable (See appendix B).

Bounds tests for model 2

The results of the bounds test for model 2 confirmed the existence of a level relationship among the variables since the F-statistics (F value for model 2 = 10.6) is above the upper bound at 5% level of significance suggesting the rejection of the null hypothesis of no level relationship. Having confirmed the existence of long run relationship, it is okay to proceed and estimate short run and long run results. The results are presented in table 8 below.

Table 8: Bounds test for Model 2

Level of significance	lower	upper
10%	2.03	3.13
5%	2.32	3.50
2.5%	2.60	3.84
1%	2.96	4.26

Source: Own Computations

4.4 Discussion of long run and short run coefficients for model 1

This section will discuss the coefficients obtained for all the variables both in the short run and long run.

4.4.1 Model 1, Long run coefficients

Equation 4.4.1 presents the co-integration equation (long run) relationship

$$\ln GAVA = 8.28 + 0.36*\ln KS - 1.76*\ln LF + 0.19*\ln TGE + 0.12\ln OPEN - 0.02*LR + 0.03*\ln REER \ldots \quad (4.1)$$

(2.09) (3.62) (-4.06) (3.29) (1.00) (-3.94) (0.35)

Note: (values in brackets are t-values)

The elasticity of growth in agriculture value added to labour force (proxied by rural population) in the long run, is -1.76 and is statistically significant at 1% level of significance. This implies that a 1% increase in the labour force reduces growth in agricultural value added by 1.76%. The increase in labour force can impact agricultural value added negatively especially when the increased labour force doesn't have necessary skills needed for agricultural value addition. As urged by Bhattacharyya and Mukherjee (2019) the whole agricultural value chain requires skilled manpower right from production, harvest, to preservation, grading, sorting, packaging, transport and marketing including any other value addition or processing activities thus farmers need to be equipped with skills if they are to positively impact agricultural value addition The results conform to those of Dubey (2016) whose findings revealed that labour force had a negative significant impact of 0.82 with agricultural value addition..

The elasticity of growth in agriculture value added to total government expenditure allocated to the agricultural sector in the long run, is 0.19 and is statistically significant at 1% level of significance. This implies that a 1% increase in total government expenditure to the agricultural sector increases growth in agricultural value added by 0.19%. An increase in the budgetary allocation to the agricultural sector enhances investment in infrastructure (roads, railway, agricultural processing plants) and supports the operation of agricultural agencies like MAAIF, NARO, NAADS, Uganda Cotton Development Authority (UCDO) and Uganda Coffee Development Authority (UCDA). These agencies are key in providing agricultural extension services, conducting agricultural research and development, providing agricultural credit and looking for market for agricultural products which in turn impact agricultural value addition. The results are in line with the findings of Wangusi and Muturi (2015) who found a positive and significant long run relationship between public spending to the agricultural sector and agricultural value addition. The findings are also consistent with those of Utpal and Dkhar (2018) who found a positive relationship between government expenditure and agricultural value added in the long run with elasticity of 0.45.

The partial elasticity of growth in agricultural value added to the lending rate in the long run is-0.02 and is statistically significant at 1% level. This implies that a 1% increase in the lending rate reduces growth in agricultural value added by 2.02%. An Increase in lending rates make it hard and expensive for farmers and those involved in agricultural value chain to access credit thus making it difficult for farmers to invest in high quality inputs and equipment needed for agricultural value addition. Similar results were obtained by Agunuwa, et al (2015). The findings of the study however contradict with those of Kareem, et al (2013) and Toby, et al (2014) who found a positive relationship in the long run although the results are aligned in the short run.

The elasticity of growth in agriculture value added to capital stock in the long run is positive but insignificant. A country with enough capital stock is capable of investing in capital equipment such as machines, tools, technology that lead to increased agricultural value addition through processing, packaging and branding of agricultural products. In addition, capital stock plays a key role in attracting skilled labour force to the agricultural sector as those involved in the agricultural sector will have adequate resources to pay the wages/salaries of the skilled personal employed in adding value to agricultural products. The insignificancy of capital stock in the model implies that capital stock doesn’t influence value addition and this may have resulted from the use of capital stock for the entire agricultural sector and not specifically capital used for value addition. The results of this study agree with the findings of Muraya and Ruigu (2017) who found a positive but insignificant relationship between capital stock and agricultural value addition in the long run.

The effect of trade openness on growth in agricultural value added is positive but insignificant in the long run. A country with a higher degree of openness has a greater ability to use technologies generated in advanced economies and this capability enables it to easily process and add value to agricultural products than a country with a lower degree of openness. In this case, trade openness is insignificant implying that trade openness does not influence agricultural value addition and this maybe because Uganda exports mainly raw materials or probably it does not import value addition equipment. The results of the study conform to the findings of Anowor (2013) who found a positive and insignificant relationship between openness and agricultural value addition in the long run. However, Ojeyinka and Adeboye (2017) found a positive and significant effect of trade openness on agricultural value addition.

The influence of Real Effective Exchange rate on growth in agricultural value added is positive but insignificant in the long run. There is an overall positive impact of real depreciation (that is, positive changes in real effective exchange rate) on agricultural value addition. When a country's currency depreciates, exports become cheaper than imports thus it creates a wider market for agricultural products, this in turn encourages local producers involved in the agricultural sector to invest more in value addition such that their products can compete in foreign markets. Basing on the findings real effective exchange rate is insignificant indicating that it doesn't influence agricultural value addition. The findings are consistent with those of Adekunle and Ndukwe, 2018 who found a positive but insignificant relationship between real effective exchange rate and agricultural value addition and they argued that real depreciation makes domestic agricultural products competitive relative to its imported substitutes.

The coefficient of adjustment is -0.84 which is negative, below one and is statistically significant at 1% level, this indicates that there is a long run equilibrium relationship among the variables. The coefficient of the error correction term shows the speed at which a deviation from the long run equilibrium is corrected. Therefore, in this model, any deviation from the long run will be corrected at a speed of 84%.

4.4.2 Model 1; Co-integration equation/short run relationship

Equation 4.4.2 presents the co-integration equation (short run) relationship

In GAVA=8.28 +2.59*lnLF -0.21*ln KS+ 0 .39*lnOPEN(Δ) + 0. 24lnOPEN (-1) -0.02*LR (Δ)

((2.09) (3.3) (-1.11) (2.42) (2.04) (-3.20)

-0.41*REER (Δ)- 0.51*lnREER(-1)… (4.3)

(-2.61) (-3.35)

Note: (values in brackets are t-values)

The elasticity of growth in agriculture value added to the first difference of trade openness in the short run, is 0.39 and is statistically significant at 5% level of significance. Therefore, a 1% increase in the changes in trade openness increases agricultural value added by 0.39% in the short run. This shows the instantaneous impact of trade openness to agricultural value added.

Furthermore, the elasticity of growth in agricultural value added to the first lag of the difference in trade openness is 0.24 and is statistically significant at 10%. This shows that a one unit change in trade openness in the previous year impacts agricultural value added for the present year by 0.24. The results are simillar to those of Sotamenou and Nehgwelah (2018) in Cameroon who found a positive significant relationship between tyrade openness and agricultural value addition in the short run

The elasticity of growth in agriculture value added to labour force (proxied by rural population) in the short run is 2.59 and is statistically significant at 1% level of significance. This implies that a 1% increase in labour force increases growth in agricultural value added by 2.59% in the short run. Labour force leads to an increase agricultural value addition in the short run because labour force is considered to be more productive in the first months of work though after some time work becomes monotonous and thus leads to a decrease in value addition (Dubey, 2016)

The elasticity of growth in agriculture value added to real effective exchange rate in the short run is -0.41. This shows the immediate impact of real effective exchange rate on growth in agricultural value added and this impact is carried over to the lagged variable. The partial elasticity of growth in agricultural value addition to the first lag of the difference in real effective exchange rate is -0.51%. This implies that a one unit change in real exchange rate in the previous year impacts growth in agricultural value added for the present year by 0.51. The findings agree with those of (Mouna, 2001) who found a negative significant relationship between agricultural value addition and a decrease in real effective exchange rate

The partial elasticity of growth in agricultural value added to the first difference of lending rate is -0.02. This shows the instantaneous impact of changes in lending rate to agricultural value added implying that a one unit change in lending rate immediately impacts agricultural value addition by 0.02. The findings are simllar to those of Zakaree (2014) in Nigeriaa who found a negative relatiosnhip between lending rates and growth in agricultural value added in the short run.

4.4.3 Summary of findings for model 1

In the long run, total government expenditure for the agricultural sector had a positive and significant relationship with growth in agricultural value addition while lending rate and labour force had a negatove but significant relationshipship with growth in agriucltural value adddition.

The findings further revealed that capital stock, trade openness and real effective exchange rate had a positive but insginficant impact on growth in agricultural value addition.

In the short run labour force and trade openness had a positive and significant relationship with growth in agricultural value addition while lending rate and real effcetive exchange rate had a negative and significant impact on growth in agricultural value addition. Capital stock and total government expenditure have no impact on growth in agricultural value added in the short run

4.5 Discussion of long run and short run coefficients for model 2

This section will discuss the coefficients obtained for all the variables both in the short run and long run.

4.5.1 Model 2, Long run coefficients

Equation 4.5.1 presents the co-integration equation (long run) relationship

$$\text{In GAVA} = \underset{(2.44)}{8.772} + \underset{(3.18)}{0.324}{*}\ln KS - \underset{(-3.28)}{1.465}{*}\ln LF + \underset{(2.73)}{0.161}{*}\ln DE - \underset{(-0.33)}{0.014}{*}\ln RE + \underset{(1.21)}{0.144}{*}\ln OPEN -$$

$$\underset{(-2.58)}{0.0142}{*}LR + \underset{(0.18)}{0.018}{*}\ln REER \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.1)$$

Note: (*values in brackets are t-values)*

The elasticity of growth in agriculture value added to capital stock in the long run, is 0.32 and is statistically significant at 1% level of significance. This implies that a 1% increase in capital stock increases growth in agricultural value added by 0.32%. A country with enough capital stock is capable of investing in capital equipment such as machines, tools, technology that leads increased agricultural value through processing, packaging and branding of agricultural products. The findings conform to the results obtained by Mwesigwa, Sserunjogi.and Mbowa (2017).

The elasticity of growth in agricultural value added to government development expenditure in the long run is 0.16 and is statistically significant at 1% level. This implies that a 1% increase in the development expenditure increases growth in agricultural value added by 0.16%. The results are in line with the expectations since agricultural development expenditure can stimulate increased production and agricultural value addition. Development expenditure should be concentrated on investment in research and development, agro processing, extension services, provision of credit, and rural infrastructure, especially feeder roads and markets since they all increase agricultural value addition. The findings of the study agree with the results of Obi and Bidemi (2016) who found a positive and significant relationship between development expenditure and agricultural value addition with elasticity of 0.53. However, Ndubuaku, Kabiru and Chaiaka (2018) found a negative relationship between government development expenditure and agricultural value addition.

The impact of recurrent government expenditure to growth in agricultural value added is negative and insignificant in the long run. Recurrent expenditure includes wage and non-wage expenses and other recurrent expenses such as fuel, workshops and vehicle maintenance. The impact of recurrent expenditure is insignificant implying that it does not influence agricultural value addition. The results of the study agree with Nurudeen and Usman (2010) who found recurrent expenditure to have a negative and insignificant impact on agricultural value addition However, Saungweme and Matandare (2014) found a positive and significant relationship between recurrent government expenditure and agricultural value addition with elasticity of 2.56

The impact of trade openness on agricultural value addition is positive but insignificant in the long run. Trade openness enhances importation of the equipment that are used in adding value to agricultural products and creates a wider market to the processed agricultural products. Trade openness is insignificant implying that trade openness does not influence agricultural value addition and this maybe because Uganda exports mainly raw materials or probably it does not import value addition equipment. The results divert from the findings of Blake, Mckay, and Morissey (2002) who found a positive and significant impact of trade openness on agricultural value added and they affirmed that trade openness had led to a boom in Uganda's agricultural value addition and has increased competitiveness in the sector thus trade openness has an impact on agricultural value added.

The impact of Real Effective Exchange rate on agricultural value addition is negative and insignificant in the long run. This implies that as a country's currency appreciates, growth in agricultural value added reduces; this is because as the currency appreciates the prices of the country's goods become high thus discouraging foreign countries from importing which in turn discourage those involved in the agricultural sector from investing in value addition due to reduced market share for their products. The insignificancy of real effective exchange rate indicates that real effective exchange rate does not influence agricultural value addition. The results agree with the findings of Obayelu and Salau (2010) whose findings showed that currency apprecaition reduced the volume of exports of processed agricultural products in Nigeria.

The elasticity of growth in agriculture value added to labour force (proxied by rural population) in the long run is -1.47 and is statistically significant at 1% level of significance. This implies that a 1% increase in the labour force reduces growth in agricultural value added by 1.47%. The elasticity of growth in agricultural value added to lending rate in the long run is -0.01 and is statistically significant at 1% level. This implies that a 1% increase in the lending rate reduces growth in agricultural value added by 0.01%.

The coefficient of adjustment is -0.66 which is negative, below one and is statistically significant at 1% level. This indicates that there is a long run equilibrium relationship among the variables. The coefficient of the error correction term shows the speed at which a deviation from the long run equilibrium is corrected. Therefore, in this model, any deviation from the long run will be corrected at a speed of 66%.

4.5.2 Model 2: Co-integration equation/short run relationship

Equation 4.5.2 presents the co-integration equation (short run) relationship

$$\ln GAVA = \underset{(2.44)}{8.77} + \underset{(2.31)}{2.13}*\ln LF(\Delta) + \underset{(1.77)}{0.31}*\ln OPEN(\Delta) - \underset{(-2.95)}{0.02}*LR(\Delta) - \underset{(-1.91)}{0.28}*REER(\Delta)$$

$$-\underset{(-1.89)}{0.33}*\ln REER \quad \ldots \ldots \quad (4.2)$$

Note: (values in brackets are t-values)

The elasticity of growth in agriculture value added to the first difference of labour force (proxied by rural population) in the short run, is 2.13 and is statistically significant at 5% level of significance. This implies that a 1% increase in the labour force increases growth in agricultural value added by 2.13% in the short run. The results confirm to those of Asif (2017) whose findings found a positive and significant relationship between capitla and agricultural value addition in south Asia both in the short and long run.

The elasticity of growth in agriculture value added to the first difference of real effective exchange rate in the short run, is -0 28 and is statistically significant at 5% level of significance. the elasticity of agricultural value added to the first lag. This implies that a one unit change in real effective exchange rate immediately impacts agricultural value addition by 0.28. the findings conform to those of Hossain (2014) who found a negative significant relationship between a decrease in real effective exchange rate and agricultural value addition.

The elasticity of growth in agricultural value added to the first lag of the difference in real effective exchange rate is -0.33 and is statistically significant at 1%. Lag. This shows that a one unit change in real effective exchange rate in the previous year impacts agricultural value added for the present year by 0.33. The partial elasticity of growth in agricultural value added to the first difference of lending rate is -0.02. This shows the instantaneous impact of changes in lending rate to agricultural value added.

4.5.3 Summary of findings for model 1

In the long run, government development and capital stock expenditure had a positive and significant relationship with growth in agricultural value added while trade openness had a positive but insignificant relationship with growth in agriucltural value addded. The findings further revealed that labour force, lending rate had a negative significant impact ongrowth in agricultural agricultural value added whereas recurrent expenditure to the agricultural sector and real effective exchange rate had a negative and insiginficant impact on growth in agricultural value addition.

In the short run labour force and trade openness had a positive and significant relationship with growth in agricultural value added while lending rate and real effcetive exchange rate had a negative and significant impact on growth in agricultural value added. Capital stock, recurrent expenditure to the agricultural sector and development expenditure to the agricultural sector had no impact on growth in agricultural value added in the short run.

4.6 Comparision of model 1 and 2

variables	Elasticities for model 1		Elasticities for model 2	
	Long run	Short run	Long run	Short Run
TGE	0.19			
KS	0.36	-0.21	0.32	
LF	-1.76	2.59	-1.46	2.13
LR	-0.02	-0.02(**Δ**)	-0.014	-0.02
OPEN	0.12	0.39 (**Δ**) 0.02 (-1)	0.144	0.31
REER	0.03	-0.41(**Δ**) -0.51(-1)	0.018	-0.28(**Δ**) 0.33(-1)
RE			-0.014	
DE			0.16	

Source: Own Computation

Total government expenditure for the agricultural sector had a positive impact on agricultural value added with an elasticity of 0.19, its component of development agricultural expenditure had a positive impact of 0.16 whereas its recurrent expenditure component had no impact on growth in agricultural value addition since its negative and insignificant. This implies that it's only the development expenditure component that influences agricultural value addition in Uganda.

In both models 1 and 2, labour force had a positive impact on agricultural value addition in the short run with model 1 having a higher value of 2.59 while model 2 had an elasticity of 2.13 on growth in agricultural value addition. Nevertheless, in the long run, labour force had a negative impact on agricultural value addition with a lower figure in model 2 (-1.46) while model 1 had -1.76.

The impact of lending rates to agricultural value addition was negative in models 1 and 2 both in the short and long run. Lending rates had the same impact in the short run for both models with an elasticity of -0.02 but in the long run they had a greater negative impact (elasticity of -0.02) for model 1 compared to model 2 (elasticity of -0.014).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

This chapter presents the major conclusions drawn from the study and provides policy recommendations derived from the study findings, areas of future research and concludes by presenting the limitations of the study.

5.1 Summary of the findings

The study examined the impact of government expenditure for the agricultural sector on growth in agricultural value added for the period 1988-2018. Growth in agriculture value added was the dependent variable and the independent variables were capital stock, labour force, lending rate, openness, real effective exchange rate, aggregated and disaggregated government expenditure for the agricultural sector.

Descriptive statistics, pairwise correlations and a linear econometric model was developed and estimated with ARDL estimation technique using annual data for 30 years' period. Time series properties of the variables were established using the ADF and PP unit root tests and these revealed that the variables were either integrated of 1(0) or I (1) implying suitability of the ARDL estimation method. Two models were selected one with total government expenditure for the agricultural sector and the other with disaggregated government expenditure (Recurrent and development). The models were estimated and the diagnostic tests were conducted which revealed that there was no problem with the variables.

5.2. Conclusions

This paper has provided useful intuitions into the impact of government expenditure on agricultural value addition using both aggregated government expenditure and disaggregated government expenditure.

The significant variables in the long run were; total government expenditure to the agricultural sector which had a positive and significant impact on growth in agricultural value added (elasticity of 0.19); development expenditure (elasticity 0.16) and capital stock with elasticities of 0.36 for model 1 and 0.32 for model 2. Lending rate had a negative but significant impact on agricultural value added with elasticities of -0.02 for model 1 and -0.01 for model 2. Labour force had a negative but significant in both models with elasticities of -1.58 and -1.55 for models 1 and 2, respectively.

Openness and real effective exchange rate had positive but insignificant impact on growth in agricultural value added for both models 1 and 2. They had elasticities of 0.12 and 0.14 for openness and 0.03 and 0.02 for real effective exchange rate for model 1 and 2, respectively. Recurrent government expenditure had an insignificant negative relationship with growth in agricultural value added. The findings further revealed that although, total government expenditure for the agricultural sector influenced agricultural value addition, the recurrent component doesn't influence growth in agricultural value addition.

In the short run, lending rate and real effective exchange rate had significant negative impact on growth in agricultural value added with elasticities of -0.02 and -0.41 for lending rate and real effective exchange rate respectively while labour force had a significant positive impact on growth in agricultural value added with elasticities of 2.59 and 2.13 for models 1 and 2, respectively. Trade openness had a significant positive impact on growth in agricultural value added for both models 1 and 2 with elasticities of 0.40 and 0.14 after the first difference for model 1 and 2, respectively and 0.24 and 0.31 for models 1 and 2 after the first lag.

5.3 Policy recommendations

Firstly, the government should increase the amount allocated to the agricultural sector since total government expenditure for the agricultural sector had a positive and significant impact on growth in agricultural value added. Increasing the amount allocated to the agricultural sector will support the operation of MAAIF and its sub-sectors like NARO, NAADS among others. Additionally, there should be an increase in the amount of resources allocated to agricultural development expenditures since according to the findings of the study development expenditure exhibited a positive significant relationship with growth in agricultural value addition. Through increasing the amount allocated to agricultural development expenditure, there are high chances of improving the operation of agricultural extension services, research and development which in turn enhance agricultural value addition both at a small and large scale.

Secondly, since lending rates had a significant negative impact on growth in agricultural value added there is need for the government to set up policies aimed at reducing interest rates. This can be done by the government financing cooperatives and rural unions (groups) which will make it possible for farmers to access credit hence they will have the capacity to invest in equipment and machinery needed for adding value to agricultural products.

Furthermore, the government should inject more money in the Uganda Development bank since if offers loan to farmers at low interest rates which encourage them to borrow and invest in agricultural value addition

Lastly, there is need to increase the amount of capital stock in the agricultural sector since capital stock had a positive and significant impact on growth in agricultural value addition both in the short run and long run. In Uganda, the most impediment to growth in agricultural value addition at the subsistence level is the use of rudimentary tools and the failure to replace worn-out tools and machines. ln order to solve this, the government needs to localise the access and distribution of farm machinery and equipment.

Additionally, the government should stimulate a rise in imports especially of capital goods, inputs of foreign technology and intermediate goods which can accelerate capital formations and enhance domestic investment in agricultural value addition. With the findings of the study, there is need for further disaggregation of capital stock into its components to determine which component of capital increases growth in agricultural value addition.

5.4. Limitations of the study

The study was unable to sample a much longer period because data wasn't readily available for some years of some variables (especially the disaggregation between recurrent and development expenditure on the agricultural sector). There was also absence of data for important variables that would have had a great impact on agricultural value addition like Foreign direct investment (FID).

5.5. Areas of further study

The current study looked at the impact of government expenditure on agricultural value addition in Uganda by using aggregated government expenditure and disaggregating government expenditure (recurrent and development expenditure for the agricultural sector). Further research can be conducted in the same area by disaggregating total government expenditure according to different sectors which include: education; health; water & environment; Justice, Law & Order; Science, technology and development and Social Development in order to investigate how each sector impacts agricultural value addition in Uganda.

There is need to conduct further research on the allocative efficiency of resources in the agricultural sector to examine if the allocated budget funds are used in the most efficient way among the major functions and sub-sectors of the agricultural sector like NAADs, NARO.

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APPENDICES

Appendix a. Pairwise correlation/ Correlation of variables

	GAVA	LF	KS	RE	LOPEN	DE	LR	TGE	REER
GAVA	1								
LF	-0.0003 0.9989	1							
KS	0.0943 0.6266	0.9434* 0.0000	1						
RE	0.0192 0.9212	0.9480* 0.0000	0.8855* 0.0000	1					
LOPEN	-0.1524 0.4300	0.8208* 0.0000	0.7177* .0000	0.7035* 0.0000	1				
DE	0.0784 0.6862	0.9673* 0.0000	0.8935* 0.0000	0.9596* 0.0000	0.7558* 0.0000	1			
LR	0.2828 0.1371	-0.5691* 0.0010	-0.6512* 0.0001	-0.3910* 0.0326	-0.5199* 0.0032	-0.4368* 0.0158	1		
TGE	0.0775 0.6893	0.9699* 0.0000	0.8977* 0.0000	0.9735* 0.0000	0.7491* 0.0000	0.9982* 0.0000	-0.4269* 0.0186	1	

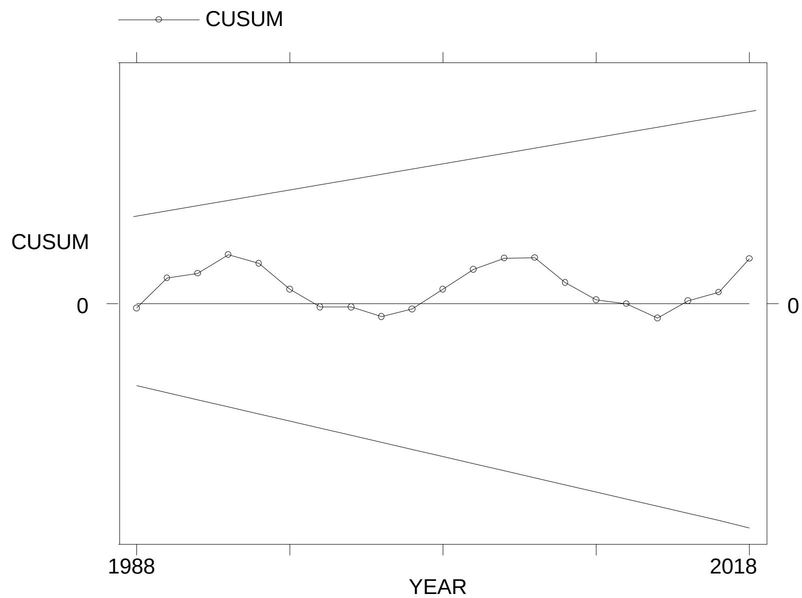
REER	0.0650 0.7376	-0.7458* 0.0000	- 0.8788 * 0.0000	- 0.6592 * 0.0001	-0.4962* 0.0053	-0.6873* 0.0000	0.6990* 0.0000	- 0.6815 * 0.0000	1

Source: Own Computation.

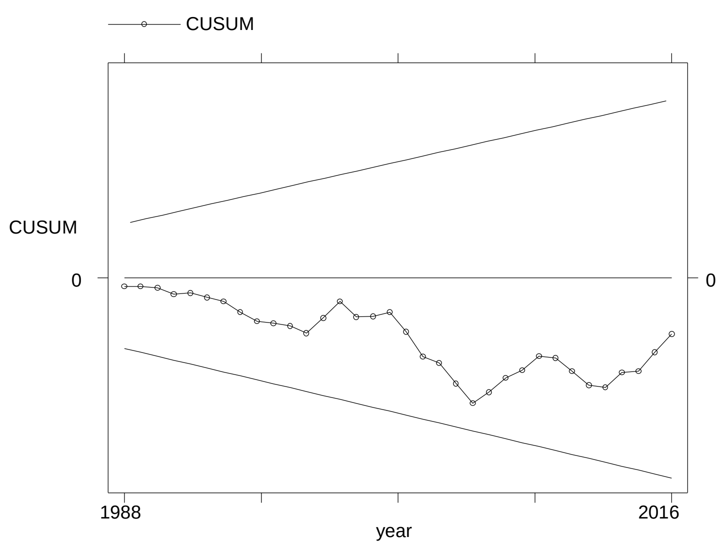
Appendix b

(i): Cumulative sum

Model 1

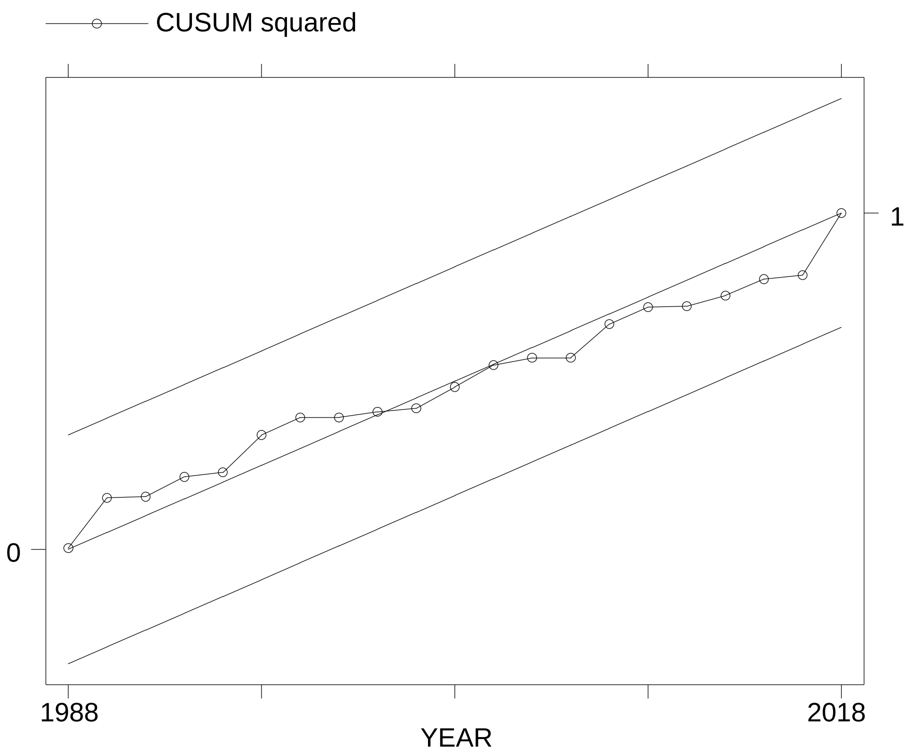


Model 2



(ii) Cumulative sum squared

Model 1



Model 2