ESTIMATING THE EFFECTIVENESS OF FISCAL POLICY IN STIMULATING ECONOMIC ACTIVITY IN LOW-INCOME COUNTRIES: A case study of Uganda

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A DISSERTATION SUBMITTED TO SCHOOL OF BUSINESS AND ADMINISTRATION IN PARTIAL FULFILLMENT OF REQUIREMENT FOR THE DEGREE OF BACHELOR OF ECONOMICS AND STATISTICS OF UGANDA CHRISTIAN UNIVERSITY

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APPROVAL

This research report titled "**Estimating the effectiveness of Fiscal Policy in stimulating economic activities in Low Income Countries: A Case Study of Uganda**" has been submitted by **Niwagaba Masiko** to the School of Business in fulfilment for the award of a Bachelor of Science in Economics and Statistics from The Uganda Christian University with my approval as his supervisor:

Name: **MR. PETER OPIO**

Sign: .....

Date: 11/09/23

DECLARATION

I, **Niwagaba Masiko,** hereby declare that this dissertation entitled "**Estimating the effectiveness of Fiscal Policy in stimulating economic activities in Low Income Countries: A Case Study of Uganda**" is the result of my original work, is not plagiarised and has not been submitted for any other degree at Uganda Christian University or any other academic institution for award. Credit has been duly given to all literature that was used in this research.

Signed: .....

Date: ..... 08th September 2023

ABSTRACT

The relationship between the business cycle and government policy is at the core of economics regardless of which school of thought an economist subscribes to. More recently a large magnitude of economic shocks have been seen which have induced government intervention. With this the size of governments has risen drastically, eliciting greater debate on the necessity of large government budgets. This paper characterizes the dynamic effects of shocks in government spending and taxes on economic activity in Uganda in the period between 2000-2020. It approaches this by using a structural vector autoregression study approach. It endeavours to estimate the size of fiscal and tax multipliers through this method, using secondary data capturing measurements of economic indicators for Uganda.

Objective One, determining the size of the multiplier effect of government expenditure, revealed that there are small but positive effects that government expenditure has on stimulating economic activity. The coefficient for the lagged value for government expenditure on current income (GDP) was found to be 0.198. This means that for every 1 unit increase in government expenditure, there is a correspondent 0.198 increase in GDP. This goes against conventional Keynesian economics of the fiscal multiplier, which asserts that increases in net government expenditure raises the total GDP by more than the amount of the increase.[1] It has been found here that the multiplier effect is less than 1 for government expenditure, while it is -0.3 for tax multiplier.

Objective Two, which examined the government's ability to impact an economy's business cycle through expenditure. Through the Impulse Response Function, it can be seen how GDP would respond to an unexpected shock in government expenditure or taxation, as it traces the dynamic impact to a system of a "shock" or change to an input. The Impulse Reaction Functions reveal that in the immediate term changes in government and tax do not have very large impact, but as time increases the impact gradually increase. This shows that changes in fiscal policy are not the only

Objective Three aimed to establish the ideal fiscal policy stance based on the results of the study. This conclusion is arrived at by considering the results of the two prior objectives. Given that multipliers are small and do not have substantial impact on the business cycle. It is ideal for government to adopt a laissez faire policy stance. This is one where government tends not to intervene in the market limiting the government expenditure in order to prop up

[1] (Corporate Finance Institute, 2015)

the economy. However, in order to fix the existing budgetary deficit, it is ideal that government increase taxation in order to return to a surplus.

In conclusion, this research offers great insight into the fiscal policy in developing countries. It shows that impact of expansionary fiscal policy does not have as great an impact as expected, this could be because of the impact of rational expectations. As government increases in size, the private sector sees this and shrinks in size in order to accommodate the government. This is why government expenditure is often inefficient in impacting the business cycle and large amounts are required in order to stabilize the country.

Dedication

This research report is dedicated to my parents Mr. Andrew Niwagaba and Mrs. Lillian Iradukunda, as well as my beloved sisters Mbabazi Kukundakwe and Nshuti Musiimenta. For the love, care, support and encouragement they gave me during this course. May God richly reward them for all the support they have given me.

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May God richly bless you all

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Chapter one: Introduction

This chapter introduces the research topic through the description of the contextual background which shows the theoretical underpinnings of this study, where in the field of economics this study fits. The chapter continues to define the problem statement which forms the basis of the subsequent chapters such as the significance of the research topic.

1.1 Background to the study

The central tenet of the Keynesian economics is majorly defined by the belief that government intervention can stabilize the economy[2], as opposed to classical economics which advocates for market forces resolving market issues. The Keynesian school of thought rose to prominence in the 1930s as a result of The Great Depression and the inability of classical economics of explaining the causes of the severe economic collapse.

There are three main assertions of Keynesian economics, first of which aggregate demand is the most important driver of the economy which can be influenced by both public and private sectors. Secondly, prices and wages are considered sticky, which means they respond slowly to changes in supply and demand. Lastly, changes in aggregate demand have their greatest effects on real output and employment.

Fiscal policy is one of the macroeconomic tools available to governments in the regulation of the economy, it describes the use of government spending and taxation to influence the economy. Fiscal policy can be expansionary or contractionary. Fiscal expansions were viewed as pivotal in stimulating economic activity after recessions in Japan, Indonesia, Korea and Thailand during the 1997 Asian financial crisis[3]. The Keynesian school of thought introduced the Keynesian multiplier which dictates that fiscal expansion has a multiplier effect on aggregate demand and output.

A fiscal multiplier is simply a measure of the impact that changes in fiscal policy has on output, in the short term[4]. The basic interpretation of the fiscal multiplier is that where it is higher than 1 GDP is highly responsive to an increase in government expenditure. Whereas, if it is below 1 GDP is not responsive to increases in government expenditure[5]. The thinking goes that where GDP is responsive to government spending, government spending has a

[2] (Jahan, Mahmud, & Papageorgiou, 2014)

[3] (International Monetary Fund, 1998)

[4] (Batini, Eyraud, Formi, & Weber, 2014)

[5] (Hemming, Kell, & Mahfouz, 2002)

larger than proportional impact on economic activity. The higher the fiscal multiplier, the more effective government is at stimulating economic activity.

However, contrary to these Keynesian views on fiscal multipliers are the consideration of rational expectations and the idea of Ricardian equivalence. These ideas arose because of the failure of government to deal with the irregular fluctuations in economic activity. The widespread optimism offered by the Keynesian revolution and its adjacent research programs, in the sixties, has quickly soured as it is now apparent that Keynesian economics has not found mastery of the business cycles. Two main events contributed to this loss of confidence in the ability of economic knowledge to predict economic phenomena. Firstly, the ability of economic models (built by Keynesian economists) to predict business cycles has failed to meet the expectations of both the producers and consumers of this model. Additionally, governments have failed grossly to substantially impact the developments in the business cycle. This situation has prompted reconsideration of accepted ideas about the ways in which fiscal and monetary policy can influence the business cycle, consequently doubting the efficacy of government policy in mitigating the effects of the business cycle. [6]

Three changes in economic theory can be identified surrounding the relation between government and business cycles, which are (1) the development of the "natural rate hypothesis," (2) doubt in the ability of the political process to produce good economic policies (3) the novel idea of "rational expectations." The second and third point is within the scope of this dissertation and help determine whether fiscal policy is effective.

Prior to the 1980s, the government's role and efficacy in the economy was pivotal in achieving the socially beneficial outcome or the public interest. Economists portrayed the political process similar to the individual maximization problem that is well-defined and has a consistent solution, that is the individual is trying to maximize utility subject to budget constraints. Similarly, government with the intertemporal budget constraint is trying to maximize expenditure and invest, while minimizing future indebtedness. However, the most basic problem is the inherent weakness of the political process for making economic decisions, as it is increasingly difficult for political players to reach a consensus about sensitive economic issues. Moreover, the political process is limited in its ability to specify consistent goals, establish clear objectives, and choose between competing interests.

More relevant to this paper is the role of rational expectations, which is a relatively novel idea in the theory surrounding government behaviour and business cycle. Rational

[6] (Grossman, 1980)

expectations implies that the ability of government to improve aggregate performance of the economy is even more limited than was earlier thought. It is hence seen that it may not feasible to design fiscal and monetary policy that can actively stabilize aggregate output and employment relative to their natural levels. The most important assumptions that follow are, (1) private agents know enough about the structure of the economy to foresee correctly the effects of monetary and fiscal actions if they perceive or predict these policies correctly, (2) private agents readily adjust their behaviour according to these perceptions or expectations. These implications mean that perceivable or predictable monetary or fiscal actions on average do not affect the time pattern of difference between actual and natural levels of output and employment.

Ricardian equivalence is founded on the idea that deficits merely postpone taxation, and that a rational individual should be indifferent between paying $1 taxes today and paying $1 plus interest in taxes tomorrow.[7] Assuming that a consumer has a lifetime budget constraint, which is a sum of all the income generated, the timing of the taxation does not affect an individual's lifetime budget constraint and cannot in turn affect his consumption decisions. This calls into question Keynesian thinking on the effect of fiscal policy on economic activity, as forward-looking consumers may not change their behaviour for small increments in wealth. It has been shown in multiple papers that given small increments of wealth the marginal propensity to consume is very small.[8] [9] Ricardian Equivalence theorem implies that fiscal stimuli defined by deficit financed spending hikes or tax cuts will lead to the crowding out and thus reduction of private consumption.

1.2 Problem statement

Accurate estimation of fiscal multipliers plays a key role in achieving the macroeconomic goals of government, which are low unemployment, low inflation and inclusive growth. Thus, it is essential to accurately estimate the relationship between government expenditure to increase accuracy in policy implementation with inflation targeting, and growth fostering in mind. Inaccurate fiscal multiplier estimates have led to inaccurate GDP and growth forecasts.[10] This may cause authorities to engage in repeated rounds of fiscal tightening in efforts to ensure that targeted variables approach official targets.

[7] (Bernheim, 1987)

[8] (Poterba & Summers, 1986)

[9] (Judd & Hubbard, 1986)

[10] (Blanchard & Leigh, 2013)

However, the existence of expansionary fiscal contraction calls into question the existing theory that fiscal expansions are necessary for stimulating economic activity, or that fiscal multipliers are always positive. It can be seen that in the case of Denmark and Ireland in the 1980s, fiscal consolidations have the opposite effect than expected. As said by (Giavazzi & Pagano, 1990), in both cases the fiscal turnaround was followed by "unusually strong expansions." However, for Ireland it is seen that a previous unsuccessful attempt at fiscal consolidations "plunged the economy into a severe recession."

Although, in Advanced Economies there is enough literature on the fiscal multipliers, emerging economies and low-income countries have little information on the size of fiscal multipliers. This is especially concerning given that the average fiscal position in Africa is a deficit of 4.0 percent of GDP.[11] This means on average most African countries are operating at a deficit under the assumption that increased government expenditure may cause economic activity to rise especially in the wake of the pandemic. As an indication of this the median public debt is 65% of GDP, which highlights the reliance of African governments on debt-financed expansions.

This study aims to address the problem of fiscal policy and predicting its impact on economic activity in Uganda under the Sub-Saharan context.

1.3 Purpose of the Study

In response to continuous fiscal and monetary policy decisions whose inspiration is puzzling, this paper intends to understand the relationship between fiscal policy and economic activity. This is to inform future policy decisions and understand what dictates movements in the business cycle in order to mitigate some of its more disastrous effects. Similarly, economist have correctly defined the relationship between monetary policy and can accurately measure its effects. This study set out to accomplish a similar goal for fiscal policy in order to quantify the links between changes in fiscal policy and changes in overall consumption.

1.4 Specific Objectives

The specific objective of this study was to deduce the relationship between government fiscal actions and business cycles, given that this is still unclear especially within the context of low-income countries. Whether government actions mitigate or exacerbate the operations of the business cycle and what is the best option to elicit a desired economic result if contractions can be expansionary. Knowing the size of the multiplier (in addition to verifying

[11] (African Development Bank, 2023)

its existence) is also of particular importance as well as the sign of the multiplier, whether it is positive or negative, as these all represent the response of the economy to government fiscal actions.

These can be summarized into 3 specific objectives:

To determine the size of the multiplier effect of government expenditure.

To examine impact of government expenditure on business cycle.

To establish ideal government fiscal policy to encourage economic growth.

1.5 Research Hypothesis

The research hypothesis states that although fiscal expenditure has some direct effect on the economic activity, the GDP is not highly responsive to changes in fiscal expenditure. Defined in terms of the Keynesian multiplier, the Keynesian multiplier for LIC/EMEs is less than 1.

In context of the research objectives above the study seeks to answer these questions phrased as null hypotheses:

- An increase in government expenditure results in a less than proportional increase in GDP.
- Changes in fiscal policy do not entirely explain changes in GDP.
- Government Expenditure is not efficient in influencing the business cycle.

1.6 Scope of the Study

1.6.1 Content Scope

The content covered the macro-economic field, especially concerning Keynesian economics. The Keynesian field of economics has distinct features prior mentioned which are; (1) they do not put emphasis on demand but rather government intervention, (2) prices and wages are considered sticky prices, and (3) changes in aggregate demand have greatest effects on real output and employment. This field was the primary area of concern. The application of Keynesian economic theory on fiscal policy and their assertions on its efficacy in influencing the demand cycle.

1.6.2 Geographical Scope

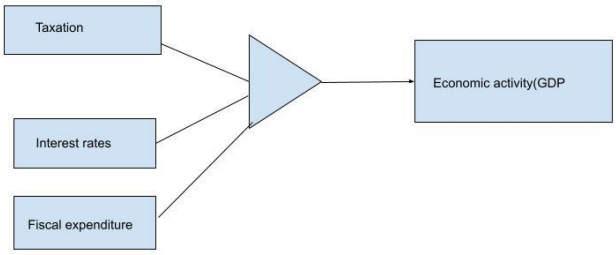
Given that the existing knowledge gap is in the emerging market economies and low-income countries, the geographical scope was decided to be Sub-Saharan Africa. These countries have similar dynamics and defining characteristics such as the average GDP per capital is within the same range “just under four thousand dollars, one-fifth of the world average.”

However, they have eight of the twenty fastest growing economies in the world.[12] They also rely relatively largely on foreign aid. In order to apply this knowledge to benefit the rest of Sub-Saharan Africa and countries generally with similar characteristics, data for Uganda was used from the period of 2000 to 2020.

1.6.3 Time Scope

This study focussed on literature on fiscal policy and economic growth for the last 20 years. It was used to review this twenty-year period that is from 2000 to 2020 in Uganda.

1.7 Conceptual Framework



The independent variables in this case that determine taxation, interest rates, and fiscal expenditure whose relationship was tested with economic activity, measured by Real GDP. This is to test the Keynesian theory of the multiplier where government expenditure has a higher than proportional effect on GDP. The theoretical backup of this choice of variables is simple and intuitive; taxation affects the level of expenditure as it dictates the level of disposable income that consumers have to use. Government expenditure has a trickle-down effect towards consumption and contributes directly to GDP, such that if government enacts an expansionary fiscal policy the money used by government to demand goods and services will increase. In addition, the money in circulation will increase, raising the level of consumption and investment as well. The interest rate measures can indicate the marginal propensity to consume (MPC) which is an important factor in determining the pass-through rate of government expenditure into consumption, investment and other forms.

[12] (Centre for Foreign Relations, 2018)

1.8 Justification of the Study

The research contributes to the elimination of a gap in the literature surrounding fiscal policy in emerging economics especially sub-Saharan Africa. In the IMF report it re-echoes this gap as it says “little is known about the size of fiscal multipliers in EMEs (emerging market economies) and LICs (low-income countries). It is also not clear from a theoretical point of view whether should be expected to be expected to be higher or lower than that of advanced economies that have been explored.

1.9 Significance of the Study

Governments, particularly that of Uganda, continue to use fiscal expansions and budgetary deficits as a method to increase demand and stimulate the economy. The argument there being that the economy would suffer as a result of reduced government expenditure. However, taking into consideration the contrasting views of (Giavazzi & Pagano, 1990) it may be prudent to cut down on spending in order to create room for the private sector to grow. This is where the aspect of rational expectations comes in, for investment, and Ricardian equivalence comes in for consumption expenditure.

Chapter Two: Literature Review

This chapter aims to explore the existing body of knowledge on this topic. By amalgamating relevant studies, empirical literature, and theoretical background, this review seeks to provide insights to the dynamic relationship between the variables and their impact on GDP. As previously said, there are two schools of thought concerning fiscal policy. These can be separated into two categories, (1) government expenditure has a proportional or larger than proportional effect on GDP (fiscal multiplier ≥ 1) and (2) government expenditure is less than one and even negative (fiscal multiplier ≤1).

2.1 Theoretical Literature Review

Traditional Keynesian logic assumes the effect of government spending stimulus will increase aggregate demand which leads to higher labour demand and thus employment and wages. The higher labour income then stimulates consumption, especially that of poor to middle income households, which further increases demand, creating more employment and higher income. The equilibrium impact of government spending of 1 unit of currency on output is then the sum of the impacts of the initial increase in government spending and induced private consumption. That is the fiscal multiplier is the sum of the direct effects of government spending and the indirect effects to the economy by the increased income in result of the stimulus.[13] This argument hinges on Keynes' Law which states that "demand creates its own supply"[14] This is because prices are rigid such that firms only adjust quantities, and prices in response to increased government demand. This causes increased production in order to satisfy demand, this has the by-product of increasing employment which then raises the household income. The second assumption is hinged on the fact that families have a high marginal propensity to consume(MPC) and the increased income will result in higher consumption as opposed to saving. This will continue to snowball into a larger economic benefit than the raw value of the government stimulus.

However, the classical view considers that market forces respond to the changes in demand and supply.[15] Given that market forces must balance out demand and supply, reductions in investment and consumption must balance the increases in government spending. It has been shown that financing of government deficit whether it is by bonds or by debt it "crowds out"

[13] (Hagedorn, Manovskii, & Mitman, 2019)

[14] (Skousen, 2017)

[15] (Froyen, 2013)

private expenditure (private consumption and investment expenditure) equal to the amount of government deficit (increased expenditure). This happens because of the rise in interest rate individuals and corporations prefer to save the money and take advantage of high interest rates and reduce the current consumption. Additionally, private investment expenditure declines because of the high interest rate (the opportunity cost of loaned funds goes up because of attractive bond yields) making many projects unprofitable reducing the investment. The rise in government expenditure is exactly matched by the decline in private expenditure (consumption and investment) which does not allow an increase in aggregate demand. Thus, increases in government expenditure may not ostensibly affect price levels.

The classical view ties in to the relatively novel idea of permanent consumption, derived from the "permanent income theory," which connects the Ricardian expenditure with consumption smoothing to explain why trends of consumption do not adjust as expected in response to fiscal actions. Milton Friedman in protest to the Keynesian foundations of consumption function produced the permanent income hypothesis during the 1950s. Changes in income can either be thought of as permanent or transitory changes. Permanent income can be thought of as corresponding to the lifetime income or wealth earned by an individual. Friedman's central hypothesis is as follows; customers respond to changes in permanent income but largely ignore changes in transitory income, and measured income is a combination of both permanent and transitory income. So measured consumption does not necessarily increase with increases in measured income because often times increases are only transitory. Thus, individuals tend to smooth consumption, creating balance between saving and spending, rather than letting consumption bounce due to short term changes in income.[16] Furthermore, Ricardian expenditure ties in here because if consumers are forward looking (as Ricardian postulates), then short-term changes in government policy will not induce consumers to spend more. On the contrary it will compel them to save more as they anticipate greater taxes to compensate these budgetary deficits. These connected ideas propose that the fiscal multiplier does not reflect reality and governments that pursue fiscal expansions via budgetary deficits are harming the economy rather than building it.

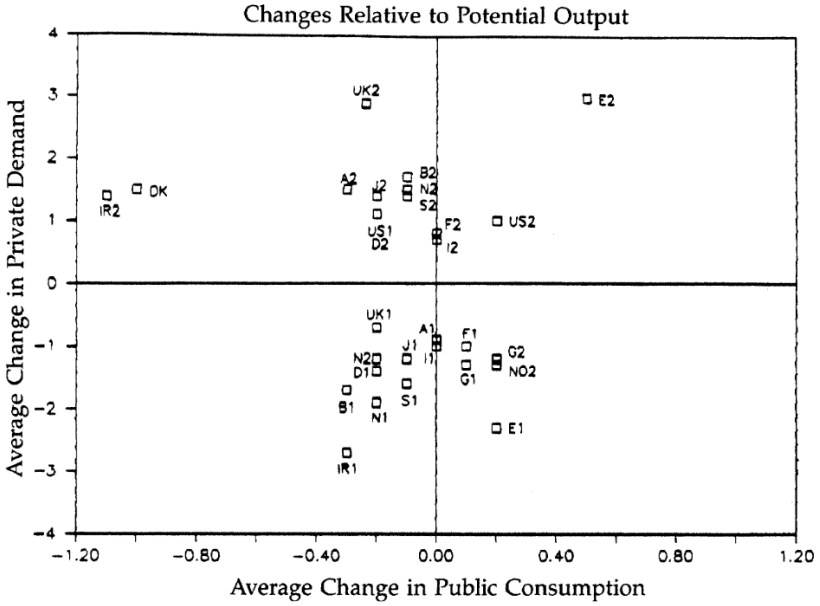
2.2 Empirical Literature Review

The study conducted by Giavazzi and Pagano gives a great foundation on which to begin the empirical studies of fiscal multipliers and their translation into real world economics. It starts

[16] (Coleman, 2013)

of by giving an account of German fiscal consolidation that aligns with the classicals saying; "fiscal consolidations had benign impact on expectations… and the public sector made room for the private sector to expand." It points to the role of rational expectations, given that the measures are part of a program to reduce taxation in the future and share of government GDP. This study monitors the results in Europe specifically Ireland and Denmark (between the period 1983 - 1989) that carried out fiscal consolidations, and experiences expansions. This runs contrary to the Keynesian assumption that all fiscal consolidations result in a downturn in the economic activity.

Figure 2 PRIVATE DEMAND AND PUBLIC CONSUMPTION



A: Austria (1980–84, 1987–89)
B: Belgium (1980–84, 1985–89)
D: West Germany (1980–83, 1987–89)
DK: Denmark (1983–84)
E: Spain (1980–84, 1985–89)
F: France (1980–84, 1985–89)
G: Greece (1980–84, 1985–89)
I: Italy (1980–84, 1985–89)
IR: Ireland (1981–84, 1987–89)
N: Netherlands (1980–84, 1985–89)
NO: Norway (1980–83, 1984–89)
S: Sweden (1980–83, 1986–89)
J: Japan (1980–84, 1985–89)
UK: United Kingdom (1980–83, 1985–89)
US: United States (1980–83, 1984–89)

SOURCE: OECD, National Income Accounts

In the graph above it is apparent that the recession of the 80s resulted in large drops in private demand, but Ireland and Denmark were seemingly insulated from the effects and even drastically reduced the public expenditure. Even more remarkable is the state of both economies before the consolidation, Ireland's national debt was 87% of its GDP, while Danish debt-to-GDP ratio wasn't much better at 65%. The study sets out to differentiate between the direct impact of fiscal policy, with the indirect effect that the expectations surrounding this policy have. In addition, to the fiscal consolidation both governments devalued their currencies and pegged the exchange rate to a low-inflation currency inducing a fall in nominal and real rates. The study does infer that there are rational expectations that affect the way fiscal policy implementations turn out. In this specific case the fiscal multiplier

was negative for both countries as shown in the graph above, seeing that a reduction in public consumption resulted in an increase in private demand.

Another study by Robert Perotti in 2002, which has the aim of identifying the precise effect of fiscal shocks or increases in spending does state that fiscal multipliers under very specific circumstances can be over 1. In fact, he claims it to be the exception, but rather declares that estimated effects of fiscal policy on GDP tend to be small but positive nonetheless. The effects of fiscal policy on GDP have become substantially weaker over time and even show negative multipliers in the post-1980 period. This study uses data from 5 different countries namely; the United States, West Germany, the United Kingdom, Canada, and Australia. The methodology used in this study makes use of automatic effects. It is said though that disregarding the singular negative values the impact response of fiscal policy on GDP is positive for all 5 countries. It is only the size of impact that varies for West Germany where it is 1.30% of GDP. The absolute peak for the United Sates is about 1% of GDP and in three countries the absolute maximum is less than 0.5. This refers to the pre-1980s period. Things began to change in the post-1980s period where for 4 countries the multiplier is negative while for the US it is 0. This was done using the structural VAR models in order to use information on the automatic effects of GDP and inflation on tax revenues and government spending to identify the exogenous fiscal policy shocks. It includes the logs of real GDP, real government spending, real net taxes and nominal interest rates.

Chapter Three: Methodology

3.1 Research Design

A research design defines the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.[17] It is in fact the conceptual structure with which research is conducted; it constitutes the blueprint for collection, measurement, and analysis of data. The study adopted causal research design, because this design gives an opportunity to see whether there is an underlying relationship between the two values. It made use of quantitative research approach which is a means for testing objective theories by examining the relationship among variables. These variables are measured so that numbered data can be analysed using statistical procedures. The research to used secondary data gathered concerning taxation, GDP, and government spending over a period of 20 years, collected annually.

3.2 Data sources

World Bank data is collected from and relies on official sources for its 189 member countries. It is one of the world's largest sources of knowledge for developing countries, and it holds a commitment to reducing poverty, increasing shared prosperity, and promoting sustainable development. With the two agencies, The International Bank for Reconstruction and Development (IBRD) and The International Development Association (IDA), the World Bank provides financing, policy advice, and technical assistance to governments of developing countries.

At the World Bank, the Development Data Group co-ordinates statistical and data work and maintains a number of macro, financial and sector databases. Working closely with the Bank's regions and Global practices, the group is guided by professional standards in collection, compilation and dissemination of data to ensure that all data users have confidence in the quality and integrity of the data produced. Much of the data comes from the statistical systems of member countries, and the quality of global data depends on how well these systems perform.

The Organisation for Economic Co-operation and Development (OECD) is an international organisation that works to build better policies for better lives. Together with governments, policy makers, and citizens they work on establishing evidence-based international standards and finding solutions to a range of social, economic and environmental challenges.

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[17] (Stelliz, Jahoda, Deutsch, & Cook, 1959)

3.3 Data Analysis plan

This research used STATA to analyse the data provided in order to draw meaningful statistical analysis with the data provided. Stata is a powerful statistical software that enables users to analyse, manage and produce graphical visualizations of data. It is primarily used by researchers in the fields of economics, biomedicine, and political science to examine data patterns, it has both a command line and graphical user interface making use of the software more intuitive.

3.3.1 Stationarity Test

Stationarity is an important feature for any time series data, yet many economic and financial time series exhibit trending behaviour or non-stationarity. Stationarity defines a time series whose properties do not depend on the time at which the series is observed. This means that mean, autocorrelation, and variance do not vary over time[18]. In order to use data, the stationarity of the data must first be detected, then any trend/seasonality effect from the data be removed. The unit root tests were used to measure, one key test that ideal for measurement is the Phillips-Peron test for one unit root. Similarly, the Dickey Fuller test is also a unit root-based test of stationarity, which test focus on the coefficient associated with the first lag of time series variable.[19]If data is found to be non-stationary it can be differenced, which is a technique that can be applied to a data set in order to remove any sort of stochasticity. Transformations such as logarithms can help to stabilize the variance of a time series. Differencing can help stabilize the mean of a time series by removing changes in the level of a time series, and therefore elimination trend or seasonality.

3.3.2 Lag Selection Order

Then the preferred lag order was deduced based on multivariate iterations of the Akaike Information Criteria, Schwarz information criteria, the Hannan-Quin information Criteria, and the Akaike's Final Prediction Error criterion. Information criteria are likelihood-based measures of model fit that include a penalty for complexity (specifically, the number of parameters). The Akaike Information Criterion (AIC) compares models from the perspective of information entropy (the average amount of information conveyed by an event considering all possible outcomes) as measured by Kullback-Leibler divergence. The AIC is described by the following model:

$$-2log\ L(\theta)\ +\ 2k$$

[18] (Ozbun, 2021)

[19] (Rehal, 2023)

Where log L(θ) denotes the maximized loglikelihood objective function for a model with *k* parameters fit to *T* data points. The Schwarz (Bayesian) information criterion (BIC) compares models from the perspective of decision theory, as measured by expected loss. The BIC for a given model is:

$$-2\ log\ L(\theta)\ +\ k\ log\ (T)$$

Hannan-Quinn Information Criterion (HQC) imposes a smaller penalty on complex models than the BIC in large samples.

3.3.3 VAR Estimation

The vector autoregression (VAR) model is one of the most flexible, successful and easy to use models for the analysis of multivariate time series. It is a. natural extension of the univariate autoregressive model to dynamic multivariate time series. The VAR model has been proven to be particularly useful for describing the dynamic behaviour of economic and financial time series for forecasting. It often provides superior forecasts to those from univariate time series models and elaborate theory-based simultaneous equations models. It is used to capture the relationship between multiple quantities as they change over time. A VAR s a *n*-equation, *n*-variable linear model in which each variable is explained by its own lagged values, plus current and past values of the remaining *n*-1 variables. A structural VAR uses economic theory to sort out the contemporaneous links between the variables. The VAR model was then estimated to test the regression coefficients, or the level to which they are related. In order to ensure that data was fit to be used presence of autocorrelation was considered.

3.3.4 Autocorrelation tests

Autocorrelation refers to the degree of correlation between the values of the same variables across different observations in the data. In linear regression analysis for time dependent phenomenon, it is assumed that the error term doesn't depend upon its past (previous) value/s. If this assumption is not fulfilled then autocorrelation is said to present. When this assumption is violated the heteroskedasticity arises which means that the estimates for the coefficients will not be reliable. Some sources of autocorrelation can include misspecification of the form of a relationship. Where presence of autocorrelation is present one must abandon the estimation because any result received will not be reliable.

3.3.5 Granger Causality

The granger causality was then tested to verify the usefulness of each variable in forecasting the others. In other words, a variable is Granger causal for another if it helps predict that

variable in the future. One should notice that Granger causality is not causality in a deep sense. It talks about linear prediction and it only holds ground if there is Granger causality one way. Granger causality only provides information about forecasting ability, it does not provide insight into the true causal relationship between two variables. Suppose a VAR(3) model is being modeled such that:

$$Y = \beta_{11} + \beta_{12}Y_{t-1} + \beta_{13}G_{t-1} + \beta_{14}T_{t-1} + \beta_{15}Y_{t-2} + \beta_{16}G_{t-2} + \beta_{17}T_{t-2} + \varepsilon$$
$$G = \beta_{11} + \beta_{12}Y_{t-1} + \beta_{13}G_{t-1} + \beta_{14}T_{t-1} + \beta_{15}Y_{t-2} + \beta_{16}G_{t-2} + \beta_{17}T_{t-2} + \varepsilon$$
$$T = \beta_{11} + \beta_{12}Y_{t-1} + \beta_{13}G_{t-1} + \beta_{14}T_{t-1} + \beta_{15}Y_{t-2} + \beta_{16}G_{t-2} + \beta_{17}T_{t-2} + \varepsilon$$

One can again test if G Granger-causes Y by testing the hypothesis that $\boldsymbol{\beta_{2,1} = \beta_{2,2} = 0}$. Many researchers will report the results of this test.Finally, the impulse response function was then computed in order to estimate the effect of a shock in one variable on another in a VAR system.

3.4 Model specification

This dissertation has utilized the Vector Autoregressive (VAR) models because it shows that government spending and taxation are not independent from one another. VAR models is one of the most successful, flexible, and easy to use models for the analysis of multivariate time series. It is a natural extension of the univariate autoregressive models to dynamic multivariate time series. The VAR model has proven to be especially useful for describing the dynamic behaviour of economic and financial time series and for forecasting. It provides superior forecasts to those from univariate time series models and elaborate theory-based simultaneous models. A vector autoregressive model is a n-variables, n-equations model which express other variables as a linear function of its own past values and past values of all others variables being considered in the model. This model is a 3 equation, 3 variable model.

$$Y = \beta_{11} + \beta_{12}Y_{t-1} + \beta_{13}G_{t-1} + \beta_{14}T_{t-1} + \beta_{15}Y_{t-2} + \beta_{16}G_{t-2} + \beta_{17}T_{t-2} + \varepsilon$$
$$G = \beta_{11} + \beta_{12}Y_{t-1} + \beta_{13}G_{t-1} + \beta_{14}T_{t-1} + \beta_{15}Y_{t-2} + \beta_{16}G_{t-2} + \beta_{17}T_{t-2} + \varepsilon$$
$$T = \beta_{11} + \beta_{12}Y_{t-1} + \beta_{13}G_{t-1} + \beta_{14}T_{t-1} + \beta_{15}Y_{t-2} + \beta_{16}G_{t-2} + \beta_{17}T_{t-2} + \varepsilon$$

Where:

Y = GDP in local currency

G= Government expenditure in local currency

T = Tax revenue in local currency

3.5 Model Fit

The model fit of the structural vector autoregression was assessed using several key statistics. The coefficient of determination (R-squared) was utilized to measure the proportion of variance in GDP explained by the independent variables. For Objective One, the R-squared value of 0.05 which showed that only 5% of the variance in GDP can be attributed to government expenditure and tax revenue. Similarly, the P-values for the GDP equation is not statistically significant implying that there are missing variables that need to be included in order to increase the ability of the equations to predict and explain the changes in GDP. However, it can be seen that the equation for tax revenue is statistically significant in explaining the changes in tax revenue. However, the equation only accounts for 32.69% of the variation in tax revenue. These low R-squared value may reveal the presence of tax leakages as well as a large reliance on debt, as well as aid and grants.

3.6 Ethical Considerations

The data accessed from The World Bank group was accessed under the Creative Commons Attribution 4.0 International License (CC-BY 4.0). Where the group makes it publicly available according to open data standards. This allows users to copy, modify, and distribute data in any format for any purpose, including commercial use. Users are only obliged under this to give appropriate credit and indicate if they have made any changes. The open data standards are as set out in the open definition, which sets out the principles that define "openness," summed up in the statement that "open means anyone can freely access, use, modify, and share for any purpose."

Whereas data from the OECD is used under the terms and conditions, saying it "encourages the use of its data, publications and multimedia products. It makes data available for use and consultation by the public

Chapter 4: Data Analysis and Interpretation

This chapter presents the findings of the research and the interpretations of the data collected during the study. The purpose of this chapter is to examine the data collected to establish the impact of fiscal policy represented by government expenditure and tax figures on GDP.

4.1 Finding on Background Characteristics

Three variables have been listed concerning Uganda's economic indicators, gross domestic product (GDP), government revenue, and government expenditure captured in billions in local currency units which are Uganda Shillings.

4.2 Presentation of Findings

4.2.1 Stationarity Test

The stationarity test is first conducted using the commands

```
dfuller var
pperron var
```

where var represents the variable, whose stationarity being tested.

Where the hypotheses are as follows:

H_0: A unit root is present in a time series. Meaning the time series is not stationary.

H_A: A unit root is absent in a time series meaning it is stationary.

The decision rule is given as:

If p-value >0.05 the alternative hypothesis H_A is rejected and accept the null hypothesis H_0 though, when the p-value <0.05 the null hypothesis is rejected and fail to reject the alternative.

When a time series is not stationary, cannot be used it in our regressions as it may lead to spurious regressions which is a statistical model that shows misleading statistical evidence of a linear relationship. This means that if such data is used in a regression model a high R^2 value is likely to be found even when the series are independent of each other.

Table 1.1: Results from STATA showing stationarity test on GDP figures

```
. dfuller gdpinbillions

Dickey-Fuller test for unit root                    Number of obs   =        20

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test            1% Critical       5% Critical      10% Critical
               Statistic            Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             1.993            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9987

.

. pperron gdpinbillions

Phillips-Perron test for unit root                  Number of obs   =        20
                                                    Newey-West lags =         2

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test            1% Critical       5% Critical      10% Critical
               Statistic            Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)           0.490           -17.200           -12.500          -10.200
 Z(t)             2.284            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9989

.
```

Source: *Primary data calculations from STATA (2023)*

GDP can be seen as non-stationary because the p-value is 0.9987, which is greater than 0.05. According to the decision rule the null hypothesis is accepted, meaning there is presence of a unit root. The Phillips Perron test is considered to confirm the result given by the Dickey Fuller.

The Phillips Perron confirms the result of the Dickey Fuller, stating that the time series for GDP is non-stationary. The same tests for tax revenue were conducted, which produce the following results,

Table 1.2: Results from STATA showing stationarity tests on tax revenues

```
. dfuller taxinbillions

Dickey-Fuller test for unit root                   Number of obs   =        20

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             2.419            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9990

.
```

Source: *Primary data calculations from STATA(2023)*

Similarly, tax revenue is non-stationary via the Dickey Fuller criterion as noticed the p-value is 0.9990 where the level of significance is 0.05. Given that the p-value> 0.05 it can be said that the time series is non-stationary.

The Phillips-Peron test gives the same result, the time series for tax revenue is non-stationary. Government expenditure is considered next and conduct the Dickey Fuller and Phillips Perron tests

Table 1.3: Results from STATA showing stationarity on government expenditure.

```
. dfuller govinbillions

Dickey-Fuller test for unit root                   Number of obs   =        20

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -0.246            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9328

. pperron govinbillions

Phillips-Perron test for unit root                 Number of obs   =        20
                                                   Newey-West lags =         2

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)           0.667           -17.200           -12.500          -10.200
 Z(t)             0.385            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9809
```

Source: *Primary data calculations from STATA (2023)*

These show that government expenditure is also non-stationary. This means that statistical analysis cannot be carried out without making the data stationary, as it is one of the assumptions of VAR. Either differencing or using the logs of the different time series are considered . This is done with the command:

```
generate dvar = d.variable
generate lvar = log (variable)
```

Where the first command is for differencing and the second is for finding the log.

Table 1.4: Results from STATA showing the effects of differencing for GDP

```
. generate dgdp = d.gdpinbillions
(3 missing values generated)

. dfuller dgdp

Dickey-Fuller test for unit root                   Number of obs   =        19

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.841            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0025
```

Source: *Primary data calculations from STATA (2023)*

As shown the time series for GDP becomes stationary, by both categories the Dickey Fuller test and the Phillip Peron test it is stationary given by the p-values of 0.0025 and 0.0025 respectively.

We can see that these p-values are less than the level of significance set as 0.05, so according to the decision rule we reject the null hypothesis of non-stationarity and we consider the differenced time series non stationary.

This is the same for the government expenditure, which is made stationary from one differencing. This is shown by the Dickey Fuller test and Phillips Peron test which yielded the p-values of 0.00 and 0.00.

Table 1.4: Results from STATA showing the effects of differencing for government expenditure

```
. pperron dgov

Phillips-Perron test for unit root                 Number of obs   =        19
                                                   Newey-West lags =         2

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)         -22.230           -17.200           -12.500          -10.200
 Z(t)            -6.019            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

Source: *Primary data calculations from STATA (2023)*

The tax revenue however does not become stationary after the first difference as the p-value for the Dickey Fuller test is 0.1865, which is higher than our p-value. We thus accept the null hypothesis of non-stationarity.

Table 1.5: Results from STATA showing the effects of differencing for tax revenue

```
(4 missing values generated)

. dfuller ddtax

Dickey-Fuller test for unit root                   Number of obs   =        18

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.571            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0063

.
```

Source: *Primary data calculations from STATA (2023)*

We attempt the second difference which gives a Dickey Fuller p-value of 0.063, yet the Phillip Peron value is high remaining at 0.2804. This is satisfactory as the Phillips Peron test is based on asymptotic theory and works best in large samples, yet this sample is not necessarily large.

4.2.2 Selection Criteria

The selection lag order length is given by the following prompt:

```
varsoc
```

We then measure how many lags we should include in the regression, using the selection order criteria of the AIC, HQIC, and the SBIC.

Table 1.6: Results from STATA showing the selection order criteria

```
. varsoc

  Selection-order criteria
  Sample:  2004 - 2020                        Number of obs      =        17
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-430.685				2.9e+18	51.0218	51.0364	51.1688*
1	-420.347	20.677*	9	0.014	2.5e+18*	50.8643*	50.9228*	51.4525
2	-412.906	14.881	9	0.094	3.5e+18	51.0478	51.1501	52.0771

```
  Endogenous:  dgdp dgov ddtax
   Exogenous:  _cons
```

Source: *Primary data calculations from STATA (2023)*

We are shown by the stars that beside the number which lag order is ideal for the VAR, we can see that two of the 3 criteria recommend using one lag.

Presentation of Finding on Objective One

4.2.3 VAR Model Estimation

Once we know the recommended lag- length we carry out VAR using the following prompt:

```
var dgdp dgov ddtax, lags (1/1)
```

Which gives the following results

Table 1.7: Results from STATA showing the vector autoregression model

```
. var dgdp dgov ddtax, lags(1/1)

Vector autoregression

Sample:  2003 - 2020                            Number of obs     =         18
Log likelihood =  -444.8569                     AIC               =   50.76188
FPE            =   2.28e+18                     HQIC              =   50.84373
Det(Sigma_ml)  =   5.88e+17                     SBIC              =   51.35546

Equation              Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
dgdp                      4   1573.51   0.0518   .9831613   0.8053
dgov                      4   1877.55   0.1930   4.306128   0.2302
ddtax                     4   617.424   0.3269   8.743545   0.0329
------------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
dgdp         |
        dgdp |
         L1. |   -.024869    .282512    -0.09   0.930    -.5785824    .5288443
             |
        dgov |
         L1. |   .1977284   .2174816     0.91   0.363    -.2285278    .6239845
             |
       ddtax |
         L1. |  -.3010414   1.406865    -0.21   0.831    -3.058447    2.456364
             |
       _cons |   4653.063   1257.091     3.70   0.000     2189.21     7116.916
-------------+----------------------------------------------------------------
dgov         |
        dgdp |
         L1. |  -.0069883   .3370998    -0.02   0.983    -.6676917    .6537152
             |
        dgov |
         L1. |  -.1891652   .2595041    -0.73   0.466    -.6977838    .3194535
             |
       ddtax |
         L1. |  -2.344435   1.678704    -1.40   0.163    -5.634634    .9457644
             |
       _cons |    1031.29    1499.99     0.69   0.492    -1908.636    3971.216
-------------+----------------------------------------------------------------
ddtax        |
        dgdp |
         L1. |  -.1916355    .110854    -1.73   0.084    -.4089053    .0256343
             |
        dgov |
         L1. |   .1459937   .0853369     1.71   0.087    -.0212636     .313251
             |
       ddtax |
         L1. |  -1.020628   .5520353    -1.85   0.064    -2.102598    .0613409
             |
       _cons |    879.127   493.2658     1.78   0.075    -87.65628    1845.91
------------------------------------------------------------------------------
```

Source: *Primary data calculations from STATA (2023)*

This gives the VAR:

$$Y = 4653.06 - 0.025Y_{t-1} + 0.198G_{t-1} - 0.301T_{t-1}$$

$$G = 1031.29 - 0.007Y_{t-1} - 0.189G_{t-1} - 2.344T_{t-1}$$

$$T = 879.127 - 0.191Y_{t-1} + 0.146G_{t-1} - 1.021T_{t-1}$$

4.2.4 Tests of Stability

We then measure the stability of the model using the Eigenvalue stability condition, which in literature is also referred to as stationarity conditions. If all inverse roots of characteristic

autoregressive polynomial have modulus less than one and lie inside the unit circle the estimate VAR is stable

Table 1.7: Results from STATA showing the vector autoregression model

```
. varstable

Eigenvalue stability condition
```

Eigenvalue	Modulus
-.6800894 + .4661768i	.824526
-.6800894 - .4661768i	.824526
.1255162	.125516

```
All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.
```

Source: *Primary data calculations from STATA (2023)*

4.2.5 Autocorrelation Test

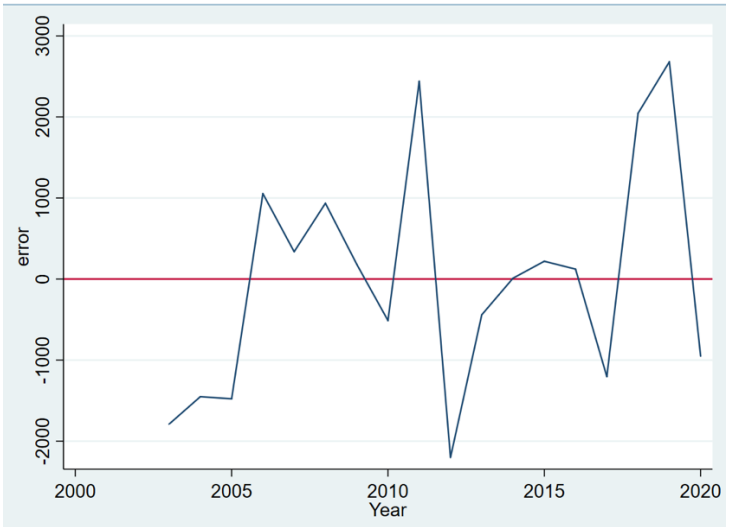
As we see above the modulus is all less than 1, with the results being 0.824, 0.824, and 0.125. If the VAR is not stable diverse tests conducted on our VAR model may be invalid. Similarly, impulse response standard errors are not valid.

We then carry out the residual diagnostics using the prompt:

```
predict error, resid
```

We then graphically represent the residuals to measure if the errors are serially correlated not.

Table 1.8: Results from STATA showing the residual diagnostics



Source: *Primary data calculations from STATA (2023)*

We then carry out the Lagrange test where the null hypothesis that there is no autocorrelation, thus if the p-value is greater than 0.05 we accept the null-hypothesis that there is no autocorrelation.

Table 1.9: Results from STATA showing the Lagrange multiplier test

```
. varlmar

  Lagrange-multiplier test

+--------------------------------------+
| lag |      chi2     df    Prob > chi2 |
|-----+--------------------------------|
|   1 |   10.0658      9      0.34519  |
|   2 |    4.8562      9      0.84666  |
+--------------------------------------+

  H0: no autocorrelation at lag order
```

Source: *Primary data calculations from STATA (2023)*

It can be seen that at both lags there is no autocorrelation. This means that the statistical tests can proceed and they are reliable given that the data conforms to the characteristics of data for linear regression.

Discussion of Finding on Objective One

The equation of interest remains the equation for GDP, as well as that for government expenditure. The chi square statistic for the GDP is 0.98, resulting in a p-value of 0.81. This p-value suggests that there is no statistically significant relationship between the GDP and the terms of the equation. However, this may also imply that the variables do not explain a large proportion of the variance in the GDP. This may mean that more variables need to be included to explain GDP in summative manner. Similarly, p-value for the governmental expenditure equation is 0.23 also suggesting that there is no statistically significant relationship between government expenditure and the variables included in the equation. This may also point to the fact that some key variables explaining variation in government expenditure were not included in the model. Conversely, the equation for tax revenue is statistically significant meaning that there is a meaningful correlation between tax revenue and the variables included in the equation.

From the first equation in the above VAR model, it can be seen that the government multiplier is 20%, meaning that for every 1 unit increase of government expenditure, a subsequent 0.2 unit increase in GDP happens. Whereas the tax multiplier is -30% meaning that for every 1 unit increase in tax revenue there is a subsequent 0.3 unit decrease in government revenue. This is notable as tax has the largest effect on the GDP while government expenditure and the lagged value of GDP itself have much lower impact on GDP at 20% and 2.5% respectively.

In the second equation we gather that there is a negative correlation with the lagged variable for GDP of 0.007 which is very small and less that 1%. While the lagged variable for government expenditure is -0.19 which results in 19%. This coincides with economic and political economy. Often when governments overspend in a previous period there are forced to make concessions by reducing expenditure in the next period. This means for every increase of 1 unit of government expenditure in the present it results in a 0.19 unit decrease of government expenditure in future periods. The coefficient for the lagged value of the tax revenue is very large as unit increases in lagged values for tax revenue result in decreases of -2.3 in government expenditure. This may speak to inefficiency in tax collection meaning that increases in tax revenue come at very large costs and thus take up large parts of government budget.

Lastly for the third equation for taxation, the lagged value for GDP has a negative correlation with tax revenue where 1 unit increases in GDP result in 0.19 unit decreases in tax revenue. Though increases in government revenue result in increases in taxation where 1 unit increases in government revenue result in 0.14 increases in tax revenue. The lagged value for tax revenue has a negative correlation with the tax revenue in the current period as for every increase of tax revenue by 1 in the previous period results in decreases of tax revenue in the current period of 1.02.

In conclusion we can see that great increases in government expenditure do not have a great impact on the standing in the economy. It doesn't greatly impact the GDP in the economy given that for every unit increase in expenditure results in only a 0.20 increase in GDP. This may speak to large leakages in the economy as money that the government spends is largely paid to foreign companies that repatriate the funds. This means that only a minimal portion of that money has an impact on other areas of the economy such as investment or consumption. Additionally, we see that taxation doesn't greatly hinder the operating of the economy as its multiplier is negative as expected, but it is not greater than 1. This means for every 1 unit increase in tax revenue, GDP reduces by only 0.301. However, the figures hint towards inefficiency and wastefulness in tax collection. This is because of the negative correlation between the lagged value for taxation and the current value for government expenditure

Presentation of Findings on Objective Two

4.2.5 Granger Causality Test

We then continue into the Granger Causality test, which examines if lagged values of one variable help predict other variables in the model. The Granger test hypothesis is as follows:

H_0: X does not Granger Cause Y

H_A: X Granger causes Y

Where the rule of decision is:

If p<0.05: X granger causes Y at the 5% significance level

If p>0.05: X does not granger cause Y at the 5% significance level

Table 2.0: Results from STATA showing the Granger Causality Test

```
. vargranger

  Granger causality Wald tests
```

Equation	Excluded	chi2	df	Prob > chi2
dgdp	dgov	.82659	1	0.363
dgdp	ddtax	.04579	1	0.831
dgdp	ALL	.82799	2	0.661
dgov	dgdp	.00043	1	0.983
dgov	ddtax	1.9504	1	0.163
dgov	ALL	2.1157	2	0.347
ddtax	dgdp	2.9885	1	0.084
ddtax	dgov	2.9268	1	0.087
ddtax	ALL	4.0455	2	0.132

Source: *Primary data calculations from STATA (2023)*

Here we see only the variable for tax revenue helps predict changes in gross domestic product and government expenditure and not the other way round at the 0.1 significance level.

Discussion of Results of Objective Two

This granger causality test starts with a null hypothesis that the excluded variable does not granger cause the value of interest. It makes use of the Wald Test which is a parametric statistical measure to confirm whether a set of independent variables are significant for a model or not. So, we can see that the government expenditure is not statistically significant for the equation of GDP as the chi-square value is 0.826, which results in a p-value of 0.363. This means at the 0.05 significance level we fail to reject the null hypothesis that government expenditure is not significant for the model of GDP. Similarly, the figures for GDP and taxation are low where the chi-square value is 0.045 which results in a p value of 0.831. This means at the 0.05 significance level we fail to reject the null hypothesis that the variable for tax revenue does not granger cause GDP. In sum there is not enough evidence for unidirectional causality between GDP and government expenditure.

Similarly for the next block we can see that for government expenditure there is no evidence of causality between it and GDP. This is because the chi square statistic is very small at 0.00043 where the p-value is 0.983. Similarly for tax revenue and government expenditure, it

can be seen that the chi square statistic is a bit higher at 1.95 resulting in a p-value of 0.163. This means that taxation does not cause government expenditure or is not statistically significant in the model for government expenditure. Thus, there isn't enough evidence to denote causality between the model and the dependent variable which is government expenditure.

Lastly for taxation it can be seen that GDP is not statistically significant at the 5% level but at the 10% level it is significant. So, it can be seen that there is weak causality between GDP and tax revenue where GDP causes changes in taxation to a lesser degree. Similarly, government expenditure determines tax revenue at the 10 % level but at the 5% level the causality is not statistically significant given the p-value of 0.087. However, the whole model is not statistically significant as it resulted in a p-value of 0.132.

These results show that there is not enough evidence to denote unidirectional or bidirectional causality between any of the variables, which means neither of the variables cause variation in the other variables. This may point towards a lack of comprehensive and frequent data recording as there may not be enough data for economic indicators to identify relationships between variables.

Presentation of Finding on Objective Three

4.2.6 Impulse Response Function Analysis

An impulse response function traces the dynamic impact to a system of a shock or change to an input. The image below, which represents our main area of interest analyses how the GDP of a country would react to shocks in government expenditure. Here the impulse response function of government expenditure on GDP is seen, initially it does not have a large effect in the short term but causes larger changes after a few time periods.

Table 2.1: Results from STATA showing the Impulse Reaction function

Source: *Primary data calculations from STATA (2023)*

Whereas the tax revenue, has a larger effect more immediately on GDP and then a considerably larger effect in the long run as shown below. It can be seen that the effect of tax revenue on GDP is outsized compared to that of government expenditure on GDP which echoes multiple findings of the "stronger negative effects of taxation on GDP."[20]

Discussion of Finding on Objective Three

If a one standard deviation shock to GDP and taxation in both of the impulse response functions. The effects of the shock will be visible on other endogenous variables at the next time periods. This is because the VAR system contains only the lags of the other variables. There are no contemporaneous effects, meaning variables are not explained by current period values of other variables. It is noticed in Table 2.1 that the variable for government expenditure and GDP are positively correlated as there is an initial increase that is very small. However, later the IRF converges on zero but some residual shocks persist whose magnitude becomes greater and greater as we continue to 16 lags. It is evident that government expenditure has a small effect on GDP as seen in the third panel in Table 2.1.

[20] (Perotti, 2002)

Chapter 5: Summary, Conclusion, and Recommendations

This section analyses empirical data in accordance with the literature review. By studying the connection between the government expenditure and taxation, which represent fiscal policy, and GDP, it provides insight into the determinants of economic activity.

5.1 Summary of background statistics

The background statistics show the GDP consistently increasing with a percentage of at least 4% consistently increasing, peaking at around 11% in 2006. The year 2020 represents the only where the percentage increase in GDP is 3%, showing the effects of the corona virus pandemic. Over this period GDP increased by an average of 6% throughout the years 2000-2020 and the increase over the years represents an increase of 234%.

Government expenditure paints a similar picture with consistent, though larger increases with an average increase in government expenditure of 15.5%, with highs of 122% and lows of −46.8%. These peaks and troughs in expenditure represent changes in fiscal policy, contractionary for the negative figures and expansionary for the positive figures.

Taxation similarly has consistent increases though more balanced and less varied than government expenditure. Increases averaging 15%, with highs of 21.6% in 2012 are identified and a low of −3.0% in 2020 again representing the impact of the corona virus pandemic.

5.2 Summary of findings on Objective One

The first objective laid out had the purpose of understanding the relationship between fiscal expenditure and GDP. It can be seen this in the VAR equation for GDP, where the coefficient for government expenditure is 0.198 while the coefficient for tax revenue is -0.301. These coefficients can be termed as the multiplier effects. It means that for every 1 unit increase in government expenditure there is a correspondent 0.19 unit increase in GDP. Similarly, for tax revenue for every increase in tax by 1 unit the GDP would reduce by 0.301 because the coefficient is negative. The unit of measurement for the data is in billions of shillings in this case.

These findings tie into findings of other researchers such as (Perotti, 2002), which declares the evidence of stronger negative effects of taxation on GDP and the multipliers are negative. This implies that where increase in tax revenue or average tax rate, the GDP reduces. This is because high taxation slows economic activity as the government purchases fewer goods and

services from the private sector. This is because it decreases individuals' disposable income, likely causing a decrease in spending on goods and services.[21]

Additionally, almost all studies find that output positively respond to increases in government spending. The size of the multiplier depends on key parameters such as the intertemporal elasticity of labour supply and the persistence of the shock to government spending. The null hypothesis is seen to be accurate therefore we accept the null hypothesis that an increase in the government expenditure results in a less than proportional increase in GDP.

5.3 Summary of findings on Objective Two

The granger causality again is an econometric test used to verify the usefulness of one variable to forecast another.[22] A variable is said to Granger-cause another variable if it is helpful in forecasting the other variable, this means that lags of one variable are significant in predicting the future values of another. It is evident that only tax revenue Granger-causes both GDP and government expenditure. On the other hand, government expenditure does not have a statistically significant relationship with GDP. Its lags are neither statistically significant in the equation for another variable, and the past values aren't significant in predicting the future values of another.

Similar to the proposition of consumption smoothing, and rational expectations government expenditure may not have a great impact on GDP. The Granger-Causality results disprove the proposition of the Keynesian branch of economics which declares that fiscal expansions result always in great expansions in GDP. The Granger Causality shed light on the effectiveness of government expenditure in the Ugandan context. Government expenditure does not cause/ spurn GDP, and is thus not an effective way of stimulating economic activity. The null hypothesis is thereby accepted that changes in fiscal policy do not comprehensively explain changes in GDP

5.4 Summary of Findings on Objective Three

The Impulse Reaction Function shows that fiscal shocks have almost no effect on output in Uganda in the short term for both taxation and government spending. This means that pursuing fiscal policy expansions as a means of galvanizing economic activity may not yield immediate results. This is because GDP is not responsive in the short term to shocks in tax and government expenditure. In the long term, the GDP becomes more responsive to changes

[21] (Weinstock, 2021)

[22] (Clower, 2021)

after 5 lags for both tax and government expenditure. However, the one standard deviation shock does not have a large impact on GDP showing that the government often requires large amounts of expenditure in order to impact the business cycle in small ways. This is backed up by the size of the multiplier meaning changes in government fiscal policy are not effective in influencing changes in the business cycle such as saving the economy from recession. In this we also accept the null hypothesis which states that government expenditure is not efficient in influencing the business cycle of an economy.

5.5 Conclusion

An empirical study of the responses to fiscal policy in Uganda between the periods 2000-2020 provides an estimation of the fiscal and tax multipliers, and serves as baseline to predict the behaviour of other sub-Saharan African countries.

The results of the data analysis paint a mixed picture that is partially in line with the conclusions arrived at by (Giavazzi & Pagano, 1990). In this paper they bring forth the proposition that government expenditure takes up space that the private sector would otherwise take. It suggests that the best way to spur economic activity is to scale back the involvement of the government to allow private players to take part. This seen as Fels and Froehlich say that fiscal actions have an impact on expectations. With changes in government's share of GDP the public sector either makes room for the private sector to expand or forces it to shrink. This minimizes the fiscal multiplier as individual's expectations affect the way they react to government actions.

Although statistics have shown that government expenditure is continuously rising, and so is tax revenue and GDP. This reveals a common trait of all sub-Saharan countries in terms of their defining characteristics such as, the narrow tax base as a result of a very large informal sector present. This affects the fiscal and tax multiplier because the informal sector is undertaxed and underregulated so changes in government policy rarely affect them. Consequently, this diminishes the fiscal multiplier as government policy has a relatively smaller effect on the largest part of the economy, the informal sector.

This explains the small multiplier of 0.139 on fiscal expenditure, because there is minimal responsiveness of other factors of output to changes in government expenditure.

5.5 Key Recommendations

This study's findings have important implications for Ugandan fiscal policy and their estimated impacts. The studies policy implications mainly hinge on the effects changes in fiscal policy may have on economic activity.

These policy recommendations reflect the results of the many statistical tests:

Contractionary Fiscal Policy. The imposition of a fiscal contraction would be an ideal policy recommendation for the government of Uganda. This is because with every fiscal contraction two things happen. There is the direct effect of the spending change and the indirect effect on expectations. This study recommends that Uganda pursues continued and persistent fiscal contractions in order to increase the size of Uganda's economy. It is evident that large increases in government expenditure may lead to jumps in economic activity, but that process is very inefficient as it yields a very low multiplier. A fiscal contraction may cause an initial downturn in economic activity, but it will have a benign effect on expectations. However, the public belief plays a large part in whether the contraction will have a positive impact on the economy. If the public senses that government will exert fiscal discipline and reign in errant expenditure that has been running ahead of tax revenue, then it will spur them on to take up the space left behind by the government.

Reduction of Government Borrowing. Government borrowing in Uganda has created a crowding out effect in the credit market. Firstly, government debt and bonds are considered risk free in most countries as the government rarely defaults on debt. Thus, banks and credit agencies prefer to invest in these because they are virtually risk-free. In addition, they have much higher interest rates that they offer such as 16%[23], which is currently quoted for a 10-year bond. This is much higher than different countries yield rates which remain at the sub-10% region. This has a detrimental effect to consumption and investment which rely on borrowing. Large government borrowing has the effect of pushing out and disenfranchising borrowers as it increases interest rates to levels that are not sustainable for individuals and companies. This hinders the economy from harnessing the power of debt to maximize the growth rates. These high interest rates also represent the opportunity cost of lending the money from the banks perspective. The bank considers that they would have gotten a relatively stable and high yield if they had invested it in government bonds, and thus proceed to make interest rates high in order to reflect the high opportunity cost.

5.6 Areas for Further Research

Due to Resource and time Constraints, this study focused on the following objectives, to supplement this study, further research needs to carried out along the following areas. A study should be conducted to measure the leakages within formal income reporting for the GDP of

[23] (World Government Bonds, 2023)

Uganda. This is because as a low-income country monitoring of GDP, and other economic indicators is not always completely accurate. So, in order to estimate the effects of government expenditure it needs to be understood the leakages and gaps in information as a result of having such a large informal sector in the Ugandan economy.

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APPENDIX

APPENDIX A: Data Used in Study in Billion USD.

Year	gdp(in billions)	gov(in billions)	tax(in billions)
2000	37,892.70	1,358.23	999.66
2001	39,856.93	1,604.36	1,088.36
2002	43,337.51	1,820.42	1,222.81
2003	46,142.86	1,959.24	1,418.62
2004	49,283.91	2,133.40	1,650.61
2005	52,404.85	2,326.18	1,935.47
2006	58,056.57	2,567.95	2,264.98
2007	62,940.54	2,731.59	2,652.96
2008	68,421.87	2,746.38	3,204.80
2009	73,075.60	3,193.57	3,737.57
2010	77,195.32	4,477.37	4,252.02
2011	84,445.24	9,971.55	5,158.31
2012	87,685.79	5,302.85	6,272.33
2013	90,830.99	5,318.18	7,220.83
2014	95,469.10	6,148.99	8,065.07
2015	100,421.91	8,200.75	9,761.43
2016	105,223.08	7,392.27	11,042.37
2017	108,518.04	8,691.68	12,431.32
2018	115,358.94	10,405.15	14,067.59
2019	122,786.60	11,590.30	16,130.63
2020	126,410.41	13,286.40	15,639.91