

**SUPERVISOR'S APPROVAL FORM**

The undersigned certifies that they have supervised the student, Ashley Josi's dissertation entitled: **Causal Relationship Between Tax Revenue and Government Expenditure in Zimbabwe (2009-2016)** submitted in partial fulfilment of the requirements of Bachelor of Commerce Economics Honours Degree at the Midlands State University.

**SUPERVISOR'S SIGNATURE** .....

**CHAPTER 1** .....

**CHAPTER 2** .....

**CHAPTER 3** .....

**CHAPTER 4** .....

**CHAPTER 5** .....

**DATE** .....

## APPROVAL FORM

The undersigned certify that they have supervised and recommend to the Midlands State University for acceptance of a research dissertation entitled: **Causal Relationship Between Tax Revenue and Government Expenditure in Zimbabwe (2009-2016)** submitted by **Ashley Josi** in partial fulfilment of the requirements of the Bachelor of Commerce Economics Honours Degree.

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**DECLARATION**

I, **Ashley Josi** do hereby declare that this research represents my own work, and that it has never been previously submitted for a degree at this or any other university.

**Student's signature** ..... **Date** .....

**Supervisor's signature** ..... **Date** .....

## **DISCLAIMER**

This dissertation is submitted in partial fulfilment of the Bachelor of Commerce Economics Honours Degree at Midlands State University. Information presented in this study is completely the author's work; it does not in any way represent the views, ideas and opinions of Midlands State University or of the supervisor. Therefore, they are not held responsible for any errors since they are entirely borne by the author.

## **DEDICATION**

I am dedicating this dissertation to my family and friends.

## **ACKNOWLEDGEMENTS**

Special thanks to Lord the Almighty for the opportunity of a memorable fruitful period, the grace and strength to soldier through my four year period with Midlands State University.

A big heartfelt thank you goes to my immediate supervisor, Mr. Chipunza for his productive criticism, research assistance, dedication and guidance throughout this research. I also express my gratefulness to the whole Economics Department lecturers for their support and nurturing commitments in the field of economics. To Drew and Brighton, I am extremely thankful and indebted to you for your valuable guidance and encouragement. Finally, a token of appreciation goes to the Josi family for the moral support, encouragement and expectation of the best out of me.

## ABSTRACT

*Knowledge on the long run connection between tax revenues and government expenditures are of huge significance for both fiscal and monetary arrangement in developing nation such as Zimbabwe. Two testable hypothesis were investigated which are: does tax revenue Granger-cause government expenditure and does government expenditure Granger-cause tax revenue. The impact of the two hypothesis were researched in the context of the Zimbabwean economy using time series monthly data that ranges from 2009 to 2016. In trying to come up with approach measures that would help resuscitate government's ability to generate revenue for financing its activities, particularly budget deficits, an examination on the direction of causality between tax revenue and government expenditure asked consideration. The research utilized the pairwise Granger Causality test, unit root test amongst other tests and the findings show that there is a long run relationship between the two since the data was stationary at level. Granger Causality test concluded that there exist a bi-directional causal relationship between tax revenue and government expenditure (Fiscal Synchronisation hypothesis). Therefore, policy makers are not supposed to implement standalone policies since the two relate each other in the long run, decisions to be made are supposed to be made simultaneously.*

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## LIST OF ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
AEG	Augmented Engle Granger
ARDL	Autoregressive Distributed Lag
CLRM	Classical Linear Regression Model
GDP	Gross Domestic Product
GE	Government Expenditure
MoFED	Ministry of Finance and Economic Development
OLS	Ordinary Least Square
RBZ	Reserve Bank of Zimbabwe
SADC	Southern African Development Countries
TR	Tax Revenue
VAR	Vector Autoregressive Model
VECM	Vector Auto Correction Model
ZIMRA	Zimbabwe Revenue Authority

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# CHAPTER 1

## INTRODUCTION

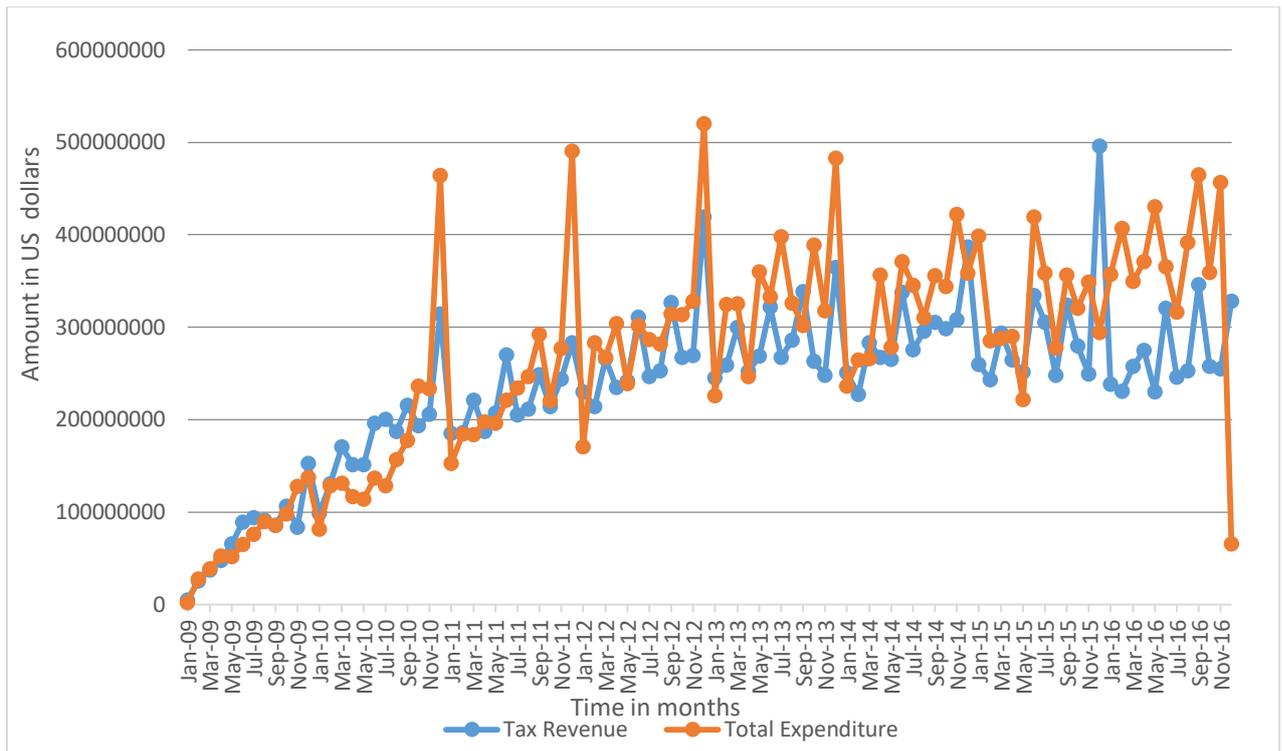
### 1.0 Introduction

It is a policy priority of every country to achieve macroeconomic goals such as sustainable economic growth, price stability, full employment, external balance amongst others. Undoubtedly, the realisation of such goals is not automatic and it requires policy guidance using fiscal and monetary policy instruments (Musa *et al.*, 2014). For the above macroeconomic objectives to be achieved, huge government expenditure financed from government fiscus is required and this entails that public expenditure will sky rocket (Saungweme, 2013). The economy is then regulated by either the central bank or the government through monetary and fiscal policy tools. The issue of tax revenue and government expenditures has picked up interest of the society for policy makers as the two are drivers that can bring/support the economy to its potential level or the achievement of high economic growth. Understanding the causality between government expenditure and government tax revenue is key, particularly for nation like Zimbabwe, which is experiencing persistent spending shortfalls and hindered financial development.

### 1.1 Background of the Study

The situation of facing challenges in meeting current and capital expenditure needs is not a new phenomenon in Zimbabwe as it dates back several years ago and it therefore worsens after the adoption of the multicurrency in 2009. Due to the impositions of sanctions, tax revenue became the major if not only source of income for the Zimbabwean government as such the government has since experienced a budget deficit.

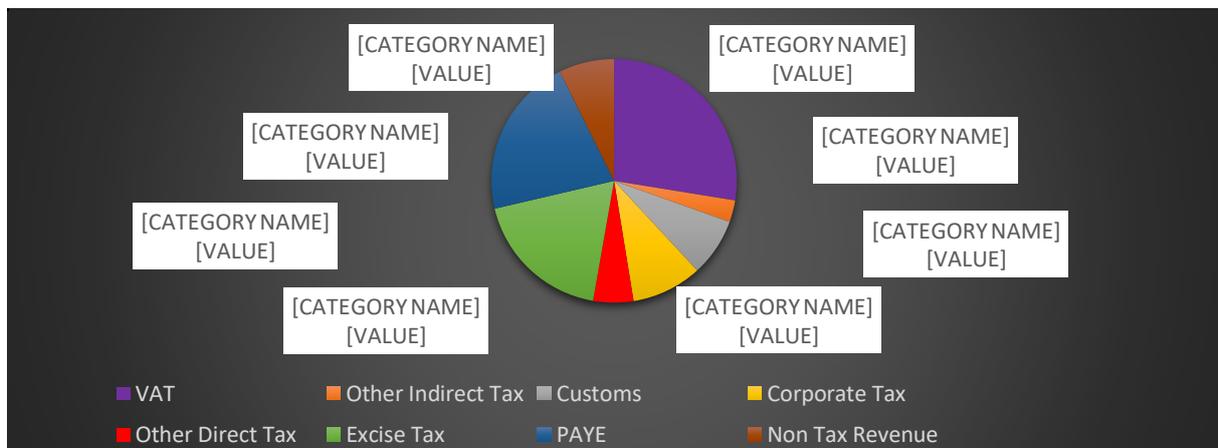
Figure 1.1 below shows tax revenues and government expenditure trends from 2009-2016 and the chart clearly depict that, government expenditure trend is rising at a higher pace and is mostly above the tax revenues that are being collected.



Source: Researcher’s computation using Reserve Bank of Zimbabwe (RBZ) Data.

Figure 1.1: Tax Revenue and Government Expenditure Trend (Jan 2009 – Dec 2016)

With reference to the Ministry of Finance and Economic Development (MoFED) in the Zimbabwe’s National Budget Statement of 2017, 92.7% of the Zimbabwean government revenue is collected from taxation and the remaining 7.3% is non-taxable revenue. Furthermore, the Budget Statement of 2017 goes on to say that the country has a tax/Gross Domestic Product (GDP) ratio of 27.2%, the highest value recorded in the Sub-Saharan Africa. The diagram below shows the Composition of Total Revenues in 2016.

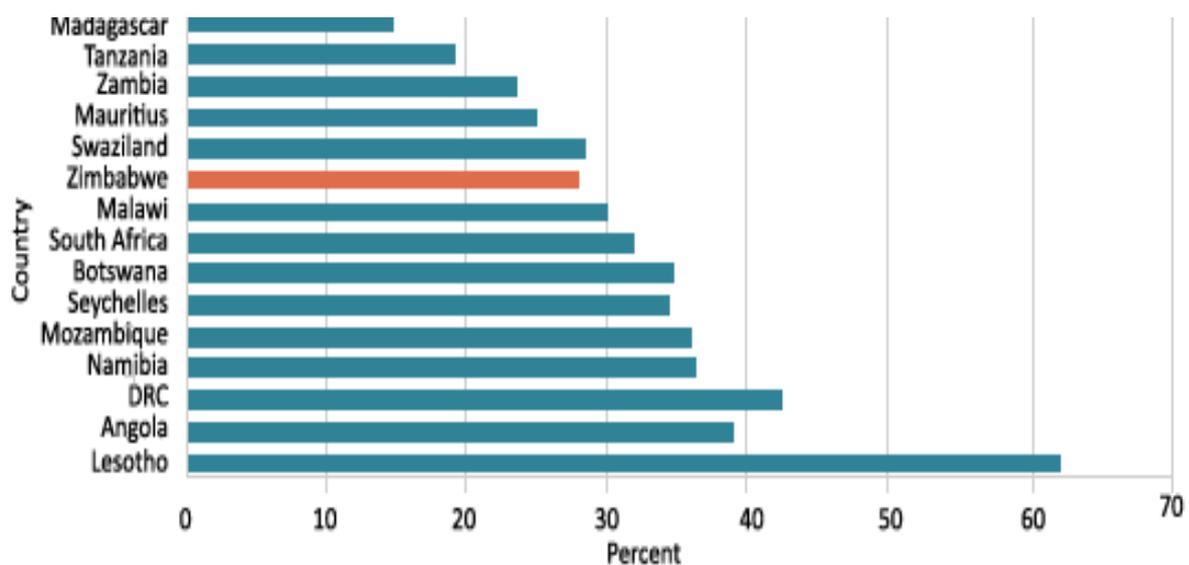


Source: Zimbabwe (2017) National Budget Statements Brief.

Figure 1.2: Composition of Total Revenues in 2016 in Percentages

The inception of the bond notes and coins as surrogate currency facilitated economic adjustments in terms of revenue collection improvements. ZIMRA collected more revenue and they managed to meet set targets. Revenue (tax revenue) is key to developing countries such as Zimbabwe because it provides government the funding they require to back financial advancement and development. With reference to Zimbabwe’s National Budget Statement of 2017, 92.7% of the Zimbabwean government revenue is collected from taxation and the remaining 7.3% is from non-taxable revenue.

Efforts to enhance effectiveness and efficiency of government expenditure requires a strong understanding of expenditure profiles and trends of the government (central and local) on how well they spend and execute their budgets. Zimbabwe’s average public expenditure, expressed as a percentage of the Gross Domestic Product (GDP) lies at 28 percent from 2011 to 2015, a bit lower than the average of 32 percent of countries in Southern African Development Community (Government of Zimbabwe & World Bank, 2017). This is shown in Figure 1.3 below:



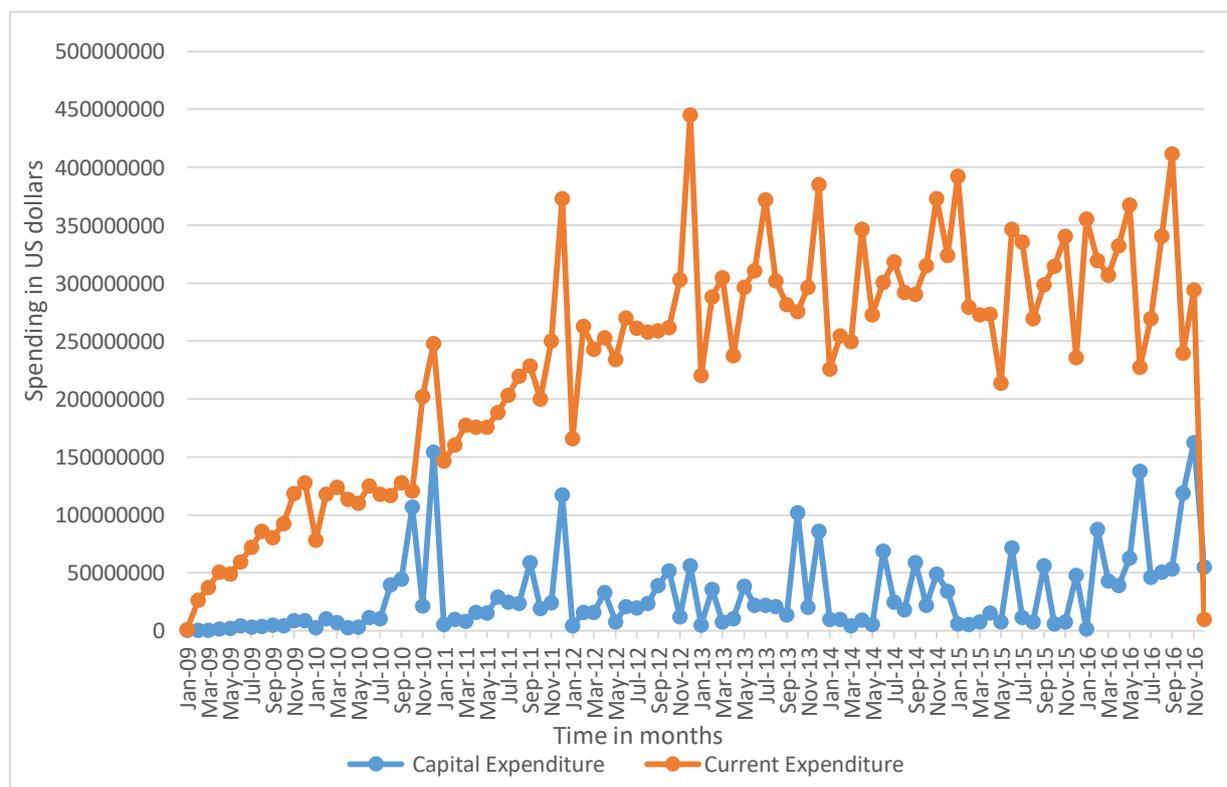
**Source: Zimbabwe Public Expenditure Review 2017 - Government of Zimbabwe & World Bank 2017**

**Figure 1.3 -Total Public Expenditure as a Percentage of Gross Domestic Product for Selected SADC Countries (2011-2015).**

An ability to maintain budget balance or strong budget sustainability means that a country has no deficits behaviour but in the case that the economy has a weak budget sustainability, the government will always change the fiscal structural stance and a good example of countries with weak budget sustainability is Zimbabwe. Abdunnasser (2002) in Puah *et al.*, (2008)

defined budget sustainability as the government’s ability to maintain a certain level of spending, taxation and borrowing patterns and also to modify policies to satisfy long run budget constraints.

Pettinger (2007) stated that for several political motives, budget deficits at all times occur as politicians gain votes not by increasing taxes and cutting expenditures, but rather by doing the opposite. The writer continued by stating several problems associated with budget deficits and some include enlarged government borrowing, bigger interest rate payments, increased aggregate demand which is inflationary, future tax increase and spending cuts amongst other consequences. Sometimes the government can try to justify the deficit by mentioning that they are spending on public utilities and capital investment, the following table show the capital and current expenditure by the Zimbabwean government from 2009 to2016.



Source: Researcher’s computation using RBZ Data.

Table 1.4: Trend of Zimbabwe’s Total Current and Capital Expenditure (2009-2016).

From Table 1.4, it is clear that the Zimbabwean government spend much on current expenditure other than capital expenditure. Little investment in capital expenditure means the government will always depend on borrowing because its spending patterns are not generating more revenues for them to use in the future.

## **1.2 Problem Statement**

There is no cohesion between tax revenue and government expenditure and as a result, the country is always in budget deficits as clearly shown figure 1.1 where government expenditure is rolling above the tax revenue figures. Revenue (tax revenue) is falling short despite being the major if not only source of government expenditure in Zimbabwe. Such imbalances calls for great economic adjustments and one way or the other, the government has to settle the fiscal imbalances using its future surpluses which in turn require an increases in taxes or expenditure cutting. Direction of causality between the two variables remains vital in guiding efforts to improve performance of the economic sector. This gives the foundation of this research were the study is aim at establishing the direction of causality between government expenditure and tax revenue in the long run or to discover how these factors are connect in the case of Zimbabwe.

## **1.3 Objectives of the Study**

- To examine in Zimbabwean context, whether the two variables follows a unidirectional relationship or a bi-directional relationship or they are not related if each of the variables is made a dependent variable.
- To make policy proposition on government expenditure and tax revenue to the policy makers.

## **1.4 Significance of the Study**

Chief amongst all the reasons one can put forward behind studying the causal relationship between government expenditure and tax revenue in Zimbabwe is to understand and share the knowledge and principles surrounding public expenditure. This study is of great importance as it provides conclusions on which one of the hypothesis hold in Zimbabwe between the tax-spend hypothesis, spend-tax hypothesis and the bi-directional causality (fiscal synchronization hypothesis). Researchers such as Saungweme (2013) and Masere & Kaja (2014) undertook their studies on the relationship between government expenditure and revenues: Zimbabwean Case from 1980-2004 and 2010-2012 respectively. However, as time passes by or in the long run, Zimbabwean government spending patterns, economic variables and policies changes and this calls for this study on ascertaining what should take precedence, revenue collection or expenditure given changes that took place since 2009 up to 2016.

In addition to the determination of the causal relationship, the researcher also point out the importance of exploring ways to address fiscal imbalances in policy recommendations. Causal relationship between government expenditure and revenue was also studied in Malaysia, Ghana, and Namibia amongst other countries by Taha and Loganathan (2008), Takumah (2014) and Eita (2008) respectively. Like these researches, the researcher aim to add knowledge to the board of economics, that is, the research and its findings add more evidence and knowledge in the field of economics particularly in the development of the public expenditure theory and such information can then be used by other researchers as point of reference or guidance in areas of their studies.

### **1.5 Study Hypothesis**

Below are testable hypothesis that are going to be examined:

The researcher start with spend-tax hypothesis

**H<sub>0</sub>**: government expenditure does not granger cause tax revenue.

**H<sub>1</sub>**: government expenditure granger causes tax revenue.

Followed by the tax-spend hypothesis

**H<sub>0</sub>**: tax revenue does not granger cause government expenditure.

**H<sub>1</sub>**: tax revenue granger cause government expenditure.

Lastly, the researcher is going test for fiscal synchronisation

**H<sub>0</sub>**: states that there is no bi-directional relationship between tax revenue and government expenditure in Zimbabwe.

**H<sub>1</sub>**: there exist a bi-directional relationship between tax revenue and government expenditure in Zimbabwe.

### **1.6 Research Limitations**

The study make use of data sampled at monthly intervals hence the results cannot be generalised to other sampling intervals. More so, the study does not take into account the effect of changes in prices (inflation) on the way the government spends. Price increase also raise government expenditure.

## **1.7 Study Delimitations**

The research aim at studying the causality between government expenditure and tax revenue for Zimbabwe for the time period which covers 2009 to 2016. There is geographical limitation since it concentrates on Zimbabwe alone. More so, the study is limited to a time frame of four years covering 2009 to 2016.

## **1.8 Organization of the study**

This chapter give a review of the general connection between government expenditure and tax revenue in Zimbabwe. In chapter two, the research produces the essential comprehension of recognition (theoretical studies and as well as empirical studies present in economics literature) towards the relationship of the two variables in the economy. Thereafter, the following chapter is for model specification with relation to how others scholars tested the variables. Further to that, chapter four is for the presentation and interpretation of the results. Lastly, chapter five give a synopsis display of the findings and additionally recommend for additional studies and research conclusion will be drawn.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter will cover the theoretical and empirical literature on causality, the connection between government expenditure and tax revenue. Further to that, on the empirical literature, explorations done by different researchers will also be covered featuring the economies where the hypotheses were pertinent.

#### **2.1 Theoretical Literature Review**

In body of literature, there exist many empirical researches conducted using different approaches and data on the causality. Granger (1969) postulated that sometimes there exist difficulties in deciding causality between two related variables and also whether or not feedback is occurring. However, their results varied in the direction of causality and the strength of relationship between the variables. Nevertheless, whenever a researcher talks about government expenditure and tax revenue, there are some theories that cannot go unmentioned such as the Wagner's Law, Peacock-Wiseman Hypothesis and those around taxation such as the Ability to pay theory, the Benefit theory and the Tax-Spend, Spend-Tax and the Fiscal Synchronisation hypothesis amongst others.

##### **2.1.1 Expenditure Increases with Time: The Wagner's Law and the Peacock and Wiseman Hypothesis**

Akrani (2011) also talked about German economist, Adolph Wagner's Law of increasing state activity. The study stated that as the economy grow and develop over time, activities and functions of the government increases. Adolph Wagner further added that with progressive people, an increase will take place in both the central and local government as they aim to undertake both the old and new functions in the interest of the society/ to meet economic needs of people. As a result, the intensification and expansion of the government activities and function lead to a rise in public expenditure. Generally, it is an expectation that when an economy is forecasting positive growth, government expenditures has the tendency of increasing or rising. With respect to this study, countries such as Zimbabwe are developing countries and their expenditures are of skyrocketing nature.

The Wagner's law hypothesis is applicable in both developing and developed economies but Peacock & Wiseman (1961) queried the study on whether the Wagner's ideas could be applied to all societies at all time and suggested that the time pattern of actual public expenditure growth did not fit well with the Wagner's Law. As a result, Peacock and Wiseman (1961) studied the public expenditure of United Kingdom based on the Wagner's law and they concluded that the Law is still valid but rise in public expenditure greatly depend on revenue collection. More so, they also added that there exist a big gap between people's expectations on public expenditure and tolerance level of taxation. Above all, both Wagner and Peacock and Wiseman conclusively agreed that expenditures has a tendency of rising as time passes by.

### **2.1.2 The Tax-Spend, Spend-Tax and Fiscal Synchronisation Hypothesis**

Tax-Spend, Spend-tax, the Fiscal Synchronisation and no relationship are the distinguished causalities that arise as a result of studying the relationship between tax revenue and government expenditures and each carries itself with its corresponding policy implications. This research is expecting to find one of these results which explained in detail below. Lojanica (2015) postulate that Revenue-Spend hypothesis also known as the Tax-Spend hypothesis which states that any change in government revenue lead to a change in the state expenditures.

The hypothesis simply state that government is supposed to gather the revenue first before spending it. On the study undertaken by Friedman (1978), the limitations of tax limitations cited in Rezaei (2014), the writer stated that there is positive causality between the two variables and this imply that when tax revenue is increasing government expenditure also increase but the end result is budget deficit. This is because the government spend what it receives plus more it can get. Tax cut is a suggested solution to those budget deficits since higher deficits will influence the spending decision of the government (Molausi, 2004) cited in Rezaei (2014). On contrary, Buchanan & Wagner (1978) cited in Rahman & Wadud (2014) highlighted that there exist a negative causality between government revenue and expenditure. This is as a result of unsatisfied taxpayers knowing that any increase in government tax revenue and expenditure will be their burden.

The Spend-Tax hypothesis state that government spending is set first and tax policies and revenues are therefore adjusted to suit or fit the government desired level of expenditure (Rezaei, 2014). Further to the above, Rahman & Wadud (2014) added that the hypothesis was

developed by Peacock and Wiseman (1979) and Barro (1974) and the authors concluded that current rise in state expenditure lead to a rise in government revenue (through raising taxes). The Spend-Tax Hypothesis was also found by Saungweme (2013) who studied for causal relationship between tax revenue and government expenditure and generally, the hypotheses always lead to an increase in taxes to be paid by taxpayers and this will have various consequences and a suggested solution is to reduce government expenditure.

The Fiscal Synchronisation hypothesis was as a result of the works of Melter & Richard (1981) and Musgrave (1966) as specified by Rahman & Wadud (2014). The writer further postulated that the decision on taxation and spending are determined simultaneously and depends on the voter's welfare maximizing demand for public services and attitude towards redistribution function of the state. Therefore improvement and adjustments of both variables is required to cater for problems such as budget deficits.

### **2.1.3 The Ability to Pay Theory**

Ability to pay theory states that country's citizens are supposed to pay taxes according to their ability to pay. Kendrick (1939) further asserted that this will work in close connection to ownership of property, level of expenditure and income basis as measure of abilities to pay. Generally, individuals who are involved in the above mentioned activities are somehow able to pay taxes.

### **2.1.4 The Benefit Theory**

As per the Benefit theory of taxation, the state should collect taxes on people basing on the benefits conferred to them (Majura, n/d).The more the benefits an individual or company gains, the more the taxes they should contribute and the hypothesis was then applied in Tanzania with an opinion that the collected funds can then be used to further develop various facilities and add more to government revenue.

## **2.2 Empirical Literature Review**

The bulk of empirical studies have not yet come to a solid conclusion concerning the relative power of tax revenue and government expenditure on economic fundamentals such as economic growth. Some economists support the tax-spend hypothesis and others support the spend-tax hypothesis. In other words, some say revenue granger-cause spending and other say spending-granger cause tax revenue.

Taking into account the insights of Aisha & Khatoon (2009) from their study on the relationship between government expenditure and tax revenues in Pakistan, they found that there exist a unidirectional causal relationship that runs from government expenditure to tax revenue. Generally, the results support the spend-tax hypothesis. The result that tax revenue does not granger-cause government expenditure in Pakistan is best explained by political economy where main expenditures are determined politically by bureaucratic and military influence because these consumption expenditures pose self and or group interest rather than overall welfare. The results also work in close link with the findings by Saungweme (2013) and the one by Carneiro et al. (2005). They state that the government tend to spend first before raising revenues to cater for the expenditures.

In Zimbabwe, a study on causality between government expenditures and revenues was done by Saungweme (2013) using time series data from 1980 to 2004. The research was done because the researcher stated that there are various changes identified in political, economic and social sectors of the economy since the independence and such changes means that there are also changes in government expenditures, revenues and patterns. Basing on the idea that Zimbabwe experienced a multiple currency era since 2009, Masere & Kaja (2014) who also undertake a similar study came up with different results and they concluded that the two variables are independent, they do not Granger-cause each other.

In comparison, the two studies produced different results because Saungweme (2013) used annual data of 1980 up to 2004, a period before economic changes whilst Masere & Kaja (2014) used monthly data from 2010 to 2012- a small sample data analysis after the multicurrency adaption and thus this marks the differences in results. The Granger causality models (both bivariate and multivariate) were developed to test the tax-spend hypothesis in the country's public finance management system. The findings support the Barro (1974) hypothesis that government expenditure causes revenue and that there exist a long run relationship between government expenditures and total government revenues.

Carneiro *et al.* (2005) undertook a study to empirically establish the temporal causality and long run relationship between government revenues and government expenditures of Guinea-Bissau, a low income economy that is stressed to attain fiscal discipline. The study postulated that understanding the relationship between the two variables shed more light to the government with respect to resource allocation in the economy. The outcomes of the study using time series data from 1981 to 2002 reflected that government expenditures are

determined ahead of government revenues and this support the Spend-Tax hypothesis (a unilateral causal relationship). Carneiro *et al.* (2005) also produced the same results as those that were produced by writers such as Lojanica (2015) and Nwosu & Okafor (2014) although they were studying different nations. In other words, the writer find that the government seems to spend first before raising revenue and as a policy recommendation to the achievement of fiscal sustainability, the government spending should be reconsidered with the view to consider its contribution to resource allocation and their potential to improve growth enhancing spending categories.

Establishing a relationship between government expenditure and revenue remained an important issue for policy formulation especially those that are linked to budget deficits. Using time series data that spans from 1977 to 2011 to investigate the causal relationship between government expenditure and revenue in Namibia, Eita (2008) used Granger causality test through cointegrated vector autoregression (VAR) methods. The paper tests whether government revenue causes government expenditure or whether causality runs from government expenditure to government revenue, and if there is bi-directional causality. The findings show that there is unidirectional relationship that runs from government revenue to government expenditure and this suggests that fiscal imbalances can be mitigated by policies that stimulate government revenue. Generally, Tax-Spend hypothesis supports the theory around public expenditure

In Serbia, Lojanica (2015) investigated the causality between government expenditure and revenue from 2003 to 2013. The writer initiated by adding that continuous budget deficits were the source of instability and they were jeopardizing the running of the Serbian economy. Using monthly time series, the study tested stationarity of the data using the Augmented Dickey Fuller (ADF) and causality between the variables using Autoregressive Distributed Lag (ARDL). Further analysis of the results depicted that the data was stationary after second differencing and there exist a unidirectional causality that runs from government expenditure to government revenue and the results supports the Spend-Tax Hypothesis. The writer suggested that the government was supposed to reduce its spending in the long run given the difficult situations they encounter in tax collections.

Further to the above empirics, a study was done on the dynamic causal relationship between government revenue and government expenditure nexus in Ghana using data that covers the period from 1986 to 2012. The researcher included Gross domestic product as a control

variable in the model. The data properties indicated that the series were stationary after first differencing and the results produced a bi-directional relationship between the two variables both in the short run and long run hence supporting the fiscal synchronisation hypothesis. The result implies that the government has to make their decision simultaneously. As a recommendation in the case of budget deficits, the government can introduce revenue generating policies and also to reduce spending (Takumah, 2014).

Taha & Loganathan (2008) also undertook a study on causality between tax revenue and government expenditure in Malaysia and their results stated that there was bidirectional Granger causality that runs from tax revenue (both direct and indirect taxes) and government expenditure but there is unidirectional relationship that runs from non-tax revenue to government expenditure. Further to the above results, the researcher indicated that reducing tax rates may lead to fall in future government expenditure and non-tax revenue seem to be a less important contributor to the success of country's growth as compared to direct and indirect taxes.

Furthermore, Sarawak is one of the largest states in Malaysia and as a result Puah *et al.* (2011) mentioned that it is prudent plan to study Sarawak's expenditure and revenues. This is because of its great importance in supporting development strategies. Puah *et al.* (2011) make use of time series data that covers the period 1970 to 2008 for their research and the research tested long run relationship between the variables and they found that the variables were related. In addition to the tests done, the Granger causality test revealed that there exist a bi-directional causal relationship between the Sarawak State expenditure and revenue. The results were just as the same as those that were produced by Taha & Loganathan (2008) studying the whole economy of Malaysia. The only difference is that the studies covers the whole country and the other covers a state in the country. The implication of the causal relationship results implies that the state is supposed to make their fiscal decisions simultaneously. With reference to this hypothesis, Meltzer & Richard (1981) suggested that the state select the desired set of spending program along with revenue necessary to finance the expenditure program.

Besides the above mentioned empirics, Aslam (2016) also studied tax revenue and government expenditure in Sri Lanka: An econometric AEG testing approach. The aim of the investigation was based on examining cointegration relationship that exist between government expenditure and tax revenue using time series data ranging from 1950 to 2013.

With tax revenue considered as the independent variable and government expenditure as dependant variable, cointegration technique was employed to check for long run relation between the variables and the error correction mechanism was used to investigate the short run behaviour of tax revenue on government expenditures. The results showed that the variables maintained and sustained a positive long run and short run relationship.

More so, considering a study done by Cheng (1999) on causality between taxes and expenditures: evidence from Latin American countries, the investigation also used cointegration technique and granger causality method to examine the causality between taxes and expenditures. The findings of bidirectional causality in Chile, Panama, Brazil and Peru indicate that taxes and expenditures are jointly determined. Unidirectional causality was also detected running from taxes to expenditures in Columbia, Honduras, the Dominican Republic and Paraguay. In a nutshell, combined, their study strongly rejects the spend-tax hypothesis.

Sriyana (2009) studied the relationship between tax revenue and government expenditure for Indonesia over the time period of 1970-2007. Vector Error Correction Model (VECM) and cointegration technique was used and empirical results suggested that there exist a long run relationship between the two variables but in the short run, there is unidirectional causality relationship which runs from tax revenue to government expenditure. The researcher suggested that the government should effectively and efficiently manage public finance policies in a bid to support tax-spend fiscal policy.

Nwosu & Okafor (2014) took the subject of studying the causal relationship between government expenditure and government revenue to Nigeria. The writers examined government expenditure (both total and disaggregated expenditure which are current and capital expenditures) and total revenue (both total and disaggregated revenue which are oil and non-oil revenue) using time series data which ranges from 1970-2011. According to Nwosu & Okafor (2014), the cointegration tests results show the existence of long run equilibrium relationship between government expenditures and government revenues. Further to above, the Vector Autoregressive (VAR) results clearly showed that government expenditure (capital and current expenditures) have a long run unidirectional with government revenue (oil and non-oil revenue). The causal relationship results showed that there exist a unidirectional relationship between the variables and they support the Spend-Tax hypothesis where government expenditure initiates government revenue. The study concluded its recommendations in a way that an increase in government expenditure without

increase in revenue widen budget deficit and as a result , they are supposed to source more revenue from other sectors like the mining sector and reduction of recurrent expenditure .

It is commonly known that the nature and composition of state expenditure influences economic growth and people’s social welfare. As a result of lacking evidence about the Chinese economy’s revenue and expenditure relationship, Li (2001) also undertook a study under causality between government expenditure and revenue: the evidence of China. The empirical results of the study postulated that there exist a bi-directional relationship between government revenues and expenditures. This result is also supported by the works other writers such as Takumah (2014), Cheng (1999) and others although differences come in terms of countries of study. Any attempt to adjust/change one variable without considering the other or the interdependency between them result in counterproductive.

**Table 1: Empirical Literature Summary Table**

Author(s)	Samples/Country under study	Results
Cheng (1999)	Latin American countries	The findings identified bidirectional causality in Chile, Panama, Brazil and Peru. Unidirectional causality was detected running from taxes to expenditures in Columbia, Honduras, the Dominican Republic and Paraguay although overall the study rejects the spend-tax hypothesis.
Li (2001)	China	There exist a bi-directional relationship between government revenues and expenditures.
Carneiro <i>et al.</i> (2005)	Guinea-Bissau from 1981 to 2002	The writer’s results suggested that the government seems to spend first before raising revenue.
Taha & Loganathan	Malaysia	There was bidirectional granger causality that runs from tax revenue and government

Author(s)	Samples/Country under study	Results
(2008)		expenditure but there is unidirectional relationship that runs from non-tax revenue to government expenditure.
Eita (2008)	Namibia from 1977-2011	There exists a unidirectional relationship that runs from government revenue to government expenditure.
Aisha & Khatoon (2009)	Pakistan from 1972-2007	Unidirectional causal relationship that runs from government expenditure to tax revenue.
Sriyana (2009)	Indonesia over the time period of 1970-2007	There is unidirectional causality relationship which runs from tax revenue to government expenditure
Puah <i>et al.</i> (2011)	Sarawak, Malaysia from the period 1970 to 2008	Granger causality test tested revealed that there exist a bi-directional causal relationship between the Sarawak State expenditure and revenue.
Saungweme (2013)	Zimbabwe from 1980-2004	Government expenditure causes government revenue (unidirectional relationship).
Takumah (2014)	Ghana from 1986-2012	There exist a bi-directional relationship between the two variables both in the short run and long run hence supporting the fiscal synchronisation hypothesis.
Nwosu & Okafor (2014)	Nigeria	The causal relationship results showed that there exist a unidirectional relationship between the variables and they support the Spend-Tax hypothesis where government expenditure

Author(s)	Samples/Country under study	Results
		initiate government revenue.
Lojanica (2015)	Serbia from 2003-2013	There exist a unidirectional causality that runs from government expenditure to government revenue.
Aslam (2016)	Sri Lanka from 1950-2013	The results showed that the variables maintained and sustained a positive long run and short run relationship.

### 2.3 Conclusion

Generally, the above empirics have shown mixed sentiments between the two variables, government expenditure and government tax although a previously Zimbabwean based study by Saungweme (2013) supports the spend-tax hypothesis. However, as time passes by, all those government adjustments can therefore push a change in the way the economy is supposed to implement their policies. Diebold (2017) stated that cause come first before effect and this simply means that from all the mixed sentiments different authors produces, theory the general theory state that because of spending precedes taxation (Watson, 2017). Both variables have significant positive impact on economic growth but they only differ in strength and magnitudes.

## CHAPTER 3

### METHODOLOGY

### 3.0 Introduction

This research plans to take a look at the causality between government expenditure and tax revenue in Zimbabwe using monthly data from 2013 up to 2016 giving the researcher 95 time series observations. The tests that the researcher incorporates include VAR models, Granger Causality test, Error Correction Model and Cointegration. This part will additionally clarify the types of information utilized and the regression models that were adapted and used in the study. Moreover, this chapter gives an overview of the regression difficulties that may have affected the research results. There are a number of causality tests that have been used by researchers in the scholarly society and these incorporate VAR models, Granger Causality test, Error Correction Model and Cointegration. Since the researcher is interested in long run relationship between the variables, a cointegration model will be used.

### 3.1 Model Specification

The relationship or connection between tax revenue and government expenditure can either run from government expenditure to tax revenue or from tax revenue to government expenditure and this is perfectly denoted by the following two functional forms which are:

- $GE = f(TR)$
- $TR = f(GE)$

To define the causality between government expenditure and tax revenue, a Granger causality econometric model adapted by the investigator is the one in Gujarati (2004) and the test involves estimating the following pair of unrestricted regressions equations:

$$GE_t = \sum_{k=1}^n \beta_k TR_{t-k} + \sum_{i=1}^n \alpha_i GE_{t-i} + W_t \dots \dots \dots (i)$$

$$TR_t = \sum_{k=1}^n \gamma_k TR_{t-k} + \sum_{i=1}^n \delta_i GE_{t-i} + Z_t \dots \dots \dots (ii)$$

Where  $GE_t$  is Government Expenditure and  $TR_t$  is Tax Revenue, the two variables to be tested. Regression equation  $i$  stand for Government expenditure that is linked to the previous values of itself ( $GE_{t-i}$ ) and those of Tax Revenue ( $TR_{t-k}$ ). Equation  $ii$  follows the same meaning but with respect to Tax Revenue. Variables such as  $t$  denote the time period and  $W_t$

and  $Z_t$  represent error terms which are assumed to be uncorrelated, normally distributed and they are also identical.

## **3.2 Justification of the Variables**

### **3.2.1 Government Expenditure (GE)**

Government expenditure involves the purchase of goods and services, which includes public consumption and investment, and transfer payments consisting of capital and income transfers (United Nations, 2004 and bbamantra, 2017). The variable was measured in US Dollars (US\$). It was used by several researchers and their findings produced mixed sentiments. This also work in close connection with works done by Saungweme (2013) and Aisha & Khaton (2009), the writers used government expenditure and revenue to test for causal relationship and the results showed a unidirectional relationship which supports spend-tax hypothesis. Therefore, a unidirectional causal relationship is expected from this study.

### **3.2.2 Tax Revenue (TR)**

Tax revenue refers to compulsory contributions and transfers in form of fines, penalties amongst others to the central government for public purposes (Dzingirai & Tambudzai, 2014). Zimbabwean government tax revenue incorporates contributions from both indirect and direct tax revenue collections by boards like Zimbabwe Revenue Authority and the variable is therefore measured in US Dollars (US\$). The variable was also used by several writers and findings by writers like Cheng (1999) and Sriyana (2009) supported the tax-spend. Tax revenue growth values includes variables such as Value added tax, Pay as you earn, customs fees amongst others but it excludes non-tax revenue to suit the purpose of the study.

## **3.3 Granger Causality Tests**

To analyse the direction of causality between government expenditure and tax revenue, the researcher made use of the Granger Causality Test which was put forward by Granger (1986) and Engle and Granger (1987). The test is widely used in various areas because it's simple and clearly, its test results helps to determine the direction of causality and the relations that exists amongst the variables under the study. Below are some of the findings that the Granger Causality test produces:

- **Unidirectional Causality**

This result implies the impact of one variable on the other. This suggest that an adjustment in government expenditure granger causes a change tax revenue or a change in tax revenue granger cause an adjustment in government expenditure.

- **Bi-directional Causality**

Feedback causality proposes that the causality is two ways, at the end of the day it is bi-causal. The interactions suggest that government expenditure has an effect on tax revenue and at the same time tax revenue influences government expenditure.

- **No Causality**

After testing for causality, it is also feasible for the investigator not to locate any causal connection between government expenditure and tax revenue. In the case that causality doesn't exist, it implies that the factors are not related.

### **3.4 Diagnostic Tests**

#### **3.4.1 Optimal Lag length Determination**

It is always key and important to correctly determine correct lag length and the lag length that is used in a study should be determined before the causality test is done because the Granger causality test findings are also based on the lag length selected. Having a true lag length will avoid problems of inefficient and inconsistence estimates, for a higher order lag length: there will be over estimation of parameter values and increased forecasting errors and finally, for lower order lag length: there will be problems of underestimations of coefficients and it generates auto correlated errors (Dzingirai & Tambudzai, 2014).

Amongst several models that are used to define true lag length, there is Schwarz (SIC) and Akaike Information Criterion (AIC). However the researcher importantly selected Akaike Information Criterion (AIC) because it's good for studies with large sample size ( $n > 30$ ) and it also eliminates auto correlation of error terms. More so, to establish the casual connection between government expenditure and tax revenue in Zimbabwe, it is of great importance to run other diagnostic tests such as co-integration and unit root test to make sure that the variables meet the requirements of the Classical Linear Regression Model (CLRM) assumptions.

#### **3.4.2 Unit Root Test**

Gujarati (2004) postulated that several time series techniques can be used in order to model dynamic relationship between time series variables and therefore stationarity or the random walk of a model is tested using the Unit Root Test. Non-stationarity of variables propels testing for stationarity using the unit root test and it is of great importance because it avoids spurious regression of variables. A series is stationary when its mean variance and covariance is constant over a time period. The Dickey Fuller and the Augmented Dickey Fuller (ADF) tests are then used to test for stationarity of variables. Further to the above, a series is stationary when the Augmented Dickey Fuller (ADF) test statistics are greater than the critical values and this statement depicts the alternative hypothesis ( $H_1$ ). As for the null hypothesis ( $H_0$ ), ADF statistics are less than the critical values and the conclusion is always that the series is non-stationary (Gujarati, 2004). In the case that the dataset contains structural breaks or has some missing observations, the Phillips Perron approach put forward by Phillips and Perron (1988) is used to test for stationarity because in this essence, it yields better results than the Augmented Dickey Fuller approach. In this study, the ADF test was used because there are no missing gaps or structural breaks for the dataset.

### **3.4.3 Co-integration Test**

With reference to Gujarati (2004) the purpose of co-integration is to define the long run relationship between variables in a model that is, does Tax Revenue and Government Expenditure have long run relationship or there are some disequilibrium in the short run. The researcher will make use of the Johansen Co-integration to determine whether the variables are co-integrated one way or the other.

The null hypothesis ( $H_0$ ) for the test states that there exist co-integration between the variables to be tested against the alternative hypothesis ( $H_1$ ) which states that there is no co-integration. On the other hand, rejection of the null hypothesis ( $H_0$ ) means there is need to come up with an adjustment model for error correction of the deviations from the long run relations. Co-integration technique to be conducted through the use of the Engle and Granger (1987) and the Error Correction Model (ECM) should also be estimated for first difference of the co-integrated series.

### **3.4.4 Heteroscedasticity Test**

Heteroscedasticity test involves a situation where the error variance changes with time and it is tested using the Breusch-Pagan –Godfrey test. The null hypothesis ( $H_0$ ) states that there is no heteroscedasticity (there is homoscedasticity) tested against the alternative hypothesis ( $H_1$ ) which state that there is heteroscedasticity. The writer therefore rejects the null hypothesis if

the Probability-Value is less than 5% and appreciates the alternative hypothesis and concluded there is heteroscedasticity. In the case of P-value greater 5%, the writer does not reject  $H_0$  and conclude that there is no heteroscedasticity in the model (Gujarati, 2004).

### **3.4.5 Autocorrelation Test**

The regression assumption state that errors are independent and in the case of dependency, assumption violation, this means that there exist correlation over time and such correlation is called autocorrelation. In the case that autocorrelation is present, Ordinary Least Square (OLS) estimators are unbiased and consistent, though they have a minimum variance which concludes that they are not effective, the Breusch-Godfrey test is a suitable way to deal with when examining whether the presumption has been violated since it incorporate non-stochastic relapses. The hypothesis test follows that:

$H_0$ : Autocorrelation is not present

$H_1$ : Autocorrelation is present

Decision: if the probability values are less than 0.05 we reject  $H_0$  and conclude that the model suffers from autocorrelation.

### **3.5 Data Types and Sources**

The data type that was used for the study is monthly time series data that covers the period of 2013 up to 2016. The data was sourced from Reserve Bank of Zimbabwe online internet website publication database, Zimbabwe Revenue Authority (ZIMRA) receipts drafts, ZIMRA monthly and annual publications downloaded from their online internet website. Secondary data was used. Its advantages are that the information is readily available and this saves time, more reliable and less biased than primary data which is biased towards respondents.

### **3.6 Conclusion**

This section has defined the diagnostic tests to be covered to make sure that the findings attained are reliable. It further specify the data type used and its sources. The model used in the investigation was obtained from Gujarati (2004). The next chapter will be presenting and interpreting the study findings.

## CHAPTER 4

### PRESENTATION AND INTERPRETATION OF RESULTS

#### 4.0 Introduction

The major aim of this research is to analyse, find and present the causality between tax revenue and government revenue in Zimbabwe from 2009 to 2016 although the long run and short run relationship between the variables is also of great importance. This chapter interprets the results after the diagnostic tests using an econometric package E-Views 10.

#### 4.1 Lag Length determination values

Lag	0	1	2
Akaike AIC Values	39.04483	38.17049***	38.27769
Schwarz Criterion Values	39.09825	38.27802***	38.38591
Hannan-Quinn Values	39.06643	38.21394***	38.32140

**Note:** \*\*\* means the smallest value under lag length determination on various techniques.

**Source:** E-Views

Table 4.1 displays that both the Akaike AIC, Schwarz Criterion and Hannan-Quinn lowest value is at the first (1<sup>st</sup>) lag and as a result, the researcher is going to use lag one for determining the direction of the Granger causality. For results in greater details, refer to appendix 1.

#### 4.2 Unit Root Test

Table 4.2 below shows Unit Root Tests Results

Variable	Augmented Dickey Fuller Test Statistic	Critical Values		The Order of Integration
<b>EX</b>	-7.231107***	1%	-4.057528	<b>I(0)</b>
		5%	-3.457803	
		10%	-3.154859	
<b>RV</b>	-6.902833***	1%	-4.057528	<b>I(0)</b>

		5%	-3.457808	
		10%	-3.154859	

**Note:** \*\*\* represents the rejection of  $H_0$  at 1%, 5% and the 10% levels of confidence interval.

**Source:** E-Views

With reference to Gujarati (2004), non-stationary time series can be altered over time by a skill of differencing and as a result of differencing, it will then turn into differenced time series. The unit root tests results reveal that both Government Expenditure (GE) and Tax Revenue (RE) are stationary at level meaning that there is no need to difference them and they are integrated of order zero (I0). The implication of the result on Cointegration suggests that there exist a long run relationship between Tax Revenue and Government Expenditure. The absolute value of the ADF Test Statistic is more than the estimated test critical values at all levels of significance (1%, 5% and 10%) in both GE and RV.

### 4.3 Heteroscedasticity

**Table 4.3: Heteroscedasticity test results.**

Hypothesis	Decision Rule	Probability-Value (F)	Conclusion
$H_0$ : error terms are homoscedastic.	Reject $H_0$ if Probability-Value is greater than F-Probability-Value	0.5250	We do not reject $H_0$ since 5% is less than P-Value (F) and we can therefore conclude that the error terms are homoscedastic.

**Source:** E-Views

Table 4.3 clearly showed that the error terms are not suffering from heteroscedasticity meaning they are homoscedastic. This then entails that we do not reject the null hypothesis at 5% level of significance. For in-depth information about the test, refer to appendix 4.

### 4.4 Autocorrelation Test Results

To test and interpret the results of the autocorrelation, the researcher makes use of the Breusch-Godfrey Serial-Correlation-LM Test and the table below show the findings from the tests.

**Table 4.4: Results from Autocorrelation Test.**

Hypothesis	The Decision Rule	Chi-Square Probability Value	Probability -Value (F)	Conclusion
H <sub>0</sub> : No Autocorrelation	Reject the H <sub>0</sub> if the probability value is greater than the F-probability-value.	0.5588	0.5657	The test failed to reject H <sub>0</sub> since both probability values are greater than 5%.

**Source: E-Views**

With reference to Table 4.4, the Breusch-Godfrey Serial-Connection-LM Test is the test that the researcher used to test relationship between error terms. The results showed that the probability value of 5% is less than the Probability-Value (F) and as a result, we can conclude that we do not reject H<sub>0</sub> (there is no autocorrelation).

**4.5 The Granger Causality Results**

To determine the direction of causality between tax revenues and government expenditures is measured using the Granger causality and to fulfil the objective of determining the direction of causality, E-Views 10 software package was used. The table below depicts the findings.

**Table 4.5: the Pair wise Granger Causality Test**

Null Hypothesis	Observations	F-Statistic	Probability	Decision
Tax revenue (TR) does not Granger Cause Government Expenditure (GE)	95	13.1772	0.0005	Reject the Null Hypothesis

Government Expenditure (GE) does not Granger Cause Tax Revenue (TR)	95	12.5621	0.0006	Reject the Null Hypothesis
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**Source: E-Views**

According to the results depicted in Table 4.5, the  $H_0$  in both Granger Causality tests (Tax Revenue does not Granger Cause Government Expenditure and that which states Government Expenditure does not Granger Cause Tax Revenue) were rejected at five percent probability level because the conclusion states that reject  $H_0$  if the probability value from the test is less than 5%. More so, the  $H_0$  is also rejected at 99% level of significance. This implies that the researcher failed to reject all the alternative hypothesis which are Tax Revenue does Granger Cause Government Expenditure and that which states Government Expenditure does Granger Cause Tax Revenue. This is because all the probabilities from both tests were less than 5% as shown in table 4.5. Failure to reject the alternative hypothesis in both tests means that there exist a bi-directional causality between Tax Revenue and Government Expenditure. The findings work in support of the works done by other researchers like Cheng (1999) who undertook a study on causal relationship between tax revenue and government expenditure of Latin American countries and find that there exist a bi-directional causality in Chile, Panama, Brazil and Peru. The similar causal relationship results using same variables, tax revenue and government expenditure were produced by Li (2001) for the Republic of China, Takumah (2004) for Ghana and Taha & Loganathan (2008) for Malaysia.

This research's findings differ from previous studies that were done in Zimbabwe by Saungweme (2013) and Masere & Kaja (2014). All the studies produced mixed sentiments. Using annual data from 1980 to 2004, Saungweme (2013) find that there exist a unidirectional relationship between the variables which runs from government expenditure to tax revenue (the results supported Spend-Tax Hypothesis). Masere & Kaja (2014) research findings stated that there is independence between tax revenue and government expenditure. This simply means that using 2010 to 2012 monthly time series data, the researchers concluded that there is no causality between the two variables.

#### **4.6 Conclusion**

The study results provided a conclusion that there exists a bi-directional causal relationship between tax revenue and government expenditure in Zimbabwe from January 2009 to December 2016. The implication of these states that any change in tax revenue is going to affect government expenditure and at the same time, a change in government expenditure does affect tax revenues. The following chapter is going to look at the summary, conclusions and policy recommendations.

## **CHAPTER 5**

### **SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS**

#### **5.0 Introduction**

This chapter summarise the research results and it is going to pinpoint the implications of the results to the Fiscal sector of the Zimbabwean economy. Moreover, this segment is going to conclude whether the research objectives were fulfilled and seeks to advice on possible strategy proposals. Lastly, it is also going to highlight possible areas for further studies that other researchers can undertake.

#### **5.1 Summary of the Study**

The exploration was done to see the causal relationship between tax revenue and government expenditure in Zimbabwe using monthly time series data from 2009 to 2016. The research presented chapter one where the background of the study, problem statement and objectives of the study was given. Chapter two provided the theoretical background and literature about the two variables and as well as the reviewing of the empirical explorations. Specification of the model that was used and the diagnostic tests to be covered were in great detail explained in chapter three. To test the causal relationship between the two variables, tax revenue and government expenditure, Granger Causality test was used. The analysis of the outcomes was based on the methodology used. In chapter four, the analysis and presentation of the causality test showed that there exists a bi-directional causal relationship between tax revenue and government expenditures. The results support the Fiscal Synchronisation hypothesis. Outline (summary) of the research, policy proposals and recommendations were therefore presented in chapter five.

#### **5.2 Conclusion**

Presentation of the results in chapter four attracted the following conclusions. Firstly, to determine the direction of causality, Akaike AIC first lag was used and from the pairwise Granger causality test, there exist a bi-directional causal relationship between the two variables in Zimbabwe since 2009 to 2016. The time series data of both tax revenue and government expenditures was stationary at level and this means that the variables have long run relationship.

### **5.3 Policy Recommendations**

The result of the study clearly showed that there is interdependence between the variables and the Zimbabwean government is supposed to make their tax revenue and government expenditures decision simultaneously. In an aim to control the issue of budget deficits the economy is persistently facing, the Zimbabwean government should try to increase tax revenue collection through ways such as revisiting and adjustment of personal income tax, companies income tax, introduction of net wealth tax, making easy procedures in tax registration and payments, tackling of corruption in all levels amongst other ways and at the same time reducing government expenditures. They can reduce government expenditure through freezing salaries and wages of employees, stop using emergency for fund loopholes, making government transactions and contracts online for follow up and transparency amongst others. For every policy they formulate, the implementation of the policies is not supposed to be done without considering the impacts on both tax revenue and government expenditure. More so, fiscal synchronisation hypothesis might make it difficult for the government to control budget deficits because the government cannot increase tax revenue and reduce its spending at the same time.

### **5.4 Future Studies Suggestions**

This study makes use of Bivariate Granger causality to test for the relationship between tax revenue and government expenditures of Zimbabwe. As a result, future studies can therefore incorporate Multivariate Granger causality adding more variables such as Non-Tax Revenue. This will then enable the policy makers to understand relationships that exist between the variables and they will avoid making generalised policies and decisions.

Apart from the above, future studies can also try to consider the impact of other factors such as changes in price levels on the relationship between the government's tax revenues and government expenditures.

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## APPENDICES

### Appendix 1: The Data Set

Period (month and year)	Tax Revenues in million US dollars	Government Expenditures in million US dollars
Jan-09	4720122	1809368
Feb-09	25470461.67	27247383
Mar-09	37032590.35	38390172
Apr-09	47783244.41	52365065.8
May-09	65529179.77	51767675
Jun-09	88634383.87	64602903
Jul-09	93696201.65	76078560
Aug-09	91285876.74	89959521
Sep-09	85583598.15	85740152
Oct-09	106396304.1	97623708
Nov-09	83752431.4	127672278
Dec-09	152678056	137022526
Jan-10	98685397.09	81477146
Feb-10	130277762.5	128499503
Mar-10	170804560.7	131071254
Apr-10	151003501.1	116693542
May-10	151215641	113817992
Jun-10	196380951	136748872
Jul-10	199927516.9	128247892
Aug-10	187386995.4	156972350
Sep-10	215555287.4	177693239

<b>Period (month and year)</b>	<b>Tax Revenues in million US dollars</b>	<b>Government Expenditures in million US dollars</b>
Oct-10	193470808.1	236488851
Nov-10	205461428.9	233676400
Dec-10	314420179.6	464562055
Jan-11	184857580.4	152383458.6
Feb-11	185866062.5	184497083
Mar-11	221304627.8	183675059.3
Apr-11	186862748.2	197738155.6
May-11	206847582.6	196119270.1
Jun-11	269790023.6	221132111.4
Jul-11	205085687.2	234000734.1
Aug-11	211398484	246587785.6
Sep-11	248556050.9	292477274.4
Oct-11	213935467.6	220061580.9
Nov-11	243721905.3	276747001.3
Dec-11	282924118.2	490428390.5
Jan-12	229690256.7	170398780.5
Feb-12	214059987.2	282820041.7
Mar-12	265899181.9	267473974.4
Apr-12	234843928.2	304206365.8
May-12	241839337.7	239068007.7
Jun-12	310795809.5	301485585.1
Jul-12	246328270.7	286569945.5
Aug-12	252997797.8	281707293.7
Sep-12	326441869.2	314019817.5
Oct-12	267405273.4	313743771.3
Nov-12	269058164	327847647.7
Dec-12	419564469	519894574.2
Jan-13	245291304.7	225474909.8
Feb-13	258828013.1	324553003.4
Mar-13	299951221.4	325415007.8
Apr-13	251986599.6	246216608.7

<b>Period (month and year)</b>	<b>Tax Revenues in million US dollars</b>	<b>Government Expenditures in million US dollars</b>
May-13	268800925.7	359639611
Jun-13	321893080	333249685
Jul-13	266941568.6	397734582.7
Aug-13	286147936.5	326281063.9
Sep-13	338740994.8	302063941.6
Oct-13	263013004.3	388728319.7
Nov-13	247610090.6	317386466.6
Dec-13	364851624.5	483030894
Jan-14	250739698.2	235900928.3
Feb-14	227172080.8	264829673
Mar-14	283158397.2	265720379.5
Apr-14	267595109.1	356411831.3
May-14	264868269.2	278282999.7
Jun-14	337835037.8	371011405
Jul-14	275458868.2	345444310.5
Aug-14	295504562.6	310209094.1
Sep-14	305031903.1	355402811.5
Oct-14	298389948.1	344151272.8
Nov-14	307910576.6	422331101.3
Dec-14	386924226.9	358418774.8
Jan-15	259574562	398905557
Feb-15	243242950.3	285347927.7
Mar-15	293234075.4	287716252.5
Apr-15	264398309.2	289934040.8
May-15	251705765	221653505.2
Jun-15	334066600.4	419504993.5
Jul-15	305003451	358829325.6
Aug-15	248211253.4	277515289.6
Sep-15	323758342.6	356723730.9
Oct-15	279840226.3	320690224.3
Nov-15	249146408	348760311.8

<b>Period (month and year)</b>	<b>Tax Revenues in million US dollars</b>	<b>Government Expenditures in million US dollars</b>
Dec-15	495876026.6	294492480.5
Jan-16	238312476	357411689.2
Feb-16	230464081.8	407170448.2
Mar-16	257628152.4	349772676.8
Apr-16	274757717.8	371095227.2
May-16	229871043.9	430508207.8
Jun-16	320830302.4	365500530.8
Jul-16	245702898.9	316430230.8
Aug-16	252879465.2	391536629.9
Sep-16	346328964.2	465247723.9
Oct-16	257570528.2	358932641.9
Nov-16	254901365.3	456793771.1
Dec-16	327837170.6	65553662.94

## Appendix 2: Optimal lag length determination

Dependent Variable: RV  
 Method: Least Squares  
 Date: 04/13/18 Time: 10:51  
 Sample: 2009M01 2016M12  
 Included observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	84313013	12958020	6.506628	0.0000
EX	0.572097	0.044406	12.88331	0.0000

R-squared	0.638433	Mean dependent var	2.37E+08
Adjusted R-squared	0.634587	S.D. dependent var	85365837
S.E. of regression	51603159	Akaike info criterion	38.37668
Sum squared resid	2.50E+17	Schwarz criterion	38.43010
Log likelihood	-1840.081	Hannan-Quinn criter.	38.39827
F-statistic	165.9796	Durbin-Watson stat	1.907824
Prob(F-statistic)	0.000000		

Dependent Variable: RV  
 Method: Least Squares  
 Date: 04/13/18 Time: 10:54  
 Sample (adjusted): 2009M02 2016M12  
 Included observations: 95 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	63763505	14260948	4.471197	0.0000
EX	0.385124	0.056412	6.827029	0.0000
RV(-1)	0.033981	0.108195	0.314074	0.7542
EX(-1)	0.237239	0.074476	3.185435	0.0020

R-squared	0.697174	Mean dependent var	2.39E+08
Adjusted R-squared	0.687191	S.D. dependent var	82374816
S.E. of regression	46071665	Akaike info criterion	38.17049
Sum squared resid	1.93E+17	Schwarz criterion	38.27802
Log likelihood	-1809.098	Hannan-Quinn criter.	38.21394
F-statistic	69.83436	Durbin-Watson stat	2.028425
Prob(F-statistic)	0.000000		

Dependent Variable: RV  
 Method: Least Squares  
 Date: 04/13/18 Time: 12:29  
 Sample (adjusted): 2009M03 2016M12  
 Included observations: 94 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	72813553	15139050	4.809651	0.0000
EX	0.391071	0.064057	6.105082	0.0000
RV(-2)	0.171861	0.114195	1.504981	0.1358
EX(-2)	0.082029	0.083721	0.979784	0.3298

R-squared	0.640731	Mean dependent var	2.42E+08
Adjusted R-squared	0.628755	S.D. dependent var	79760621
S.E. of regression	48598048	Akaike info criterion	38.27769
Sum squared resid	2.13E+17	Schwarz criterion	38.38591
Log likelihood	-1795.051	Hannan-Quinn criter.	38.32140
F-statistic	53.50281	Durbin-Watson stat	2.221937
Prob(F-statistic)	0.000000		

### Appendix 3: Unit root testing using the Augmented Dickey Fuller

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

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-6.902833</b>	<b>0.0000</b>
Test critical values:		
1% level	-4.057528	
5% level	-3.457808	
10% level	-3.154859	

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

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(RV)  
 Method: Least Squares  
 Date: 04/13/18 Time: 12:37  
 Sample (adjusted): 2009M02 2016M12  
 Included observations: 95 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RV(-1)	-0.656237	0.095068	-6.902833	0.0000
C	92075015	16549575	5.563588	0.0000
@TREND("2009M01")	1377570.	294149.5	4.683232	0.0000

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

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-7.231107</b>	<b>0.0000</b>
Test critical values:		
1% level	-4.057528	
5% level	-3.457808	
10% level	-3.154859	

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

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(EX)  
 Method: Least Squares  
 Date: 04/13/18 Time: 12:40  
 Sample (adjusted): 2009M02 2016M12  
 Included observations: 95 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX(-1)	-0.826286	0.114268	-7.231107	0.0000
C	1.04E+08	20580954	5.037683	0.0000
@TREND("2009M01")	2480026.	489235.4	5.069188	0.0000

## Appendix 4: Heteroscedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey  
Null hypothesis: Homoskedasticity

F-statistic	0.407156	Prob. F(1,94)	0.5250
Obs*R-squared	0.414026	Prob. Chi-Square(1)	0.5199
Scaled explained SS	1.620546	Prob. Chi-Square(1)	0.2030

Test Equation:  
Dependent Variable: RESID^2  
Method: Least Squares  
Date: 04/13/18 Time: 05:50  
Sample: 2009M01 2016M12  
Included observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.71E+15	1.89E+15	1.965072	0.0524
EX	-4125387.	6465233.	-0.638088	0.5250
R-squared	0.004313	Mean dependent var		2.61E+15
Adjusted R-squared	-0.006280	S.D. dependent var		7.49E+15
S.E. of regression	7.51E+15	Akaike info criterion		75.96933
Sum squared resid	5.31E+33	Schwarz criterion		76.02276
Log likelihood	-3644.528	Hannan-Quinn criter.		75.99093
F-statistic	0.407156	Durbin-Watson stat		1.578468
Prob(F-statistic)	0.524968			

## Appendix 5: Autocorrelation

Breusch-Godfrey Serial Correlation LM Test:  
Null hypothesis: No serial correlation at up to 1 lag

F-statistic	0.332283	Prob. F(1,93)	0.5657
Obs*R-squared	0.341781	Prob. Chi-Square(1)	0.5588

Test Equation:  
Dependent Variable: RESID  
Method: Least Squares  
Date: 04/13/18 Time: 15:13  
Sample: 2009M01 2016M12  
Included observations: 96  
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2362607.	13634890	-0.173277	0.8628
EX	0.008307	0.046837	0.177359	0.8596
RESID(-1)	-0.068888	0.119506	-0.576440	0.5657
R-squared	0.003560	Mean dependent var		-9.62E-09
Adjusted R-squared	-0.017869	S.D. dependent var		51330845
S.E. of regression	51787420	Akaike info criterion		38.39394
Sum squared resid	2.49E+17	Schwarz criterion		38.47408
Log likelihood	-1839.909	Hannan-Quinn criter.		38.42634
F-statistic	0.166142	Durbin-Watson stat		1.814006
Prob(F-statistic)	0.847177			

## Appendix 6: The Granger-Causality Test

Pairwise Granger Causality Tests

Date: 04/13/18 Time: 16:18

Sample: 2009M01 2016M12

Lags: 1

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Null Hypothesis:	Obs	F-Statistic	Prob.
EX does not Granger Cause RV	95	13.1772	0.0005
RV does not Granger Cause EX		12.5621	0.0006

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