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The relationship between government revenue and government expenditure in South Africa: a cointegration and causality approach.

By

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ACRONYMS

ADF	Augmented Dicky Fuller
ECM	Error Correction Model
GDP	Gross Domestic Product
GEXP	Government Expenditure
GREV	Government Revenue
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
SARB	South African Reserve Bank
SARS	South African Revenue Services
StatsSA	Statistics South Africa
VAT	Value Added Taxation
VAR	Vector Autoregression
VECM	Vector Error Correction Model

ABSTRACT

The government plays an important role in stabilising the economy, by implementing adequate economic policies such as fiscal policy, which consists of government revenue and government expenditure. A budget deficit arises when government expenditure exceeds government revenue. It is important to understand the direction of causality between government revenue and government expenditure, as this will assist when suggesting the remedial approach that should be followed by budgetary authorities in order to effectively deal with the budget deficit.

The main objective of this study was to determine the relationship between government revenue and government expenditure in South Africa. The study employed annual time series data from 1982 to 2019, taken from the South African Reserve Bank website and the Economic Research Federal Reserve Bank of St. Louis. The Johansen cointegration test was used to test for cointegration and the Granger causality test was used to test for causality. The empirical results found that the variables are cointegrated. Therefore, a long-run relationship exists between the variables. The results of the Granger causality test found that there is no causality between government revenue and government expenditure. Therefore, policy makers or budgetary authorities should make its revenue and expenditure decisions separately. The dissertation also went an extra step by analysing the disaggregated expenditure and revenue patterns. The reason that this was done is because the researcher wanted to examine the effects that the different types of expenditure and revenue have on South Africa's fiscal position. Further policy recommendations were made based on the trends of the data that were observed from the disaggregated expenditure and revenue patterns.

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Chapter 1: Introduction

1.1 Background and overview

Fiscal policy is an instrument that is used by the government to adjust its levels of revenue and expenditure, in order to monitor and influence the economy (Pettinger, 2019). Developing countries, such as South Africa, are faced with major challenges in the planning and implementation of fiscal adjustment policies. One of the challenges arises from the increasing demand for public expenditure such as education, healthcare and infrastructure. The other challenge arises from the lack of capacity to raise revenue from domestic sources to finance the increased expenditure, primarily due to a narrow tax base and low per capita income (Yabashota and Smurit, 2012).

The government plays an important role in stabilising the economy, by implementing adequate economic policies such as fiscal policy, which consists of government revenue and government expenditure. A budget deficit arises when government expenditure exceeds government revenue. It is important to understand the direction of causality between government revenue and government expenditure, as this will assist when suggesting the remedial approach that should be followed by budgetary authorities in order to effectively deal with the budget deficit (Ndoricimpa, 2017).

According to Weil (2019), fiscal policy is said to be tight or contractionary when the government budget is in surplus (government revenue is higher than government expenditure) and loose or expansionary when the government budget is in deficit (government expenditure is higher than government revenue). One of the most important things to note about fiscal policy is that it affects aggregate demand, through changes in government expenditure and government revenue. A fiscal expansion, for example, leads to a raise in aggregate demand through one of two means. Firstly, demand increases directly if the government increases its purchases but keeps taxes constant. Secondly, an increase in transfer payments or a cut in government taxes results to a rise in households' disposable income, leading to them spending more on consumption. This rise in consumption will in turn raise aggregate demand. According

to Eller (2011), in an open economy, fiscal policy also affects the exchange rate and the trade balance.

When the government runs a deficit, it relies on government debt to meet some of its expenses. According to Sere (2016), although government debt serves as an injection into the economy it can result in a higher demand of loans, increased borrowing from international investors and borrowing from the private sector, causing government spending to increase as societies also demand more. Therefore, for developing countries, such as South Africa, this causes a greater dependence on debt financing and also results to negative crowding out effects for the economy. These negative effects are: higher interest rates re-payments, a decline in foreign (capital) investment and a debt burden for future generations. Therefore, policy makers in the government need to reduce the level of the budget deficit in order to boost or sustain economic growth.

The South African government generates most of its revenue from tax collection. The main source of tax revenue for the South African government is personal income tax, followed by value added tax (VAT), company tax and excise tax, respectively (Stats SA, 2019). Even though government revenue continues to increase, the government has struggled to meet its tax targets, over the past years. In the 2019/2020 fiscal year, for example, the South African Revenue Service (SARS) fell short of its tax revenue target by R66 billion (Dludla, 2020). Before 1994, government expenditure, in the form of: general public services, education, social protection and healthcare mostly benefited a minority group. However, when apartheid ended, previously marginalised groups were also incorporated and started benefiting more from government spending. As a result, government expenditure has significantly increased since 1994. National government expenditure totalled R122 billion in fiscal 1993/1994 (South African Reserve Bank, 2013) and in fiscal 2019/2020 it totalled R1.4 trillion, which is an increase of more than R1.2 trillion from fiscal 1993/1994 (Deloitte, 2019). The 2008 global financial crisis took a hard knock on the South African economy. As a result, the country has not been able to achieve a budget surplus since fiscal 2006/2007.

Unfortunately, the Coronavirus pandemic has added fresh challenges to the country's existing financial woes. It has resulted to the 2020/2021 financial year recording a record high budget deficit of 14 percent of GDP (Morton and Blair, 2021). Finance Minister Tito Mboweni emphasised in the 2021 Budget Speech that treasury expects to collect R1.21 trillion in taxes during 2020/21, which is about R213 billion less than the 2020 Budget expectations- making

it the largest tax shortfall on record (Haldane, 2021). This shortfall comes as no surprise, considering that the country experienced many lockdowns, which resulted to many businesses closing and left many people unemployed. In the build up to the 2021 Budget Speech, there was a concern that new tax measures may be implemented to address the shortfalls. However, treasury decided not to introduce any measures to increase tax revenue, considering that the country is still faced with the Coronavirus pandemic (Hughes, 2021). Nonetheless, treasury expects a tax revenue of R1.37 trillion to be collected in the 2021/2022 financial year. On the other hand, the government is budgeting to spend R2.02 trillion every year for the next three years (BusinessTech, 2021).

Additionally, the 2021/2022 budget was focused on big spending announcements in an effort to shield citizens, business and the economy in general from the Coronavirus pandemic. This is evident in the National Treasury's decision to allocate R10.3 billion, in order to purchase and deliver COVID-19 vaccines over the next two years. An additional R100 million has also been allocated by treasury to the SA Medical Research Council, in order to fund vaccine research programmes (Mokone, 2021).

1.2 Research Problem

South Africa's budget deficit is continuing to rise, despite the government's commitment to reduce it. Therefore, the country has been relying on debt to finance its expenditure. In 2020/2021, there was an increase in government's gross borrowing requirement from R432.7 billion to R670.3 billion, or from 8 to 13.6 per cent of GDP. Gross loan debt is expected to increase from R3.95 trillion, or 80.3 per cent of GDP, in 2020/21 to R5.23 trillion, or 87.3 per cent of GDP, by 2023/24. Over the same period, net loan debt will increase from R3.66 trillion, or 74.3 per cent of GDP, to R5.09 trillion, or 84.9 per cent of GDP (National Treasury, 2021). Last year, cabinet considered the passive approach and the active approach, in finding an approach that could be used by the government to reduce the country's growing budget deficit. It is important to highlight that there is no study, thus far, that have been able to prove what the ideal debt-to-GDP ratio should be.

Under the passive approach, debt stability is not the government's main priority. Thus, South Africa would continue on its current trajectory. This would result in the country's economic growth remaining low and government debt spiraling upwards. The adoption of the passive approach is problematic because the rising debt, and the possibility of default, would lead to bondholders requiring higher returns, thus pushing up debt-service costs. The high debt-service costs would, in turn, result in a reduction in public spending on health, education and other policy priorities. Therefore, cabinet recognised that the passive approach is not a viable option for the country (National Treasury, 2020). As a result, it decided to adopt the active approach to deal with the rising debt. Cabinet has also endorsed the target of a primary surplus (meaning revenue will exceed non-interest expenditure) by 2023/24.

Under the active approach, the government acts rapidly to stabilise debt by reducing spending and enacting economic reforms. So far, the budgetary authorities have taken a decision to make large reductions in non-interest spending over the next three years, amounting to R300 billion in order to narrow the deficit and stabilise the debt to GDP ratio. The majority of these reductions will be applied to the wage bill (BusinessTech, 2021).

National treasury conceded in last year's medium-term budget that options to stabilise the fiscus are becoming increasingly limited. Therefore, there is a need of a study that will examine the relationship between government revenue and government expenditure in South Africa, in order to suggest whether there are any other reforms that can be adopted by the budgetary authorities alongside the reductions in non-interest spending, to deal with the budget deficit.

1.3 Research Objective

The main objective of this dissertation is to analyse the relationship between government revenue and government expenditure in South Africa, to enable the researcher to recommend an approach that could be used by the budgetary authorities as a remedial measure to effectively deal with the budget deficit.

1.3.1 Sub Research Objective

To disaggregate government expenditure and government revenue in order to recommend adjustments that can be implemented by the budgetary authorities, to reduce the government deficit.

1.4 Research Question

The research question of this study is: "What is the appropriate approach that could be used by the budgetary authorities to effectively deal with the budget deficit in South Africa?"

1.5 Significance of the study

Under the Zuma presidency, South Africa adopted the democratic developmental state approach. According to Craig (2017), a developmental state is characterised by a greater use of state intervention and industrial policy as a means of achieving wide ranging priority economic/social policy objectives such as: creating economic growth, reducing poverty as well as improving health/education sectors and public service delivery.

There is an ongoing debate about what the optimal debt-to-GDP ratio should be. Uncertainty also remains about whether the reduction in government debt and government deficit positively contributes to a country's economic growth (Hennerich, 2020). The reason for this is because of Japan's flagship developmental state. As an economy that started its post-war reforms in the 1970s, it pioneered the developmental state and saw impressive double-digit economic growth rates for decades until the Asian financial crisis of 1997. Since then, it has effectively experienced an average of zero percent economic growth rate and an escalating debt amounting to about 230 percent of GDP in 2020. Yet despite all this, the economy remains largely stable and in the ranks of the first world. It seems plausible that the ordering of their economy according to developmental state principles – which do not involve actively maintaining a set "stable" debt/gdp ratio – laid institutional and infrastructural foundations for the country to withstand economic shocks and elongated periods of low or no growth.

However, this has not been the case for South Africa. The implementation of the developmental state approach under the Zuma presidency resulted in the country's budget deficit widening rapidly, forcing it to rely on debt to finance its expenditure. Unlike Japan, South Africa's economy has been failing to grow while its debt-to-GDP ratio is significantly increasing. It is worth further noting that a government can run a developmental state without running a huge debt in the process. Countries such as South Korea and Hong Kong have proven it.

Of late, under President Ramaphosa, South Africa seems to be adopting a neoliberal approach, which is a similar approach that was adopted by former president Thabo Mbeki. President Ramaphosa's ascension to power in February 2018, thus, resulted to new fiscal policy reforms being implemented by the government. Therefore, there is a need for a new study that will analyse South Africa's government revenue-expenditure nexus.

The study will play an important role in assisting the government to make effective policy decisions when analysing ways to reduce the budget deficit in South Africa, considering that it will also incorporate the latest data. It is worth emphasising, once more, that the government stated that cabinet has adopted the active approach to deal with the rising debt, which has resulted to the budgetary authorities deciding to make large reductions in non-interest spending over the next three years. Therefore, this study is relevant because it will seek to determine whether there are additional reforms that could be adopted by the budgetary authorities, alongside the reductions in non-interest spending, to deal with the country's widening budget deficit.

Lastly, it is important to note that South Africa is a developing country that has a budget deficit problem like many other developing countries. Therefore, this study may be useful in providing relevant information that can be used by other developing countries that also have a budget deficit problem.

1.6 Structure of the dissertation

The dissertation will be broken down in the following manner:

Chapter 1: Introduction

This chapter will deal with the introductory information to the dissertation. The chapter will include subsections such as the background, statement of the problem, objective of the study and the organisation of the study.

Chapter 2: Literature Review

This chapter reviews both theoretical and empirical literature. The theoretical literature will be analysed first, to enable the researcher to understand the different theories behind the relationship between government revenue and government expenditure.

Chapter 3: Research Methodology

This chapter will explain the research methodology that will be employed in the dissertation.

Chapter 4: Results and Data Analysis

This chapter will present and analyse the results of the dissertation.

Chapter 5: Conclusion and Policy Recommendations

This chapter will summarise the major findings of the dissertation and policy recommendations will be provided based on the results.

Chapter 2: Literature review

2.1 Introduction

This study will review both, theoretical and empirical literature. The theoretical literature will be analysed first, to enable the researcher to understand the different theories behind the relationship between government revenue and government expenditure.

Section 2.2 reviews the theoretical literature and is divided into four major hypotheses being: the tax-and-spend hypothesis, spend-and-tax hypothesis, fiscal synchronisation and fiscal neutrality hypothesis. Section 2.3 analyses the empirical literature from different countries and is divided up as follows: literature from American, Asian, European, and other non-African countries, literature from African countries and literature specifically from South Africa. Lastly, section 2.4 concludes the chapter.

2.2 Theoretical Literature

There are four main theories that underpin the government revenue-expenditure nexus: (i) the tax-and-spend hypothesis, (ii) the spend-and-tax hypothesis, (iii) the fiscal synchronization hypothesis and (iv) the fiscal neutrality hypothesis (Champita, 2016).

2.2.1 Tax-and-spend hypothesis

Friedman (1978) introduced the tax-and-spend hypothesis, arguing that government revenue is the cause of government expenditure. The approved adjustment made to the California Constitution about the tax limitation in 1978 led to the development of the tax-and-spend hypothesis. According to Friedman (1978), an increase in government revenue will directly raise government expenditure, implying a positive relationship between the variables. For example, the conventional fiscal measure to reduce budget deficits by increasing tax revenue will exert an inflationary pressure on prices of goods and services, which raises government consumption expenditure. On this basis, lower taxes would reduce the budget deficit or give rise to fiscal sustainability (Darrat, 2002; Payne, 2003). Therefore, Friedman (1978) argued

that the citizens of a country should have the ability to limit the budget of their government by deciding how much they are willing to give back to their government. Hence, the tax limitation proposition has a purpose of ensuring that the money received by government from its people is spent in an effective way. Additionally, Friedman (1978) suggested that what is needed on the state, federal and local level of government is not the adjustment of balancing the budget but rather to limit the expenditure of the government to the portion of income received.

2.2.2 Spend-and-tax hypothesis

The spend-and-tax hypothesis argues that government expenditure causes government revenue and not vice versa. This view is in agreement with Wray (2015), albeit his treatment of government debt and expenditure is a somewhat unorthodox approach. Peacock and Wiseman (1961) suggested that a tolerable level of taxation exists, which sets a constraint on government expenditure. They further stated that government expenditure increases with Gross National Product (GNP) as an economy grows. This is because as income levels rise, tax revenues of the government also increase. Public expenditure trends upwards in normal times. However, the trend would be disturbed during periods of social upheavals such as war, famine and natural disasters that require a rapid increase in public expenditure. Therefore, the government would have to increase taxation levels in order to finance such increased levels of government expenditure. According to Peacock and Wiseman (1961), the high taxation levels will be regarded as acceptable by the citizens during such crisis periods, which they described as the displacement effect.

Peacock and Wiseman (1961) further explained that, given that the citizens of a country become aware of the social problems during the period of the crisis, an inspection effect may arise, making higher government expenditure possible in order to solve the social problems. This is possible because the levels of taxation tolerated by the citizens do not return to former levels. Hence, the increases in taxes as a result of the crisis will now become permanent tax policies (Narayan, 2005). Similarly, the Ricardian equivalence proposition by Barro (1974) argues that government usually exploited government expenditure since any debt incurred today would be repaid by higher tax in the future.

Wray (2015), in the defence of the spend-and-tax hypothesis, argues that there are a number of principles that do not apply to sovereign currency-issuing governments such as South Africa: "Governments have a budget constraint (like households and firms) and have to raise funds through taxing or borrowing; Budget deficits are evil, a burden on the economy except under some special circumstances (such as a deep recession); Government deficits drive interest rates up, crowd out the private sector, and lead to inflation; Government deficits take away savings that could be used for investment; Government deficits leave debt for future generations; government needs to cut spending or tax more today to diminish this burden; Higher government deficits today imply higher taxes tomorrow, to pay interest and principle on the debt that results from deficits". Another argument that is made is that while these statements are consistent with the conventional wisdom, and while several of them are more-or-less accurate if applied to the case of a government that does not issue its own currency, they do not apply to a currency issuer (such as South Africa) and it needs not be pointed out that many governments around the world are currency issuers. In short, the above are orthodox practices but they have been hastily generalized and erroneously implemented for currency-issuing governments. Such claims and the merit they carry, although not the main focus of this study, do require further exploration as they cast a shadow of scientific scepticism on all studies of government's revenue-expenditure nexus.

As an antithesis to the aforementioned principles, Wray (2015) states that unless a currency is pegged to gold or some foreign currency, the sovereign government does not need revenue in its own currency in order to spend. Secondly, taxes are not needed to pay for government spending. Thirdly, the government must spend (or lend) the currency into the economy before taxpayers can pay taxes in the form of that currency.

2.2.3 Fiscal synchronization hypothesis

Musgrave (1966) as well as Meltzer and Richard (1981) put forward the fiscal synchronization hypothesis, which maintains that there exists a bidirectional causal relationship between government expenditure and government revenue. That is government expenditure causes government revenue, which in turn causes government expenditure. In other words,

government expenditure causes government revenue with a feedback effect. This is so because expenditure and revenue decisions are made concurrently. Therefore, the result is that changes in them occur simultaneously. Under the fiscal synchronization hypothesis, policy makers decide on the revenue and expenditure levels by comparing the marginal costs and marginal benefits of government activities (Narayan, 2005).

2.2.4 Fiscal neutrality hypothesis

The final hypothesis is the fiscal neutrality hypothesis, stated by Baghestani and McNown (1994). The argument follows that, revenue and expenditure decisions are made independent of each other. Therefore, there is no causal relationship between government expenditure and government revenue. Expenditures are determined by the requirement of the citizenry and revenue will depend on the maximum amount of tax the citizenry can support. Hence, it is only by a matter of coincidence that fiscal equilibrium can be achieved. According to Baghestani and McNown (1994), this is possible because economic growth ensures that in the long-run, institutions become more separate and independent, which in turn makes it possible for expenditure and revenue decisions to be made separately.

The argument by Baghestani and McNown (1994) that fiscal equilibrium is coincidentally achieved, is similar to Abba Lerner's argument for the notion of "sound finance". Lerner argued that the government must not run its finances like a household or a firm. According to Wray (2015), Lerner emphasised that budget balancing does not assist the government to achieve the public purpose (for example full employment). Lerner also stated that if the budget balances, then there is no problem. However, there is no requirement for it to balance. It is also important to highlight that Lerner rejected the notion that the budget deficit should be kept below any specific ratio to GDP and also argued the same regarding the debt to GDP ratio (Lerner, 1943).

Additionally, Lerner introduced the functional finance approach, which comprises of two principles. The first principle is that if domestic income is too low, then the government needs to spend more. Lerner emphasised that unemployment results from low government spending. Therefore, he argued that countries that have an unemployment problem can deal with it by increasing government spending, while putting measures in place that will ensure that inflation

does not arise. Learner's second principle is that the government needs to provide more money (in the form of bank reserves), if the interest rate is too high, in order to reduce it (Wray, 2015).

2.3 Empirical Literature

There are various empirical studies that have examined the relationship between government revenue and government expenditure such as Apergis et al. (2012), Ndoricimpa (2017) and Sere (2016). However, the empirical outcomes of these studies vary and sometimes conflict each other, due to differences in the countries that are analysed, the difference in time period being studied and the difference in econometric techniques used. This section analyses the empirical literature looking more specifically at the purpose of the study, data used, methodology, results found and the theory proven.

2.3.1 Literature from American, Asian, European and other non-African countries

Ewing et al. (2006) studied the relationship between government revenue and government expenditure in the United States of America, using quarterly data from 1958Q3 to 200Q4. The threshold autoregression (TAR) model and the momentum threshold autoregression (M-TAR) model was used to ascertain the empirical links between the two variables of the budgetary process. The study also employed the common methodology of symmetric cointegration and the error correction model (ECM), in order to test for the validity of the various tax-and-spend hypotheses.

The M-TAR model found that federal government revues and government expenditures are cointegrated and the adjustment process of the budgetary disequilibrium is asymmetric. Under the symmetric and asymmetric ECMs, the study found that government revenue does not Granger cause government expenditure and nor does government expenditure Granger cause government revenue. This finding, therefore, endorses the fiscal neutrality hypothesis. Furthermore, the results of the asymmetric ECM found that revenues and expenditures respond to the long-run requirements of the budgetary balance only when the budget is worsening.

Ewing et al. (2006) raised concerns about the fiscal policy that was followed by government, which favoured adjusting both expenditures and revenues via an increase in expenditures along with a tax cut to stimulate the economy. They argued that an increase in expenditures would cause the deficit to grow dramatically in the long run. Therefore, this would result to the government relying on public debt, in order to finance the growing deficit. They further argued that without sufficiently high economic growth, the public debt would grow relative to national income and the government would eventually be forced to increase taxes. Lastly, the researchers argued that higher public borrowing would leave fewer national savings available to finance private sector investment. This crowding out effect, however, is challenged by Wray (2015). Although being cognisant of the fact that government expenditure has implication for private sector expenditure, Wray (2015) argues that the impact on the interest rate is often dampened by issuing government IOUs to the banks and targeted expenditure on investment activities.

Chang and Chiang (2009) examined the relationship between government revenue and government expenditure in a panel of 15 OECD countries, using annual data over the period from 1992 to 2006. The Kao cointegration test found that there is cointegration between government revenue and government expenditure. Therefore, there is a long-run relationship between the variables. Secondly, the panel Granger causality test found that there is a bidirectional causal relationship between government revenues and government expenditures, which lends support to the fiscal synchronization hypothesis in the 15 OECD countries. Chang and Chiang (2009) argued that the fiscal policymakers in the 15 OECD countries should set revenues and expenditures simultaneously. The researchers also recommended that the countries with budget deficits should raise taxes and cut spending simultaneously in order to reduce their budget deficits.

Apergis et al. (2012) acknowledged that Greece is a country that is drowning in debt, due to the high levels of expenditure patterns and low revenue turnover, causing investor confidence to decrease in the country. The threshold autoregressive (TAR) and the momentum threshold autoregressive (MTAR) models were used to analyse the relationship between government revenue and government expenditure, using annual data covering the period 1957 to 2009.

Gross domestic product (GDP) was also added to the study as an additional variable. The results of the Engle-Granger cointegration test found that there is cointegration between government revenue, government expenditure and GDP. Therefore, there is a long-run relationship between the variables. This is confirmed by the TAR and MTAR models which also reveal that there is evidence asymmetry in the budgetary adjustment process (Apergis et al, 2012). The asymmetric error correction model shows that in the short-run, there is a unidirectional causality from government revenue to government expenditure. Therefore, the study is consistent with the tax-spend hypothesis. The recommendation to policy makers in Greece was that they should increase the country's revenue levels in order to control the budget deficit.

Ritcher and Dimitros (2013) also studied the relationship between government revenue and government expenditure in Greece. However, this study used a different approach compared to Apergis et al. (2012) and it also used a different time period, to analyse the relationship between the variables. It used annual data from 1833 to 2009. Gross domestic product (GDP) was also included in the study as an additional variable. The vector error correction model (VECM) was used to analyse the relationship between the variables. The results of the Johansen cointegration test found that the variables are cointegrated. Therefore, there is a long-run relationship between the variables. The results of the Granger causality test found that there is a unidirectional causality from government expenditure to government revenue, which endorses the spend-tax hypothesis. This result is different compared to the one that was found by Apergis et al. (2012). The policy recommendation by the researchers was that the policy makers in Greece should significantly reduce government spending, in order to make the public sector more efficient. Moreover, the researchers argued that any attempt to reduce public deficits without reducing public spending will fail. Richer and Dimitros (2013) emphasised that this will help Greece bring back a sustainable fiscal path without reducing essential and productive expenditure and lead the economy to a long run growth.

Lukovic and Gribic (2014) studied the causal relationship between government revenue and government expenditure in the Republic of Serbia, using quarterly data for the period 2003Q1 to 2012Q4. Gross domestic product was also included in the study as an additional variable.

The study made use of the Toda-Yamamoto long-run non-causality method, to determine whether the causal relationship between government revenue and government expenditure exists in Serbia. The application of this method confirmed that there exists a unidirectional causality, from government expenditure to government revenue, which endorses the spend-tax hypothesis. The study found that future government efforts to cut government spending included in the consolidation propositions seem to be justified, since the analysis conducted in the study indicates that it is the optimal way to reduce the budget deficit in the long run.

It is important for one to note that an increase in state spending, in line with the spend-tax hypothesis, leads to an increase in government revenues in the long-run, through an increase of tax rates. However, the researchers found that since the taxation capacity in Serbia is limited in the medium and long-run, it appears that a further increase in government spending is not sustainable. Therefore, Luckovic and Gribic (2014) suggested that the only solution to the budget deficit, in the case of Serbia, is a decrease in government spending.

Lojanica (2015) also analysed the relationship between government revenue and government expenditure in the Republic of Serbia. However, the study followed a different approach compared to Luckovic and Gribic (2014) and it also used a different time period. It used monthly data from January 2003 to November 2014.

The results of the ADF and KPSS tests found that the government revenues and the government expenditures are in order of integration I (1), which fulfils the basic requirements for the application of the autoregressive distributed lag (ARDL) model. Therefore, the interdependence between the variables was investigated using the (ARDL) model. It is also worth noting that the study found that there is cointegration between the variables. This means that there is a long-run relationship between government revenue and government expenditure. Since the variables were found to be stationary at first difference and cointegrated, the researchers decided to also use the vector error correction model (VECM) to analyse the relationship between the variables. A key finding of the study was that there is a unidirectional causality from government expenditures to government revenues, in the long run. This finding is in accordance with the spend-tax hypothesis. This result is similar to the one that was found by Luckovic and Gribic (2014). Lojanica (2015) recommended that the budgetary authorities should reduce government expenditures in the long run.

Adnan and Jalili (2010) studied the relationship between government revenue and government expenditure in Romania, using quarterly data from 1998Q1 to 2008Q3. The study employed the autoregressive distributive lag (ARDL) model to analyse the relationship between the variables. The study found that cointegration exists between the variables. Therefore, there is a long-run relationship between government revenue and government expenditure. Secondly, the study found that there is bidirectional causality between government revenue and government expenditure, which endorses the fiscal synchronisation hypothesis. The policy recommendation was that budgetary authorities in Romania should raise revenues and cut spending simultaneously in order to control the budget deficit.

Al-Qudair (2005) examined the relationship between government revenue and government expenditure in Saudi Arabia, using the error correction model (ECM). Annual data was used, covering the period 1964 to 2001. The results of the Johansen cointegration test confirm that there is one cointegrating vector. Therefore, there is a long-run relationship between the variables. The Granger causality test found that there is evidence of bi-directional causality in the long-run as well as in the short-run. Thus, it can be concluded that the study is consistent with the fiscal synchronization hypothesis. Al-Qudir (2005) explained that Saudi Arabia is an oil-rich country, which relies mostly on oil to generate its revenue. Therefore, the bi-directional causality between government revenue and government expenditure in the long-run and short-run could be due to the fact that when oil revenues fluctuate over time, it affects the growth and expenditure of the country. The researcher also argued that the increase in government expenditure can motivate economic activities causing revenues, which are not oil related, to be increased.

Irandoust (2018) studied the relationship between government revenue and government expenditure in Sweden, using annual data from 1722 to 2011. The study used the hidden cointegration approach and the Granger non-causality methodology to examine the response of the government expenditure to government revenue changes and vice versa.

The results based on hidden cointegration technique and a modified version of the Granger non-causality test, found that there exists a long-run and asymmetric relationship between government spending and government revenues. The study also found that there exists a bi-

directional causality between government revenue and government expenditure, which endorses the fiscal synchronization hypothesis.

There are two policy recommendations that Irandoust (2018) made. Firstly, the researcher recommended that the reduction of the budget deficit could be achieved through government expenditure cuts, accompanied by contemporaneous tax controls. Secondly, the researcher suggested that fiscal sustainability can be achieved if tax authorities work closely with other fiscal institutions.

Endirisinghe and Sivarajasingham (2015) examined the relationship between government revenue and government expenditure in Sri Lanka, using the vector error correction model (VECM). Annual data was used, covering the period 1960 to 2013. The results of the Johansen cointegration test confirm that there is one cointegrating relationship between government revenue and government expenditure. Therefore, there is a long-run relationship between the variables. The Granger causality test found that there is evidence of unidirectional causality from government expenditure to government revenue (Endirisinghe and Sivarajasingham, 2015). It can be concluded that the study is consistent with the spend-and-tax hypothesis. The recommendation to the policy makers in Sri Lanka was that they should try to reduce recurrent expenditure and increase development and investment expenditure, which will generate income in the future.

Sani et al. (2018) examined the causal relationship between government expenditures and revenues in Indonesia, using annual data, covering the period from 1963 to 2017. The Granger Causality test approach in the vector autoregressive (VAR) model was used to analyse the relationship between the variables. The Granger causality test found that there is a bi-directional causality between government expenditure and government revenue, which endorses the fiscal synchronisation hypothesis. Sani et al. (2018) emphasised that the Indonesian government strongly relies on loans, in order to cover the fiscal deficit. The researchers also expressed concerns that the country is heading towards financing deterioration. They argued that this can be prevented by ensuring that government expenditures are reduced. They further suggested that this requires stronger support from all spheres of government.

Yashobanta, and Smruti (2012) studied the relationship between central government revenue and government expenditure in India, using annual data covering the period from 1970 to 2008. The vector error correction model (VECM) was used to analyse the relationship between the variables. The Johansen co-integration test found that the variables are cointegrated. This proves that there is a long-run relationship between the government revenue and government expenditure. The results that were obtained from the Granger causality test found that there is bidirectional causality between central government revenues and expenditures in the long-run, which supports the fiscal synchronization hypothesis. The researchers decided to go a step further by analysing the short-run Granger causality based on the WALD test. The results of the WALD test found that there exists a unidirectional causality from government expenditure to government revenue, which supports the spend-and-tax hypothesis. The policy recommendation to fiscal authorities in India was that they should try to raise revenue and cut expenditure simultaneously, in the long-run, in order to control the respective fiscal deficit.

Mohanty and Mishra (2017) also examined the nexus between government revenue and government expenditure in India. The study used the vector error correction model (VECM) to analyse the relationship between the variables, which is the same approach that was used by Yashobanta, and Smruti (2012). However, it used a different time period to analyse the relationship between the variables. The study used annual data, covering the period 1980 to 2013. The Johannsen co-integration test found that there is one co-integrating relationship between government revenue and government expenditure. Therefore, there is a long-run relationship between the variables. Secondly, the Granger causality test found that there is a unidirectional causality from government revenue to government expenditure, which proves that the study is consistent with the tax-spend hypothesis. This causality finding is different to the one that was found by Yashobanta and Smruti (2012). Mohanty and Mishra (2017) suggested that the unsustainable fiscal imbalances (deficit) in India can be mitigated by policies that stimulate government revenue.

Mehrara et al. (2011) used annual data covering the period 1995 to 2008, to examine the inter-temporal relationship between government revenue and government expenditure for 40 Asian countries. Gross domestic product (GDP) was also included in the study as a control variable.

The Koa panel cointegration test found that there is cointegration between the variables. Therefore, there exists a long run relationship between the variables. The panel Granger causality test found that there is bi-directional causality between government revenue and government expenditure, which proves that the study is consistent with the fiscal synchronization hypothesis. Mehrara et al. (2011) recommended that the countries with budget deficits should raise revenues and cut spending simultaneously in order to control their budget deficits.

Al-Zeud (2015) studied the relationship between government revenue and government expenditure in Jordan, using annual data from 1990 to 2011. The VECM was used to analyse the relationship between the variables. The Johansen cointegration test found that there is cointegration between the variables. Therefore, there is a long-run relationship between government revenue and government expenditure. The results of the Granger causality test found that there exists a bi-directional causality between government revenue and government expenditure, which endorses the fiscal synchronisation hypothesis. Al-Zeud (2015) recommended that policy makers should pay attention to the bidirectional causality between government revenue and expenditure, which might complicate the government's efforts to control the budget deficit and may contribute to explaining the high national debt figure.

Ghazo and Ziad (2018) also studied the relationship between government revenue and government expenditure in Jordon. The study employed the error correction model to analyse the relationship between the variables, using annual data covering the period from 1976 to 2016. Unlike Al-Zeud (2015), Ghazo and Ziad (2018) took a different approach by analysing the relationship between direct revenues, indirect taxes, non-tax revenues and foreign revenues, and current expenditures as well as capital expenditures. The results of the Johansen cointegration test proved that the variables are cointegrated. This means that there is a long-run relationship between the variables. The results of the Granger causality test found that there exists a bidirectional causality between direct tax revenues and capital expenditures and a bidirectional causality between non-tax revenues and current and capital expenditure. The Granger causality results also found that there exists a unidirectional causality from current expenditures to both direct and indirect tax revenues, a unidirectional causality from capital

expenditure to indirect tax revenue, and a unidirectional causality from foreign aid to both current and capital expenditure.

A policy recommendation by Ghazo and Zaid (2018) was that decisions concerning any components of public expenditure or revenue in Jordan, must be based on a scientific outcome that depends on the nature of the causal relationship between them.

Jiranyakul (2018) examined the relationship between government revenue and government expenditure in Thailand, using the TAR and MTAR models. The Residual-Based Cointegration test found that there is cointegration from government revenue and government expenditure. Therefore, there is a long-run relationship between the variables. The Granger causality test found that there is evidence of unidirectional causality from government expenditure to government revenue (Jiranyakul, 2018). Therefore, it can be concluded that this study is consistent with the spend-tax hypothesis. The recommendation to policy makers in Thailand was that a cut on government expenditure is needed to restore fiscal discipline.

Taha and Loganathan (2008) studied the relationship between government revenue and government expenditure in Malaysia, using annual data from 1970 to 2006. The study divided revenues into three types: direct tax revenue, indirect tax revenue and non-tax revenue. The vector autoregressive (VAR) model was used to analyse the relationship between the variables. The Johansen cointegration test found that the variables are cointegrated. Therefore, there is a long-run relationship between government revenue (direct tax, indirect tax and non-tax) and government expenditure. The Granger causality test found that there is a bidirectional causality between direct tax revenue, indirect tax revenue and government expenditure, which endorses the fiscal synchronization hypothesis. The Granger causality test also found that there is no causality from non-tax revenue to government expenditure, which endorses the fiscal neutrality hypothesis.

Taha and Loganthan (2008) argued that the results obtained in the study indicate that reducing direct and indirect tax rates may lead to a fall in government spending in the future. In addition, the researchers argued that non-tax revenues seem to be a less important contributor to the successfulness of country's growth as compared to direct and indirect tax. Lastly, they strongly suggested that future research should attempt to incorporate more variables in the analysis.

Karim et al. (2006) studied the relationship between government revenue and government expenditure in ASEAN-5 countries (Malaysia, Indonesia, Thailand, Singapore and Philippians), using annual data from 1970 to 2000. The study included gross domestic product (GDP) as an additional variable. The vector autoregressive (VAR) model was used to analyse the relationship between the variables. The results of the Johnsen cointegration found that there is cointegration between the variables for all of the ASEAN-5 countries. Therefore, this means that there is a long-run relationship between government revenue, government expenditure and gross domestic product for all of the ASEAN-5 countries. The study took a rare approach, by using the variance decomposition test to analyse the influence that the variables have on each other.

The results of the variance decomposition found that there is a strong influence on expenditure to revenue in Malaysia, Indonesia and Philippines. This finding supports the spend-revenue hypothesis. Meanwhile, for Thailand and Singapore, the results of the variance decomposition found that there is a strong influence on revenue to expenditure. This finding supports the tax-spend hypothesis.

Karim et al. (2006) recommended that the federal government in Malaysia, Indonesia and Philippines must properly plan their expenditures and ensure that an efficient tax collection strategy is implemented. The researcher also recommended that the Thailand and Singapore government should plan their expenditure based on revenue availability.

Gouder, Narayan and Prasad (2007) studied the relationship between government revenue and government expenditure in Fiji. The study investigated the causal relationship between government revenue and government expenditure using cointegration and Granger causality approaches. It employed quarterly time series data from 1968Q1 to 2003Q4. This study was conducted differently from other studies that have analysed the relationship between government revenue and government expenditure. Not only did the researchers model the relationship between government revenue and government expenditure in an aggregate sense, but they also modelled them in a disaggregated sense. In other words, the researchers examined the relationship between government revenue and the various components of government expenditure. Similarly, they examined the relationship between government expenditure and the various components of government revenue. The main findings of this study were that,

firstly, government revenue and government expenditure, in both the aggregate and disaggregate sense, were cointegrated.

Secondly, it was found that in the short-run, there is a unidirectional causality from government expenditure to government revenue in the aggregate sense. This finding is consistent with the spend-and-tax hypothesis. In the long-run, the study found that there exists a bidirectional causality between government revenue and government expenditure, which supports the fiscal synchronization hypothesis. The researchers welcomed the cointegration and causality findings. However, what they found alarming was that, despite the fact that expenditure and revenue decisions are made simultaneously and not in isolation, Fiji has not succeeded in stemming current account deficits. Given this alarming situation, Gouder, Narayan and Prasad (2007) suggested that policy makers should consider expenditure reforms. Additionally, they argued that over the last decade or so, in recognition of expanding expenditures relative to revenues, there had been development plans focused on civil service reforms to reduce expenditure in Fiji. However, nothing concrete had been achieved. Therefore, they recommended that this policy action needs to be reinvigorated and viewed with much urgency.

Narayan and Narayan (2006) analysed the relationship between government revenue and government expenditure in twelve developing countries. The twelve developing countries that were analysed are: El Salvador, Haiti, Chile, Venezuela, Guatemala, Uruguay, Ecuador, Peru, Paraguay, Guyana, Mauritius and South Africa. The study analysed the relationship between government revenue and government expenditure in these twelve countries by making use of a multivariate framework, which modelled them together. Gross domestic product was also included in the study as an additional variable.

The sample period differed from each country and was contingent on data availability. For instance, for El Salvador, annual data covering the period from 1954 to 1996 was used. For Peru, annual data covering the period from 1970 to 2000 was used. For Guyana, annual data covering the period from 1961 to 1966 was used. For Haiti, annual data covering the period from 1967 to 1997. For Chile, annual data covering is the period from 1973 to 1996 was used. For Uruguay, annual data covering the period from 1969 to 1996 was used. For Venezuela and Ecuador, annual data covering the period from 1950 to 1996 was used. For Guatemala, annual data covering the period from 1958 to 1996. For Paraguay, annual data covering the period

from 1958 to 1993 was used. For Mauritius, annual data covering the period from 1966 to 2000 was used and for South Africa, annual data covering the period from 1960 to 2000 was used.

Narayan and Narayan (2006) applied the Toda and Yamamoto (1995) test for Granger causality, which revealed the following: For Haiti, government expenditure Granger causes government revenue, which is consistent with the spend-and-tax hypothesis. For El Salvador, Haiti, Chile, Mauritius and Venezuela government revenue Granger causes government expenditure, which is consistent with the tax-spend hypothesis; and for Peru, Guatemala, Uruguay, South Africa and Ecuador there is no Granger causality between government revenue and government expenditure, which is consistent with the fiscal neutrality hypothesis.

Narayan and Narayan (2006) further argued that since fiscal neutrality was found in Peru, Guatemala, Uruguay, South Africa and Ecuador, a likely implication, in the face of rapid growth in expenditures relative to revenues, is one of serious budget deficits. Secondly, they argued that since government expenditure causes government revenue, in Haiti, the signal is that government first spends and then raise taxes at a later stage, in order to pay for the expenditures. The researchers warned that potential investors may construe this government behaviour negatively, which can lead to private investments being hampered.

Elyasi and Rahimi (2012) studied the relationship between government revenue and government expenditure in Iran, using annual data that covers the period from 1963 to 2007. Gross domestic product was also included in the study as an additional variable. The autoregressive distributed lag (ARDL) model was used to analyse the relationship between the variables. The ARDL bound test found that cointegration exists between the variables. Therefore, there is a long-run relationship between government revenue, government expenditure and gross domestic product. The Granger causality test found that there is bidirectional causality between government revenue and government expenditure, which endorses the fiscal synchronization hypothesis. Elyasi and Rahimi (2012) suggested that the fiscal authorities of Iran should try to increase revenues and decrease expenditures simultaneously, so that they can manage to control the budget deficits.

Kaya and Sen (2013) studied the relationship between government revenue and government expenditure in Turkey using annual data, covering the period from 1975 to 2011. The VAR

model was used to analyse the relationship between the variables. The Johansen Cointegration test found that the variables are cointegrated. This means that there is a long-run relationship between government revenue and government expenditure. The Granger causality test found that there is a unidirectional causality from government expenditure to government revenue. This finding endorses the tax-pend hypothesis. Kaya and Sen (2013) suggested that reducing government spending is a better solution than increasing tax revenue to obtain fiscal discipline in Turkey.

The researcher has observed that all the countries that have been analysed in the studies, that have been unpacked in this sub section, have a budget deficit. It cannot be observed whether the budgets of these countries are sustainable.

2.3.2 Literature from African countries

Ndoricimpa (2017) examined the relationship between government revenue and government expenditure in Burundi, using monthly data, covering the period January 1997 to May 2013. The paper employed TAR and MTAR models to test for the relationship between government spending and tax revenue. Since Burundi is a grant-dependent country, grants were included in the model. The results supported the presence of threshold cointegration with asymmetric adjustment. Therefore, a long-run relationship exists between the variables. Causality test results from the estimated asymmetric error correction model suggested that in the short-run, there is an independence relationship between government spending and taxes in Burundi, suggesting evidence of the spend-tax hypothesis (Ndoricimpa, 2017). A policy intuition that emerged from the study is that, to reduce the budget deficit, Burundi should reduce its grant-dependency, improve its tax collection system and cut its spending in sectors where it is not productive and reallocate it to more productive sectors.

Eita and Mbazima (2008) examined the relationship between government revenue and expenditure in Namibia, using annual time series data from 1977 to 2007. The Vector Autoregressive (VAR) model was used to analyse the relationship between the variables. The

Johansen test for cointegration suggested that there is an existence of two cointegration equations. Therefore, a long-run relationship exists between the variables. The VAR Granger casualty test found that there is an existence of unidirectional causality from government revenue to government expenditure, which endorses the tax-spend hypothesis. Eita and Mbazima (2008) suggested that the unsustainable fiscal imbalances (deficit) in Namibia can be mitigated by policies that stimulate government revenue.

Maranga (2013) studied the relationship between government revenue and government expenditure in Kenya, using monthly data from September 1999 to June 2013. The autoregressive distributed lag (ARDL) model and the error correction model (ECM) was used to analyse the relationship between the variables. The study found that there is cointegration between the variables. Therefore, there is a long-run relationship between government revenue and government expenditure. The results of the Granger causality test found that there is a bidirectional causality between government revenue and government expenditure, which endorses the fiscal synchronization hypothesis.

Therefore, Maranga (2013) argued that treasury must increase revenues and decrease expenditures simultaneously, in order to manage the budget deficits. The researcher further argued that increasing government expenditure stimulates economic activities, which in turn increase government revenues.

Kiminyei (2018) also studied the relationship between government revenue and government expenditure in Kenya. However, the study analysed the relationship between the variables using a different time period compared to Maranga (2013). It used annual (fiscal) data from 1960 to 2011.The error correction model (ECM) was used to examine the relationship between government revenue and government expenditure. The Johansen co-integration test found that there is one co-integrating equation. Therefore, a long-run relationship exists between the variables. Secondly, the Granger causality test found that there exists a unidirectional casualty from government expenditure to government revenue in the long-run and in the short-run, suggesting evidence of the spend-tax hypothesis. This finding differs from the one that found by Maranga (2013). The recommendation to policy makers in Kenya was that a cut on government expenditure is needed, to restore fiscal discipline.

Champita (2016), examined the relationship between government revenue and government expenditure in Zambia, using Granger causality tests within the vector autoregressive (VAR) framework. The study employed annual data covering the period from 1980 to 2016. The estimated VAR model included gross domestic product, exchange rate and Treasury Bill rates as additional variables to the study. The Granger causality test found that there is a unidirectional causality from government expenditure to revenue, which endorses the spend-and-tax hypothesis.

Champita (2016) argued that perpetual budget deficits will destabilise Zambia's economy macroeconomy because it raises the cost of borrowing in the economy. Secondly, it will limit resources available to the private sector for investment and thirdly, persistent budget deficits will increase the national debt. The researcher cautioned that given that increases in government revenue are Granger-caused by increases in government expenditure, financing the budget deficit through raising revenues may not be the most appropriate tool to reduce budget deficits. Lastly, Champita (2016) argued that efforts that lead to policies that control, or place limitations, on government spending must be emphasised.

There are many studies that have examined the revenue-expenditure nexus in Nigeria. However, they are all unique because they analysed the variables using different techniques and different time periods. Obioma and Ozughulu (2010), Aladejare and Ani (2012), Ogujiuba and Abraham (2012), Nwosu and Okafor (2014), Yanusa, Aworinde and Oseni (2017) as well as Abdulrasheed (2017) are examples of the researchers that have examined the relationship between government revenue and government expenditure in Nigeria.

Obioma and Ozughulu (2010) studied the relationship between government revenue and government expenditure in Nigeria, using annual data from 1970 to 2007. The study employed the Engel-Granger two-step cointegration technique, the Johansen cointegration method and the Granger causality test within the Error Correction Modelling (ECM) framework. The results of the Johansen cointegration test found that the variables are cointegrated. This, therefore, means that there is a long-run relationship between government revenue and government expenditure. The results from the Granger causality test found that there is a

unidirectional causality from government revenue to government expenditure, which supports the tax-spend hypothesis.

The researchers argued that controlling the swings in government revenue is very necessary in controlling government expenditure and avoiding unsustainable fiscal imbalances in Nigeria. Secondly, they argued that efforts to enhance government revenue should be accompanied with appropriate public expenditure reforms, so that sustainable economic growth can be achieved, since higher government revenue invites higher government expenditure.

Thirdly, Obioma and Ozughulu (2010) argued that the plan of the Federal Government of Nigeria to establish a Sovereign Wealth Fund (SWF) is commendable because it will provide a vehicle for excess crude oil revenue to be prudently invested and managed to yield returns for sustaining government expenditure in the rainy days. However, the researchers cautioned that this will require the fund to instil accountability, sound management and transparency. Lastly, the researchers recommended that the government should go a step further in intensifying efforts at developing other sources of revenue in order to insulate the economy from the volatility associated with the oil revenue.

Aladejare and Ani (2012) examined the relationship between government revenue and government expenditure in Nigeria, using annual data covering the period from 1961 to 2010. The vector autoregressive (VAR) model was adopted, in this study, to investigate the relationship between the variables. The results of the Johansen co-integration test found that there is a co-integration relationship between government expenditures and revenues. Therefore, there is a long-run relationship between the variables. The Granger causality test found that there is bi-directional causality between government revenue and expenditure, which supports the fiscal synchronisation hypothesis. The policy recommendation was that efforts to enhance sources of revenue should be accompanied by reductions in spending for Nigeria.

Ogujiuba and Abraham (2012) studied the relationship between government revenue and government expenditure in Nigeria, using annual data from 1970 to 2011. The study employed the VECM to analyse the relationship between the variables. The study found that that the variables are cointegrated, which means that there is a long-run relationship between the

government revenue and government expenditure. The vector error correction model also confirmed that there is, indeed, a significant long run relationship between government revenue and government expenditure, implying that the disequilibrium in expenditure can be corrected in the long run through policies that adjust oil and non-oil sector revenues. The Granger causality test found that there is a unidirectional causality that runs from government revenue to government expenditure, which endorses the tax-spend hypothesis. Lastly, Ogujiuba and Abraham (2012) argued that putting policies in place to enhance the performance of the non-oil sector and adopting expenditure framework that accounts for possible decline in crude oil prices is conceived as useful in enhancing a healthy revenue-expenditure relationship in Nigeria.

Nwosu and Okafor (2014) studied the relationship between government revenue and government expenditure in Nigeria using the VAR model. Annual data covering the periods 1970 to 2011 was used and oil revenue as well as non-oil revenues variables were included in the study as additional variables. The Johansen co-integration test found that there are two co-integrating equations. Therefore, a long-run relationship exists between the variables. Secondly, the Granger causality test found that there is a unidirectional relationship from government revenue to government expenditure, which endorses the tax-spend hypothesis. The study suggested that the policy makers in Nigeria should decrease the budget deficit by exploring other sources of revenue especially the non-oil minerals sector, and also reduce the size of large recurrent expenditure and move towards capital and other investment expenditures.

Yanusa, Aworinde and Oseni (2017) studied the relationship between government revenue and government expenditure in Nigeria, using annual data from 1981 to 2014. The asymmetric cointegration technique was used to analyse the relationship between the variables. The Egle-Granger cointegration test, the Gregory-Hanse cointegration test and the Hatemi-J Structural breaks cointegration test found that there is cointegration between the variables. Therefore, there is a long-run relationship between government revenue and government expenditure. The TAR and MTAR models also indicated that there is a long-run equilibrium relationship.

Thirdly, the study found that government revenue has a statistically significant impact on government expenditure in the short run, which endorses the tax-spend hypothesis.

Yanusa, Aworinde and Oseni (2017) recommended that the Nigerian government should try to diversify into other sectors of the economy, such as agriculture and manufacturing. They argued that the reason for this is because of the volatility of oil prices and the fact that oil is a resource that is depletable.

Abdulrasheed (2017) analysed the relationship between government revenue and government expenditure in Nigeria, using annual data from 1986 to 2015. The vector error correction model (VECM) was used to analyse the relationship between the variables. The Johansen cointegration test found that the variables are cointegrated, meaning that there is a long-run relationship between government revenue and government expenditure. The results of the Granger Causality test found that there is a unidirectional causality that runs from government expenditure to government revenue, which endorses the spend-tax hypothesis.

Abdulrasheed (2017) argued that an increase in government expenditure without a corresponding increase in revenue will expand the budget deficit. This will, in turn, result to additional borrowing by the Nigerian government, which could increase the indebtedness to multilateral creditors. The researcher recommended that the government should explore a medium-term expenditure framework, to ensure that the budget expenditure is less driven by revenue availability. The researcher emphasised that this would ensure that expenditure is planned and protected from unstable short term revenue availability. Secondly, Abdulrasheed (2017) recommended that the government should discover other sources of revenue especially the non-oil minerals sector, and also reduce the size of huge recurrent expenditure and move towards capital and other investment expenditures.

Carneiro, Faria and Barry (2005) studied the relationship between government revenue and government expenditure in Guinea-Bissau using annual data, covering the period from 1981 to 2002. The study took a different approach by using the ordinary least squares (OLS) model to analyse the relationship between the variables. The Granger causality test found that there is a unidirectional causality from government expenditure to government revenue. This finding endorses the spend-tax hypothesis.

Carneiro, Faria and Barry (2005) made three important policy recommendations to the Guinea-Bissau government. Firstly, they recommended that government expenditures should be re-examined in order to assess the contribution that they make to the efficient allocation of resources within the economy. They also recommended that government expenditures should be re-examined to assess their potential to finance growth enhancing spending categories (through infrastructure, research and development, education, and health). Secondly, the researchers argued that the government should seek ways to re-order the intertemporal revenue-expenditure nexus in a way that is consistent with the country's revenue mobilization potential. They emphasised that this could pave the way for a sound medium-term budgeting framework and could help the government to control its expenditures rather than increasing its fiscal revenues. They further argued that this would, therefore, re-establish the fiscal discipline without jeopardizing the accumulation of factors and affecting the country's long-term growth potential. Lastly, they recommended that the government should try to speed up the implication of policies that seek to ensure that it effectively collects revenues and does not waste state funds on unnecessary expenditure, in order to achieve fiscal sustainability.

Masere and Kaja (2014) studied the relationship between government revenue and government expenditure in Zimbabwe, using monthly time series data covering the period from January 2010 to December 2012, in order to capture the multicurrency era. The study used the error correction model (ECM) to analyse the relationship between government revenue and government expenditure. The study found that the variables are cointegrated. Therefore, a long-run relationship exists between government revenue and government expenditure. Additionally, the Granger causality test was used to test for causality. It found that government revenue does not Granger cause government expenditure vice versa. Therefore, this finding endorses the fiscal neutrality hypothesis. The policy recommendation by Masere and Kaja (2014) was that the government should make expenditure and revenue decisions separately. They further argued that policies that are meant to improve the government budget position should also target other factors like economic growth.

Masenyetse and Motelle (2012) studied the relationship between government revenue and government expenditure in Lesotho, using quarterly data for the period 1991Q2 to 2009Q4.

The paper also included recurrent expenditure and capital expenditure as additional variables. The study used the error correction model to analyse the relationship between the variables. The study found that there is cointegration between government revenue and government expenditure. This means that there is a long-run relationship between the variables. It is also important to note that the study went a step further, by assessing whether there is cointegration between government revenue and recurrent expenditure as well as capital expenditure. The study found that there is cointegration between government revenue and recurrent expenditure, which means that there is a long-run relationship between the variables. However, the study found that there is no cointegration between government revenue and capital expenditure, which means that there is no long-run relationship between the variables. Furthermore, the results that were obtained from the Granger causality test found that there is causality that runs from government revenue to government spending. This finding endorses the tax-spend hypothesis.

Masenyetse and Motelle (2012) recommended that Lesotho should implement a number of recurrent expenditure adjustment reforms, in order to ensure that there is fiscal sustainability in the medium term. Moreover, they suggested that it is critical for an increase in revenue to be accompanied by raising capital expenditure, to provide the necessary infrastructure in the country.

Kazungu (2019) studied the relationship between government revenue and government expenditure in Tanzania, covering the period from 2000Q1 to 2017Q4. The Johansen Cointegration test found that the variables are not cointegrated, meaning that a long-run relationship does not exist between the variables. As a result, the researcher employed the unrestricted VAR model to analyse the short-run relationship between the variables. The results of the Granger causality test, which was estimated based in the VAR, found that there is a unidirectional causality that runs from government expenditure to government revenue. This result endorses the spend-tax hypothesis.

A policy recommendation by Kazungu (2019) was that Tanzania needs wise expenditure-based policies that would not jeopardise fiscal discipline. The researcher also emphasised that government expenditure should be directed towards growth enhancing categories such as infrastructure, research and development, education, and health. Lastly, Kazungu (2019)

emphasised that the revenue-expenditure disparities can be reduced by improving revenue-based policies that would tap into the available revenue potentials.

Obeng (2015), examined the relationship between government revenue and government expenditure in Ghana, using annual data covering the period from 1980 to 2013. The researcher used the Ordinary Least Squares (OLS) method to analyses the long-run relationship between government expenditure and government revenue. The researcher also used the vector autoregressive (VAR) framework to analyse the short-run relationships between the two variables.

The results that were obtained by Obeng (2015) found that there is a very strong long-run and short-run relationship between the variables. However, it is worth noting that the second period lag of the revenue variable showed a negative relationship between government revenue and government expenditure. The researcher emphasised that this finding indicated the possibility of the absence of fiscal illusion in every two years of increased government expenditure. The Granger causality test found that there exists a unidirectional causality running from revenue to expenditure, which supports the spend-and-tax hypothesis. The policy recommendation was that the Ghanaian government must improve its revenue generation efforts, in order for it to fund its ever-increasing expenditure and to control the frequent fiscal slippages.

Aidam (2018) also studied the relationship between government revenue and government expenditure in Ghana. However, this study used a different approach compared to Obeng (2015) and it also used a different time period, to analyse the relationship between the variables. It used annual data from 1990 to 2013. The vector error correction model (VECM) was used to analyse the relationship between the variables. The Johansen cointegration test found that there is cointegration between the variables. Therefore, this means that there is a long-run relationship between government revenue and government expenditure. The Granger causality test found that there is a bidirectional causality between government revenue and government expenditure, which endorses the fiscal synchronization hypothesis. This result differs from the one that was found by Obeng (2015).

Aidam (2018) emphasised that one of the main concerns of the fiscal environment in Ghana is reducing the fiscal deficit and public debt. The researcher recommended that the government

should increase revenue by implementing appropriate tax policies and by expanding the tax base, to include all taxable items that have been ignored over the past period. The researcher also suggested that the government should consider increasing taxes in sectors that have inelastic demand such as the mining, telecommunication, banking and oil sub sectors, in order to increase government revenue. Aidam (2018) strongly emphasised that corruption still remains a critical issue for Ghana and argued that it is one of the main factors that have led to the country's inefficient tax collection machinery. The researcher recommended that the government should ensure that the tax collection machinery is efficient.

On the expenditure front, the researcher recommended that the government should substantially cut down on recurrent expenditure, in order to decrease the fiscal deficit and government debt. The researcher argued that this can be achieved by eliminating government subsidies and phasing out any unviable and unprofitable public sector units. Lastly, Aidam (2018) recommended that the government should try to reduce the wage bill because it is one of the units that are causing an unreasonable increase in public expenditure.

Saheed, Mekidiche and Kahout (2020) studied the relationship between government revenue and government expenditure in Algeria using annual data, covering the period from 1990 to 2019. The study took a different approach by specifically focusing on the causal relationship between the variables. The Engle Granger causality test found that there is a unidirectional causality from government revenue to government expenditure. This finding endorses the spend-and-tax hypothesis. The policy recommendation was that the deficit in Algeria can be mitigated by policies that stimulate government revenue.

The researcher has observed that all the countries that have been analysed in the studies, that have been unpacked in this sub section, have a budget deficit. It cannot be observed whether the budgets of these countries are sustainable.

2.3.3 Literature from South Africa

Nyamongo et al. (2007), Ndahiriwe and Gupta (2007), Sere (2016), Phiri (2019) and Sanusi (2020) examined the relationship between government revenue and government expenditure in South Africa.

Nyamongo et al. (2007) investigated the causal relationship between government revenue and government expenditure in South Africa using monthly data, covering the period from October 1994 to June 2004. The VECM was used to analyse the relationship between the variables. The Johansen co-integration test found that there is one co-integrating equation. Therefore, there is a long run relationship between government revenue and government expenditure. The results of the VECM Granger causality test showed that there is no evidence of Granger causality between government revenue and government expenditure in the short-term, which supports the fiscal neutrality hypothesis. The study went further by testing for causality in the long-run, using the t-statistics of the error correction term of the VECM. The estimation results found that in the long-run, there is evidence of bidirectional causality, which supports the fiscal synchronisation hypothesis.

Nyamango et al. (2007) argued that the findings of the study have important policy implications, in the short-run and in the long-run. The researchers emphasised that the short-run findings of the study suggest that there is a great risk of budget deficits, should government expenditure explode, relative to government revenue on a month-to-month basis. The researcher also emphasised that the long-run findings of the study indicate that the fiscal authorities should ensure that they are in full control of the principal instruments of fiscal policy. This will ensure that the budget deficit does not spiral out of control, should there be a rapid growth of government expenditure, relative to government revenue.

Ndahiriwe and Gupta (2010) investigated the relationship between government revenue and government expenditure in South Africa, using quarterly data for the period from 1960Q1 to 2006Q2, and annual data for the period from 1960 to 2005. For both frequencies, gross domestic product and government debt were included in the VAR system as control variables. For quarterly data, the Johansen co-integration test found that there are two co-integrating

equations. Therefore, a long-run relationship exists between the variables. Additionally, the VECM Granger causality test suggested that there is bidirectional causality between government revenue and government expenditure, which supports the fiscal synchronization hypothesis. For annual data, the Johansen co-integration test found that there is one co-integrating equation. Therefore, a long-run relationship exists between the variables. The VECM Granger causality test found that there is no causality between government revenue and government expenditure, which supports the fiscal neutrality hypothesis. The policy recommendation by Ndahiriwe and Gupta (2010) was that the government should make expenditure and revenue decisions separately.

Sere (2016) analysed the relationship between government expenditure and government revenue in South Africa using annual data from 1980 to 2015. The VECM model was used for the analysis and government debt was included in the study as an additional variable. The Johansen cointegration test found that there is one cointegrating vector. Therefore, this suggested that there is a long-run relationship between the variables. The VECM Granger causality test found that there is no causality between government revenue and government expenditure, which supports the fiscal neutrality hypothesis.

Sere (2016) recommended that the South African government should increase the level of taxation collected so that more revenue can be generated, in order to reduce the fiscal deficit. However, the researcher cautioned that this should not be done in a manner that will burden the taxpayers and suggested that the government should rather strengthen its revenue collections mechanism, to ensure that it effectively collects taxes. The researcher further recommended that the policy makers should guard against spending patterns that are harmful to the economy. Lastly, Sere (2016) recommended that the policy makers should rather prioritise expenditures such as education and health because they will lead to long-term sustainability.

Phiri (2019) studied the relationship between government revenue and government expenditure in South Africa using quarterly data from 1960Q1 to 2016Q2. The MTAR model coupled with a corresponding threshold error correction (TEC) component was applied to the study and found that there is a nonlinear revenue-expenditure cointegration relationship. Therefore, a

long-run relationship exists between the variables. Furthermore, the Granger causality test found that there is bi-directional causality between government revenue and government expenditure, which supports the fiscal synchronization hypothesis. The study suggested that the fiscal authorities should amend fiscal imbalances through increased consolidation between revenue collection and expenditure allocation.

Lastly, Sanusi (2020) studied the relationship between government revenue and government expenditure in South Africa, using quarterly data, covering the period from 1965Q1 to 2019Q2. The researcher employed linear models in order to determine the order of integration of the variables, cointegration, granger causality and variance decomposition within the structural vector autoregressive (SVAR) model. The researcher also employed nonlinear techniques in order to spot the asymmetric relation of the univariate and the expenditure and revenue linkage. It is important to note that the study carried out asymmetric adjustments, to unknot the dynamic mechanism based on the threshold vector autoregressive (TVAR) model and the threshold vector error-correction model (TVECM). Additionally, the study employed the Markov Regime Switching model, to determine the tendency of the variables to remain in a particular region and their transition probabilities.

The results that Sanusi (2020) obtained from the linear granger causality found that there is no causality between the government revenue and government expenditure, even though the variables were found to be cointegrated. Therefore, this motivated the researcher to go a step further, by examining the nonlinearity structure of the variables. The nonlinear Granger causality test results found that there is a unidirectional causality from government revenue to government expenditure, which endorses the tax-spend hypothesis. The results of the TVAR suggest that in the higher revenue regime, government expenditure is significantly influenced by revenue. On the other hand, the results of the TVECM found that in the extreme region, none of the error-correction effect is statistically significant in both expenditure and revenue equations. The researcher found that only the error-correction effect in the expenditure equation in the typical region is statistically significant. Sanusi (2020) suggested that the results prove the presence of one-way causality from government revenue to government expenditure in the typical region. Lastly, the results of Markov Regime Switching model suggest that government expenditure has greater tendency to remain in the high regime while government revenue has higher probability of staying at the low regime as suggested by transition probabilities.

Sanusi (2020) listed three important policy recommendations. Firstly, the surge in the revenue should be adequately channelled to productive use and development projects. Secondly, the researcher recommended that the South African government should reinforce observing and appraisal units in all relevant policy institutions to monitor and assess the execution and implementation as well as to track deliverables decided on at policy coordination meetings. Thirdly, the researcher recommended that the government should toughen its medium-term forecast in order to cut waste and manage the growing expenditure. Lastly, Sanusi (2020) argued that fiscal policy reliability can only be achieved through an all-inclusive tax reform such as growing the tax base and sustaining an inflation-proof tax system, refining tax administration and collection, spending rationalization and privatisation of inefficient state enterprises.

The researcher has observed that all the countries that have been analysed in the studies, that have been unpacked in this sub section, have a budget deficit. It cannot be observed whether the budgets of these countries are sustainable.

2.4 Conclusion

This literature review chapter has laid the foundation for the dissertation, by analysing the different theoretical findings as well as the empirical findings by other researchers. It is important to highlight that quite a number of recommendations were made for each of the empirical studies, based on their unique fiscal position. However, there were also quite a lot of similarities in the recommendations that were made for some of the studies, even though the countries that were being analysed are vastly different economically. This is also evident in some of the recommendations that were made for South Africa, which are similar to those recommendations that have been were made for some European and Asian countries.

The nature of the dissertation and the variables that will be used in this dissertation may not be new. However, the in-depth analysis of the literature from South Africa has made it clear that there is a need for a newer study that will analyse the relationship between government revenue and government expenditure in the country. This is because even though there are several South

African studies that have observed the country's revenue-expenditure nexus, the findings that they have obtained are mixed. Most importantly none of the South African studies, that have been unpacked in the literature review, have thoroughly analysed the country's disaggregated government revenue and government expenditure patterns. Therefore, a newer study will be relevant because it will not only take into consideration the effects that the latest reforms have had on the country's revenue and expenditure patterns but will also make a recommendation on other reforms that can be implemented to improve the country's fiscal position, taking into consideration the disaggregated government revenue and government expenditure patterns.

Chapter 3: Methodology

3.1 Introduction

This chapter explains in detail the method that will be used to test and analyse data in the results and discussion chapter. The data source and the sample of the study will be identified and explained and most importantly the theoretical framework that is based on the work of researchers such as Hakkio and Rush (1991) will be used to justify the expected relationship between government revenue and government expenditure. Additionally, the types of tests that will be used to test for stationarity, co-integration, the long-run relationship and short-run relationship and causality will also be identified and explained in detail. Lastly, the diagnostic tests that will be conducted will also be identified and explained.

3.2 Sample period and variables description

The sample of annual time series from 1982 to 2019 will be used to analyse the relationship between government revenue and government expenditure in South Africa. The reason that the researcher has decided to use 1982 as the start date is because they want the study to also include the data that was obtained from the economic sanctions, which were instituted by the United States of America in 1986 against South Africa. The study could have used the latest data from 2020 as the end date. However, the researcher decided not to use it because South Africa was deeply affected by the Coronavirus pandemic throughout 2020. This, therefore, resulted to a structural break which affected the trend of most of the country's macroeconomic data. As a result, the researcher decided to use 2019 as the end date of the study.

Economic growth will also be included in the study as an additional variable. The reason for this is because it is one of the key drivers of the level of tax revenues that can be obtained by a country. According to Lundeen (2014), an increase in economic growth contributes to an increase in tax revenues and a decrease in economic growth contributes to a decrease in tax

revenues. The data on the government revenue and government expenditure variables will be obtained from the South African Reserve Bank (SARB) database. The presentation of the economic growth data on the SARB database rendered it unusable. Therefore, the data on the economic growth variable will be obtained from the Economic Research Federal Reserve Bank of St. Louis.

Economic growth will be proxied by real gross domestic product (GDP) at constant national prices, government expenditure will be proxied by national government expenditure as a percentage of GDP and government revenue will be proxied by national government revenue as a percentage of GDP. Since government expenditure and government revenue are expressed as a percentage of GDP, they do not need to be converted to log form. However, economic growth will need to be converted to log form, since the real GDP variable is expressed in millions of 2017 U.S. Dollars. Additionally, since annual data will be used, the variables do not need to be seasonally adjusted.

3.3 Theoretical framework

The theoretical framework that is based on the work by Hakkio and Rush (1991) argues that there is a positive causal relationship between revenue and expenditure. Therefore, an increase in government revenue leads to a greater than proportional increase in government expenditure, which ultimately results in a greater budget deficit than before. As a result, there is a positive relationship between government revenue and government expenditure.

3.4 Model specification

The model adopted is taken from the theoretical framework that is based on the work of researchers such as Hakkio and Rush (1991) and is presented by equation 3.1:

$$REV = a + bEXP + \mu_t \quad (3.1)$$

Where: REV is government revenue and GEXP is government expenditure. The constant is represented by a, while b represents the coefficient of government expenditure. μ_t represents the error disturbance.

Note: If b=1 the budget is sustainable and if b<1 the budget is unstainable

The relationship between government revenue and government expenditure is expected to be positive. This follows the theoretical framework that has been adopted by researchers such as Hakkio and Rush (1991) that suggests the increase in government expenditure should be determined by the level of government revenue. Given that Lundeen (2014) found that an increase in economic growth contributes to an increase in tax revenues, the relationship between government revenue and economic growth is expected to be positive.

3.5 Estimation technique

Considering that the dependent variable (GREV) may be related to its own lag values and to those of independent variables, a vector autoregressive model (VAR) will be used to examine the relationship between government revenue, government expenditure and gross domestic product. The empirical studies that were analysed in the literature review also played a significant role in the determination of the methodological approach that will be used in this study. According to Bonsu and Muzindutsi (2017), VAR is a fundamental step for a multivariate analysis including the co-integration test, Granger causality test and the impulse response analysis. The VAR model that will be used in this study is as follows:

$$GREV_t = \alpha_1 + \sum^{n}_{i=1} \beta_{1i} GREV_{t-i} + \sum^{n}_{i=1} \gamma_{1i} GEXP_{t-i} + \sum^{n}_{i=1} \lambda_{1i} LGDP_{t-i} + e_{1t} \quad (3.2)$$

$$GEXP_t = \alpha_2 + \sum^{n}_{i=1} \beta_{2i} GREV_{t-i} + \sum^{n}_{i=1} \gamma_{2i} GEXP_{t-i} + \sum^{n}_{i=1} \lambda_{2i} LGDP_{t-i} + e_{2t} \quad (3.3)$$

$$GDP_t = \alpha_3 + \sum^{n}_{i=1} \beta_{3i} GREV_{t-i} + \sum^{n}_{i=1} \gamma_{3i} GEXP_{t-i} + \sum^{n}_{i=1} \lambda_{3i} LGDP_{t-i} + e_{3t} \quad (3.4)$$

Where: t refers to the time period; β_i, γ_i and λ_i are the coefficients to be estimated; α_1, α_2, α_3 and are the intercepts; e_1, e_2 and e_3 are the error terms; and n is the number of lags in the VAR model.

3.5.1 Testing for stationarity

Before estimating the above equations, the stationarity tests must be employed to assess whether the variables are stationary at level or first difference. Brooks (2019) emphasised two important points regarding the stationarity of variables. Firstly, if a variable has a stationary mean, variance and covariances over time, then it is stationary. Secondly, Brooks (2019) emphasised that a series that is stationary has the power to influence its behaviour and properties. Weak stationary is the widely used form of stationary, where the mean, variance and covariance are constant over time:

$E(Y_t)$ = Constant over time (3.5)

$Var(Y_t)$ = Constant over time (3.6)

$Cov[(Y_t)(Y_{t+k})]$ = Constant over time with no correlation to other covariances (3.7)

If a time series variable does not possess any of the characteristics that are listed in equations above, then it is classified as a non-stationary series. A non-stationary time series has its own mean, variance and co-variances that keeps on changing over time. According to Duan and Yusupove (2010), it is problematic to work with a non-stationary time series because it contains different trends can lead to spurious results. The Augmented Dickey-Fuller (ADF) unit root test and the Phillips-Perron unit root test will be employed to test whether the variables are stationary at level or at first difference.

The initial work on unit root testing was founded by Dickey and Fuller (1979). The main objective of the DF test is to examine the null hypothesis that the estimated Ø is statistically equal to 1 or not. The DF test equation given below as:

$$\Delta Yt = \phi Y_{t-1} + \mu_t \quad (3.8)$$

Where Δ is the first difference and ϕ is (Ø-1)

If $\phi = 0$, then there is a unit root problem resulting in the series being non-stationary. This is because under the null hypothesis, the estimated coefficient Y_{t-1} has a t-value that does not follow the t-distribution even in large samples. This portrays that the t-value does not have an asymptotic normal distribution. Therefore, DF critical values of the tau (τ) statistic are used when deciding to reject or not to reject the null hypothesis.

One of the classical linear regression model assumptions is that the errors of term μ_t are uncorrelated and the DF test is grounded on that assumption. However, the DF test usually violates this assumption by showing evidence of serial correlation (Ssekuma, 2011). Therefore, to remedy this problem, Dickey and Fuller developed the Augmented Dickey-Fuller (ADF) test. The ADF test includes lags of differenced terms in a regression equation to make the error term (μ_t) white noise. The equation of the augmented Dickey- Fuller test is taken from Al-Khulafi (2012) and is as follows:

$$\Delta X_t = \varphi_0 + \varphi_{1t} + \varphi_2 X_{t-1} + \sum^{n}_{i=1} p_i \Delta X_{t-1} + \mu_t \quad (3.9)$$

Where: ΔX_t the first difference representation of the series being tested, n is the number of lagged difference and t is the trend of the series.

The null and alternative hypothesis of the ADF unit root test is as follows: H_0: series has a unit root (non-stationary); H_1: series is stationary. If the t-statistic is greater than the test critical value (tstatistic>tcritical value), then the null hypothesis that the series is non-stationary cannot be rejected. However, if the t-statistic is less than the test critical value (tstatistic<tcritical value) then the null hypothesis that the series is non-stationary is rejected. It can, therefore, be concluded that the series is stationary.

Phillip and Perron (1988) established a wide-ranging concept of unit root for non-stationarity. The Phillips-Perron unit root test is a follow up of the ADF unit root test. However, contrary

to the ADF unit root test, the Phillip-Perron test uses nonparametric method to solve serial correlation that often occurs among error terms with no inclusion of the lagged terms (Al-Khulaifi, 2012). Although there maybe differences the Phillips-Perron unit root test has similar characteristics as the ADF test. Therefore, these two tests often give the same results and simultaneously share the same weakness traits (Duan and Yusupov, 2010). The Phillips-Perron equation is given below as:

$$\Delta Y_t = \gamma + \beta_t + \delta Y_{t-1} + \mu_t \quad (3.10)$$

Where ΔY_t is the first difference representation of the series being tested, γ is the constant, β is the coefficient of t and δ is the lag order.

The null and alternative hypothesis of the Phillips-Perron unit root test is as follows: H_0: series has a unit root (non-stationary); H_1: series is stationary. If the adjusted t-statistic is greater than the test critical value (tstatistic>tcritical value), then the null hypothesis that the series is non-stationary cannot be rejected. However, if the adjusted t-statistic is less than the test critical value (tstatistic<tcritical value) then the null hypothesis that the series is non-stationary is rejected. It can, therefore, be concluded that the series is stationary.

Once the stationary tests have been undertaken, the next step is to run the Johansen co-integration test (consisting of the Trace test and the Max-Eigenvalue test) to test whether there is a long-run relationship between the variables. According to Engle and Granger (1987), if two or more variables that are in a linear regression move together at the same wavelength with errors that are in disequilibrium, then they are cointegrated. However, it is important to note that a cointegration relationship may be realised as an equilibrium occurrence or long-term occurrence. The reason for this is because, in the short run, cointegrating variables may portray a tendency to deviate from their relationship. However, in the in the long run the variables can return to equilibrium. Sere (2016) pointed out that in most cases, two variables cointegrate when they share a common order of integration I (d). Lastly, it is also important to highlight that the cointegrating parameters are called cointegrating vectors, when the variables are cointegrated after differencing (Verbeek, 2000).

3.5.2 Vector error correction model (VECM)

The VECM is a way of combining the short run relationship with the long run relationship. Furthermore, the vector error correction model includes both the long and the short run relationship that determine the behaviour of the relationship over time. This is because when variables are cointegrated then the errors of disequilibrium are stationary; implying that the error term will always pull back to zero without them increasing (Bonsu and Muzindutsi, 2017).

The VECM that will be used in this study is derived from the VAR model (outlined in equations 3.2, 3.3 and 3.4) and is as follows:

$$\Delta GREV_t = \alpha_1 + \sum^{n}_{i=1} \beta_{1i}\Delta GREV_{t-i} + \sum^{n}_{i=1} \gamma_{1i}\Delta GEXP_{t-i} + \sum^{n}_{i=1}\lambda_{1i}\Delta LGDP_{t-i} + \varphi_{1u1t-1} + e_{1t} \quad (3.11)$$

$$\Delta GEXP_t = \alpha_2 + \sum^{n}_{i=1} \beta_{2i}\Delta GREV_{t-i} + \sum^{n}_{i=1} \gamma_{2i}\Delta GEXP_{t-i} + \sum^{n}_{i=1}\lambda_{2i}\Delta LGDP_{t-i} + \varphi_{2u2t-1} + e_{2t} \quad (3.12)$$

$$\Delta GDP_t = \alpha_3 + \sum^{n}_{i=1} \beta_{3i}\Delta GREV_{t-i} + \sum^{n}_{i=1} \gamma_{3i}\Delta GEXP_{t-i} + \sum^{n}_{i=1}\lambda_{3i}\Delta LGDP_{t-i} + \varphi_{3u3t-1} + e_{3t} \quad (3.13)$$

Where: Δ is representing the first difference of the variables in the model; u1t-1, u2t-1, u3t-1 are error correction terms; while φ_1, φ_2 and φ_3 are error correction coefficients to capture the adjustments of change to long-run equilibrium.

3.5.3 Testing for cointegration

Johansen (1991) developed a multivariate procedure to test for cointegration because the Engle-Granger method (that was developed by Engle and Granger in 1987) is univariate or single equation model. A multivariate procedure can accommodate economic variables that

often contain more than two variables. There are four important steps that must be taken in order to successfully test for cointegration between the variables. The first step is to test if the variables are stationary. If the variables are tested for stationarity and a found to be integrated of the same order I (d), then this means that there exists a linear combination among the series. The linear combination is essential because it is responsible for establishing a long run equilibrium relationship, which results to the implementation of cointegration test.

The second step is to use the lag length criteria, to determine the appropriate number of lags that can be used in the study (based on the Akaike Information Criterion (AIC), Schwarz-Boyesian Information Criterion (SBIC), Hannah-Quinn (HQ), Final Prediction Error (FPE) and the Likelihood ratio). The second step also involves determining the rank of Π. It is important for the lagged terms to be chosen properly when estimating VAR because if too many lagged terms are included, this will result to the introduction of possible multicollinearity and will also result in the consumption of the degrees of freedom. On the other hand, if too few lagged terms are in included, this could result to specification errors. There are three possible cases that can determine the rank of Π. Eita and Mbazima (2008) listed these three possible cases in detail:

- Firstly, it is possible for the rank of Π to be zero. This arises in a case where all of the elements in the matrix Π are zero. This means that the time series is non-stationary and co-integration is not present (meaning that there is no long-run relationship between the variables). Therefore, the variables do no move together over time. As a result, in this case, the VAR in first differences I (1), involving no long-run elements, is the appropriate model to employ.

- Secondly, it is possible for the rank of Π to be full (rank=2). This arises when the system is stationary, and it is possible for the two variables to be modelled by VAR in levels. It represents a convergent system of equations, with all variables being stationary.
- Lastly, it is possible for the rank of Π to be reduced (rank=1). In this case, the level-based long-run component would be stationary, even if all of the variables are individual stationary at first difference I (1). In this case, there are n-1 cointegrating vectors and the VECM is the appropriate modelling methodology to employ.

The third step, that must be taken to successfully test for cointegration**,** is to analyse the number of cointegrating vectors in the long run and the speed of adjustment. There are two hypothesis tests that are used to determine the number of cointegrating vectors: the trace statistic and the max statistic. Masenyetse and Motelle (2012) have outlined the trace statistic test and the max statistic as follows:

$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} In(1 - \lambda i)$ (3.14)

$\lambda_{max}(r, r + 1) = -TIn(1 - \lambda r+1)$ (3.15)

Where r is the number of cointegrating vectors under the null hypothesis and λi is the estimated value for the ith ordered eigenvalue from the Π matrix. Intuitively, the larger the λi, the larger and more negative will be In (1 – λi) and hence the larger will be the test statistic. Each eigenvalue will have associated with it a different cointegrating vector, which will be an eigenvector. A significantly non-zero eigenvalue indicates a significant cointegrating vector (Brooks, 2008).

The null and alternative hypotheses of the Trace test are as follows: H_0: r=0 (No co-integrating equation); H_1: r>0 (More than zero co-integrating equations) and H_0: r=1 (At most one co-integrating equation); H_1: r>1 (More than one co-integrating equation). The null and alternative hypotheses of the Max-Eigenvalue test are as follows: H_0: r=0 (No co-integrating equation); H_1: r=1 (At most one co-integrating equation) and H_0: r=1 (At most one co-integrating equation); H_1: r= 2 (At most two co-integrating equations).

The fourth and final step is to determine the number of cointegrating vectors. The error correction model can be adopted as a multivariate approach, once the cointegration in the long run has been analysed. It will then be known as a vector error correction model (VECM).

Once the long-run output has been generated (based on the vector error correction estimates), t-statistics of the variables that will be used to examine whether variables are statistically significant or statistically insignificant. The null hypothesis of the significance test is as follows H_0: Variable is statistically insignificant; H_1: Variable is statistically significant.

3.5.4 VECM Granger causality

This dissertation makes use of the VEC Granger Causality/ Block Exogeneity Wald test to analyse the causality between the variables. According to Granger (1969), the Granger causality test is based on the notion that the future cannot predict the past. However, it is rather the past that determines the future. The VEC Granger Causality/ Block Exogeneity Wald model as expressed by Granger (1969) is as follows:

$$\Delta X_t = \beta_0 + \sum^{n}_{i=1} \beta_1 \Delta X_{t-1} + \sum^{m}_{i=1} \beta_2 \Delta Y_{t-1} + \beta_3 ECT_{t-1} + \varepsilon_{1t} \quad (3.16)$$

$$\Delta Y_t = \delta_0 + \sum^{n}_{i=1} \delta_1 \Delta Y_{t-1} + \sum^{m}_{j=1} \delta_2 \Delta Y_{t-j} + \delta_3 ECT_{t-1} + \varepsilon_{2t} \quad (3.17)$$

Where: β and δ are short-run parameters which will be tested using the Wald χ^2 test in the VECM, ECT is the error correction term of the cointegrating equation and ε is a disturbance term.

The null and alternative hypothesis of the VEC Granger Causality/ Block Exogeneity Wald test is as follows: H_0: X does not Granger cause Y; H_1: X does Granger cause Y

In a regression where Y is the dependent variable and it is regressed against other independent variables (X), the following cases might arise. Firstly, X is said to Granger cause Y if the independent variable (X) can have a meaningful improvement on the prediction of Y. In other words, if variable X Granger causes Y, then this means that the changes in the variable X will lead to changes in the variable Y. Secondly, Y is said to Granger cause X if the dependent variable (Y) can have a meaningful improvement on the prediction of X. In other words, if variable Y Granger causes X this means that the changes in variable Y will lead to changes in variable X. Thirdly, there can be a bi-directional causality between the variables (where the Y variable Granger causes the X variable and where the X variable Granger causes the Y variable). Lastly, it possible for a situation to arise where there is no causality between the Y variable and the X variable.

3.5.5 Impulse response and variance decomposition

Once the VECM has been estimated, short-run dynamics can be estimated by considering the impulse response functions (IRF). According to Brooks (2008), the Granger causality test plays a crucial role in suggesting which variables have statistically significant impacts on the future values of each of the variables in the model. However, the results of this tests are unable to explain the sign of the relationship. In other words, the test is unable to state whether changes in the value of a variable will result in a negative or positive effect to the other variables in the system. It also cannot give an indication as to how long the effect lasts within the system. Therefore, the impulse response by Lütkepohl and Reimers (1992) and the variance decompositions by Mellander et al. (1992) will be analysed.

Impulse response functions play an important role by demonstrating how a variable reacts to its own shock and the shocks of other variables. In other words, this means that a shock to a variable in a model will not only directly affect that specific variable, but it will also affect other endogenous variables because it gets transmitted through the system in a dynamic structure of a model (Lütkepohl and Reimers, 1992). The impulse response functions also play an important role because they show the average period that it takes for the variable to be restored to equilibrium after a shock has taken place. In the system, the shock will gradually die away when stability is achieved (Lütkepohl and Reimers, 1992).

According to Kaabia, Gil and Chebbi (2002), the impulse response functions should be calculated from the Moving Average Representation of the VECM by making use of the following formular (as outlined by Lütkepohl (1993)):

$$Zt = \sum^{\infty}{}_{i=0} B_i \varepsilon_t \qquad (3.18)$$

Where matrices B_i (i=2,…n) are recursively calculated using the following expression: $B_n = \Phi_1 B_{n-1} + \Phi_2 B_{n-2} + \ldots + \Phi_k B_{n-p}$; $B_0 = I_{p;}\, B_n = 0$

For n<0 ; $\Phi_1 = 1 + \Pi + \Psi_1$; and $\Phi_i = \Psi_i - \Psi_{i-1}$ (i= 2,…,k)

Additionally, the variance decompositions will be generated in order to further explore the short-run relationships between the variables that will be used in this dissertation. A forecast

error variance decomposition- or just variance decomposition for short- is a way to quantify how important each shock is in explaining the variation in each of the variables in the system (Brooks, 2008). It is equal to the fraction of the forecast error variance of each variable due to each shock at each horizon. Let $\omega_{i,j}(h)$ be the forecast error variance of variable i due to shock j at horizon h. This is:

$$\omega_{i,j}(h) = \sum^{h}_{k=0} C_{i,j}(k)^2 \quad (3.19)$$

The fraction of the forecast error variance of variable i due to shock j at horizon h, denoted $\phi_{i,j}(h)$, is then the above divided by the total forecast error variance:

$$\Phi_{i,j}(h) = \frac{\omega i,j\,(h)}{\Omega i\,(h)} = \frac{\sum h\ k=0 Ci,j\,(k)2}{\sum h\ k=0 \sum n\ j=1 Ci,j\,(k)2} \quad (3.20)$$

It is worth noting that variance decompositions are slightly different from the impulse responses because they measure the percentage of the forecast error variance of a variable that is explained by exogenous shocks (impulses) to other variables in the system. Furthermore, the variance decomposition can determine and explain forecast error variance by innovations to each independent variable in a model (Mellander et al, 1992).

3.5.6 Diagnostic tests

Lastly, the diagnostic tests will be conducted, to validate the robustness of the results and test if the established relationships are stable over time. The diagnostic tests consist of the following tests: the normality test (Null and alternative hypothesis: H_0: Residuals are normally distributed; H_1: Residuals are not normally distributed), the auto correlation test (Null and alternative hypothesis: H_0: No serial correlation; H_1: Serial correlation is present) and the heteroskedasticity test (Null and alternative hypothesis: H_0: Heteroskedasticity is not present; H_1: Heteroskedasticity is present).

3.6 Descriptive statistics

Descriptive statistics are very important because they summarise data and provide a method to convey impressions about the data that will be used in a particular study (Vetter and Anlag, 2017).

Table 3.1 Descriptive statistics

	GREV	GEXP	LGDP
Mean	23.15789	26.35789	13.09690
Median	23.25000	26.30000	13.04112
Maximum	26.00000	32.20000	13.50457
Minimum	20.20000	22.30000	12.72709
Std. Dev.	1.672937	2.322467	0.275774
Skewness	0.100661	0.400598	0.211034
Kurtosis	2.073130	2.565469	1.471122
Jarque-Bera	1.424395	1.315324	3.983048
Probability	0.490565	0.518061	0.136487
Sum	880.0000	1001.600	497.6820
Sum Sq. Dev.	103.5526	199.5726	2.813902
Observations	38	38	38

Source: SARB and the Economic Research Federal Reserve Bank of St. Louis (2021), own calculations

The most important information from the table above is the information that is presented by the Skewness, Kurtosis and Jarque-Bera values. Skewness is a measure of asymmetry of the distribution of the series around its mean (Dugar, 2018). The skewness values of GREV, GEXP and LGDP all lie between -0.5 and 0.5. Therefore, the variables are fairly symmetrical. The Kurtosis value measures the peakedness or flatness of the distribution of a series (Taylor, 2019). A Kurtosis value of three means that the distribution is normally distributed, a value less than three means that the distribution is flat and a value above three means that distribution is peaked. The Kurtosis value of GREV, GEXP and LGDP is less than three. Therefore, the variables have a flat (platykurtic) distribution.

The Jarque-Bera statistic tests whether each variable is normally distributed (Brooks, 2019). The null and alternative hypothesis of the Jarque-Bera test is as follows: H_0: Variable is normally distributed; H_1: Variable is not normally distributed. The Jarque-Bera probability of GREV is 0.490565, the Jarque-Bera probability of GEXP is 0.518061 and the Jarque-Bera probability of LGDP is 0.136487. Therefore, the null hypothesis cannot be rejected at all significance levels for all of the variables. It is concluded that GREV, GEXP and LGDP are normally distributed.

After the econometric analysis has been presented, the dissertation will go an extra step by analysing the disaggregated expenditure and revenue patterns. The reason that this will be done is because the researcher wants to examine the effects that the different types of expenditure and revenue have on South Africa's fiscal position. Further policy recommendations will be made based on the trends of the data that have been observed from the disaggregated expenditure and revenue patterns.

3.7 Conclusion

This chapter explained in detail the method that will be used this study to test and analyse data in the following chapter. It began by explaining the data source, the study sample and gave a summary of the expected signs of the variables. The theoretical framework by Friedman (1978) was used to justify why a positive relationship is expected between government revenue and government expenditure. Additionally, it explained in detail the types of tests that will be used to test for stationarity, co-integration, the long-run relationship and short-run relationship and causality. Lastly, it also listed the diagnostic tests that will be performed and unpacked the key components of the descriptive statistics of each of the variables, that will be used in this study.

Chapter 4: Results and discussion

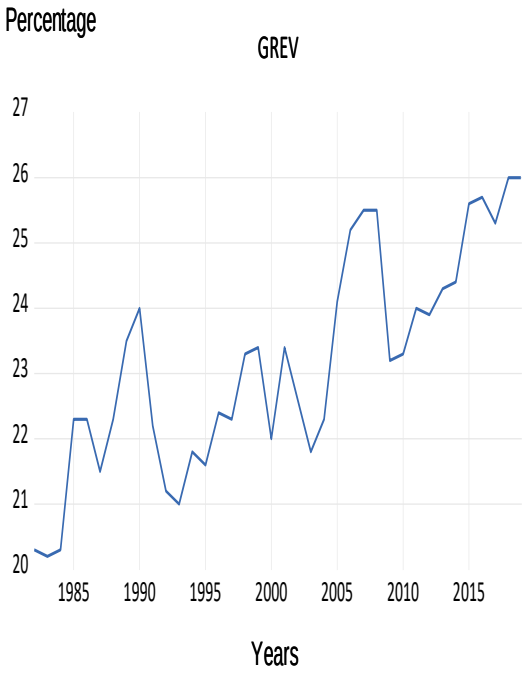
4.1 Introduction

This chapter analyses the relationship between government revenue and government expenditure in South Africa, using the methodological framework that was unpacked in the previous chapter. It seeks to determine whether the variables are co-integrated, analyse the long-run and short-run relationship between the variables and assess the causality between the variables.

4.2 Graphs of the individual variables

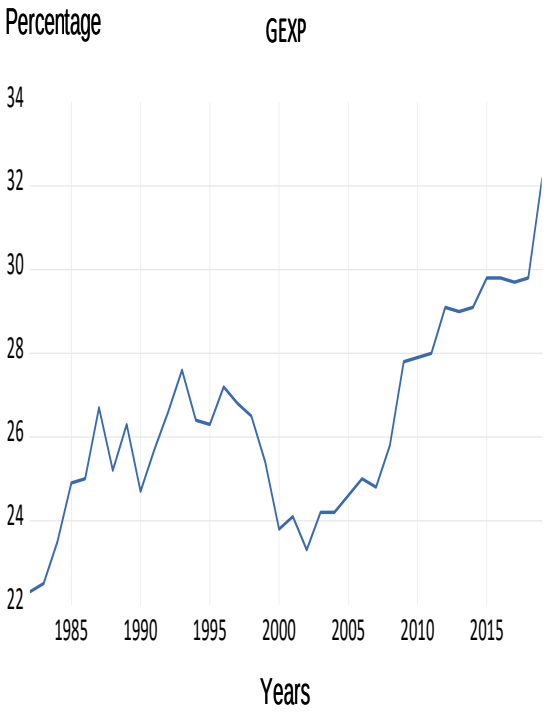
The graphs below indicate that GREV, GEXP and LGDP are upward trending. Therefore, the variables are non-stationary. As a result, the Augmented Dicky-Fuller unit root test and the Phillips-Perron unit root test will be conducted to test whether the variables are rather stationary at first difference.

Figure 4.1 Upward trending GREV variable



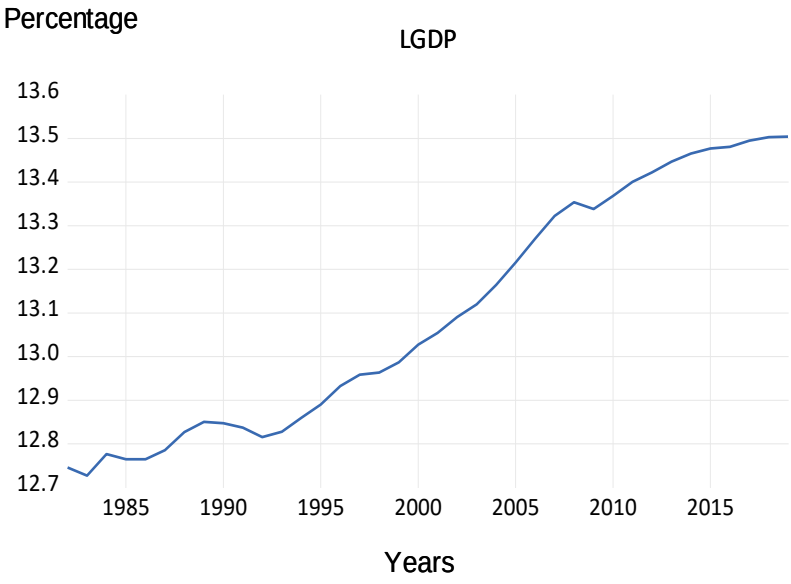
Source: Own analysis 2021

Figure 4.2 Upward trending GEXP variable



Source: Own analysis 2021

Figure 4.3 Upward trending LGDP variable



Source: Own analysis 2021

4.3 Testing for stationarity (using the Augmented Dickey-Fuller (ADF) unit root test and the Phillips-Perron unit root test)

Table 4.1 Augmented Dicky-Fuller unit root test output

Level		**First difference**	
Variable	Test critical values	Variable	Test critical values
GREV t-statistic: -1.759904	1% Level: -3.621023 5% Level: -2.943427 10% Level: -2.610263	GREV t-statistic: -5.712628	1% Level: -3.626784 5% Level: -2.945842 10% Level: -2.611531
GEXP t-statistic: -0.592642	1% Level: -3.621023 5% Level: -2.943427 10% Level: -2.610263	GEXP t-statistic: -6.278203	1% Level: -3.626784 5% Level: -2.945842 10% Level: -2.611531
LGDP t-statistic: -0.387341	1% Level: -3.621023 5% Level: -2.943427 10% Level: -2.610263	LGDP t-statistic: -4.359095	1% Level: -3.626784 5% Level: -2.945842 10% Level: -2.611531

Source: Own analysis 2021

The Augmented Dicky-Fuller unit root test finds that, at level, the t-statistic of GREV is greater than the test critical values at all significance levels (i.e. -1.759904 > -3.621023 (1 percent significance level); -1.759904 > -2.943427 (5 percent significance level) and -1.759904 > -2.610263 (10 percent significance level)). Therefore, the null hypothesis that the variable has a unit root cannot be rejected at all significance levels. It can be concluded that GREV is non-stationary at level. However, at first difference, the t-statistic of GREV is less than the test critical values at all significance levels (i.e. -5.712628 < -3.626784 (1 percent significance level); -5.712628 < -2.945842 (5 percent significance level) and -5.712628 < -2.611531 (10 percent significance level). Therefore, the null hypothesis that the variable has a unit root is rejected at all significance levels. It can be concluded at GREV is stationary at first difference.

At level, the t-statistic of GEXP is greater than the test critical values at all significance levels (i.e -0.592642 > -3.621023 (1 percent significance level); -0.592642 > -2.943427 (5 percent significance level) and -0.592642 > -2.610263 (10 percent significance level)). Therefore, the null hypothesis that the variable has a unit root cannot be rejected at all significance levels. It can be concluded that GEXP is non-stationary at level. However, at first difference, the t-statistic of GEXP is less than the test critical values at all significance levels (i.e. -6.278203 < -3.626784 (1 percent significance level); -6.278203 < -2.945842 (5 percent significance level) and -6.278203 < -2.611531 (10 percent significance level). Therefore, the null hypothesis that the variable has a unit root is rejected at all significance levels. It can be concluded at GEXP is stationary at first difference.

Lastly, the Augmented Dicky-Fuller unit root test finds that at, level, the t-statistic of LGDP is greater than the test critical values at all significance levels (i.e -0.387341 > -3.621023 (1 percent significance level); -0.387341 > -2.943427 (5 percent significance level) and -0.387341 > -2.610263 (10 percent significance level)). Therefore, the null hypothesis that the variable has a unit root cannot be rejected at all significance levels. It can be concluded that LGDP is non-stationary at level. However, at first difference, the t-statistic of LGDP is less than the test critical values at all significance levels (i.e. -4.359095 < -3.626784 (1 percent significance level); -4.359095 < -2.945842 (5 percent significance level) and -4.359095 < -2.611531 (10 percent significance level). Therefore, the null hypothesis that the variable has a unit root is rejected at all significance levels. It can be concluded at LGDP is stationary at first difference.

Table 4.2 Phillips-Perron unit root test output

Level		**First difference**	
Variable	Test critical values	Variable	Test critical values
GREV Adj. t-statistic: -1.497444	1% Level: -3.621023	GREV Adj. t-statistic: -8.179464	1% Level: -3.626784
	5% Level: -2.943427		5% Level: -2.945842
	10% Level: -2.610263		10% Level: -2.611531
GEXP Adj. t-statistic: -0.592642	1% Level: -3.621023	GEXP Adj. t-statistic: -6.280461	1% Level: -3.626784
	5% Level: -2.943427		5% Level: -2.945842
	10% Level: -2.610263		10% Level: -2.611531
LGDP Adj. t-statistic: 0.241330	1% Level: -3.621023	LGDP Adj. t-statistic: -4.417377	1% Level: -3.626784
	5% Level: -2.943427		5% Level: -2.945842
	10% Level: -2.610263		10% Level: -2.611531

Source: Own analysis 2021

The Phillips-Perron unit root test finds that, at level, the adj. t-statistic of GREV is greater than the test critical values at all significance levels (i.e. -1.497444 > -3.621023 (1 percent significance level); -1.497444 > -2.943427 (5 percent significance level) and -1.497444 > -2.610263 (10 percent significance level)). Therefore, the null hypothesis that the variable has a unit root cannot be rejected at all significance levels. It can be concluded that GREV is non-stationary at level. However, at first difference, the adj. t-statistic of GREV is less than the test critical values at all significance levels (i.e. -8.179464 < -3.626784 (1 percent significance level); -8.179464 < -2.945842 (5 percent significance level) and -8.179464 < -2.611531 (10 percent significance level). Therefore, the null hypothesis that the variable has a unit root is rejected at all significance levels. It can be concluded at GREV is stationary at first difference.

At level, the adj. t-statistic of GEXP is greater than the test critical values at all significance levels (i.e. -0.592642 > -3.621023 (1 percent significance level); -0.592642 > -2.943427 (5 percent significance level) and -0.592642 > -2.610263 (10 percent significance level)). Therefore, the null hypothesis that the variable has a unit root cannot be rejected at all significance levels. It can be concluded that GEXP is non-stationary at level. However, at first difference, the adj. t-statistic of GEXP is less than the test critical values at all significance levels (i.e. -6.280461 < -3.626784 (1 percent significance level); -6.280461 < -2.945842 (5 percent significance level) and -6.280461 < -2.611531 (10 percent significance level). Therefore, the null hypothesis that the variable has a unit root is rejected at all significance levels. It can be concluded at GEXP is stationary at first difference.

Lastly, the Phillips-Perron unit root test finds that at, level, the adj. t-statistic of LGDP is greater than the test critical values at all significance levels (i.e 0.241330 > -3.621023 (1 percent significance level); 0.241330 > -2.943427 (5 percent significance level) and 0.241330 > -2.610263 (10 percent significance level)). Therefore, the null hypothesis that the variable has a unit root cannot be rejected at all significance levels. It can be concluded that LGDP is non-stationary at level. However, at first difference, the adj. t-statistic of LGDP is less than the test critical values at all significance levels (i.e. -4.417377 < -3.626784 (1 percent significance level); -4.417377 < -2.945842 (5 percent significance level) and -4.417377 < -2.611531 (10 percent significance level). Therefore, the null hypothesis that the variable has a unit root is rejected at all significance levels. It can be concluded at LGDP is stationary at first difference.

The ADF unit root test and the Phillips-Perron unit root test results show that GREV, GEXP and LGDP are not stationary at level, but are stationary at first difference. This indicates that all variables are integrated of order one (I(1)). It is, therefore, appropriate to proceed to test for cointegration.

4.4 Analysis of the long-run relationship

It is vital to use the lag selection criteria to determine the number of the lags in the VAR before the Johansen co-integration test is performed.

4.4.1 Lag selection

Table 4.3 VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-105.4372	NA	0.176181	6.777325	6.914737	6.822873
1	17.45440	215.0603*	0.000143	-0.340900	0.208751*	-0.158706*
2	26.97783	14.88036	0.000141*	-0.373614*	0.588275	-0.054775
3	31.49630	6.212898	0.000195	-0.093519	1.280609	0.361966
4	37.64497	7.301545	0.000254	0.084689	1.871055	0.676819
5	44.53886	6.893892	0.000335	0.216321	2.414925	0.945096
6	52.12910	6.167066	0.000466	0.304432	2.915274	1.169852

Source: Own analysis 2021
Note: LR: sequential modified LR test statistic (each test at 5 percent level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion

The above output, that has been obtained in the VAR lag order selection criteria table, shows that there is a mixture of results. The LR test statistic, the Schwarz information criterion (SC) and the Hannan-Quinn criterion (HQ) suggest that one lag is the optimal number of lags that should be used in this study. On the other hand, the Final prediction error (FPE) and the Akaike information criterion (AIC) suggest that two lags are the optimal number of lags that should be used in this study.

Given this discrepancy, it is necessary to consider the sample size and the properties of AIC, FPE, HQ and SC criteria. The HQ and the SC are the most appropriate to use in a large sample because of the consistency characteristic that they possess. However, the AIC and the FPE are the most appropriate to use in a small sample because of the efficiency characteristic that they possess (Brooks, 2019). A sample of 38 annual observations can be considered large from a time-series perspective. Therefore, one lag (which is obtained from the HQ and the SC) will be used when estimating the Johansen co-integration test.

4.4.2 Johansen co-integration test

The Johansen co-integration test is used to test whether the variables are co-integrated. Should co-integration be present, this will mean that there is a long-run relationship between the variables.

Table 4.4 Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.451241	35.66054	29.79707	0.0094
At most 1	0.313767	14.05708	15.49471	0.0814
At most 2	0.013841	0.501739	3.841465	0.4787

Source: Own analysis 2021

Note: * Denotes rejection of the hypothesis at the 0.05 level

** Denotes the Mackinnon-Haug-Michelis (1999) p-values

Under the null hypothesis of no co-integrating equation, the Trace statistic is greater than the critical value at the 5 percent significance level (35.66054>29.79707). Therefore, the null hypothesis of no co-integrating equation is rejected at the 5 percent significance level. The P-value of 0.0094 (0.94 percent) further proves that the null hypothesis of no co-integrating equation should be rejected at the 5 percent significance level. Therefore, it can be concluded that there are more than zero co-integrating equations. Under the null hypothesis of at most one co-integrating equation, the Trace statistic is less than the critical value at the 5 percent significance level (14.05708<15.59471). Therefore, the null hypothesis of at most one co-integrating equation cannot be rejected at the 5 percent significance level. The P-value of 0.0814 (8.14 percent) further proves that the null hypothesis of at most one co-integrating equation should not be rejected at a 5 percent significance level. Therefore, it can be concluded that there is at most one co-integrating equation.

Table 4.5 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.451241	21.60346	21.13162	0.0429
At most 1	0.313767	13.55534	14.26460	0.0645
At most 2	0.013841	0.501739	3.841465	0.4787

Source: Own analysis 2021

Note: * Denotes rejection of the hypothesis at the 0.05 level

** Denotes the Mackinnon-Haug-Michelis (1999) p-values

Under the null hypothesis of no co-integrating equation, the Max-Eigen statistic is greater than the critical value at the 5 percent significance level (21.60346>21.13162). Therefore, the null hypothesis of no co-integrating equation is rejected at the 5 percent significance level. The P-value of 0.0429 (4.29 percent) further proves that the null hypothesis of no co-integrating equation is rejected at the 5 percent significance level. Therefore, it can be concluded that there is at most one co-integrating equation. Under the null hypothesis of at most one co-integrating equation, the Max-Eigen statistic is less than the critical value at the 5 percent significance

level (13.55534<14.26460). Therefore, the null hypothesis of at most one co-integrating equation cannot be rejected. The P-value of 0.0645 (6.25 percent) further proves that the null hypothesis cannot be rejected at the 5 percent significance level.

The results that have been obtained from the Trace test and the Maximum Eigenvalue test confirm that there is one co-integrating equation. This, therefore, implies that there is a long-run relationship between government expenditure, government revenue and gross domestic product.

4.4.3 Long-run relationship

Given that the stationary test found that the series are stationary at first difference and that the Johansen co-integration test found that there is co-integration between the variables, the Vector Error Correction Model (VECM) will be used to analyse the long-run relationship between the macroeconomic variables that are used in this study.

Table 4.6 Vector Error Correction Estimates: Long-run output

Variable	Coefficient	Standard Error	t-statistic
GREV (-1)	1.000000	_	_
GEXP (-1)	-0.001956	0.10641	-0.01838
LGDP (-1)	-4.617741	0.80496	-5.73664
C	37.36396	_	_

Source: Own analysis 2021

Note: The included number of observations is 36 after adjustments

The long-run relationship, presented in the above table, between GREV, GEXP and LGDP for the annual period from 1982 to 2019 can be summarised in an equation as follows:

$$GREV - 0.001956GEXP - 4.617741LGDP + 37.36396 = 0 \quad (4.1)$$

$$GREV = 0.001956GEXP + 4.617741LGDP - 37.36396 \quad (4.2)$$

The long-run relationship output indicates that there is a positive relationship between government revenue and government expenditure in South Africa. Additionally, it also indicates that there is a positive relationship between government revenue and gross domestic product in South Africa. Equation 4.2 shows that on average, a 1 percent increase in government expenditure will result in a 0.0020 percent increase in government revenue, ceteris paribus (c.p). This result endorses the theoretical framework that has been quoted by other researchers by Hakkio and Rush (1991), which states that there is a positive relationship between government expenditure and government revenue. This result is also similar to the one that was found by other South African studies such as Sere (2016), Ndahiriwe and Gupta (2010) and Nyamango et al (2007). Equation 4.2 also shows that on average, a 1 percent increase in gross domestic product will result in a 4.618 percent increase in government revenue, c.p. Therefore, as the economy grows, the government will gain more revenue in the long-run. It is important to also note that all of the variables have the expected signs which were outlined in the methodology chapter.

Additionally, it is important to note that the t-statistic of GEXP is greater than the critical value of the t-distribution at all significance levels (i.e -0.01838 > -2.7238 (1 percent significance level); -0.01838 > -2.0301 (5 percent significance level) and -0.01838 > -1.6896 (10 percent significance level)). Therefore, the null hypothesis that GEXP is statistically insignificant cannot be rejected. The t-statistic of LGDP is less than the critical value of the t-distribution at all significance levels (i.e - 5.73664 < -2.7238 (1 percent significance level); - 5.73664 < -2.0301 (5 percent significance level) and - 5.73664 < -1.6896 (10 percent significance level)). Therefore, the null hypothesis that LGDP is statistically insignificant is rejected at all significance levels. It can be concluded that LGDP is statistically significant.

4.5 Analysis of the short-run relationship

The error correction model represents the short-run dynamic relationship between GREV and the two independent variables (GEXP and LGDP), in which the error correction term incorporates the long-run information by showing the speed of adjustment to the long-run equilibrium relationship.

Table 4.7 Error Correction Model results: Short-run relationship

Error Correction:	D(GREV)	D(GEXP)	D(LGDP)
CointEq1	-0.655326	0.020231	-0.010008
	(0.16240)	(0.22308)	(0.00406)
	[-4.03521]	[0.09069]	[-2.46532]

Source: Own analysis 2021

Note: The figures in round brackets are the standard error and the figures in square brackets are the t-statistics

The above error correction results from the VECM estimates show that only two variables, D(GREV) and D(LGDP), have the desired negative sign. The two-tailed t-test is used to test for the significance of the variables. Therefore, since there are 36 observations, the critical value of +/- 2.0301 will be used to test for significance at a 5% significance level. D(GREV) is significant since its t-statistic of -4.03521 is more negative than the critical value of -2.0301. D(LGDP) is also significant since its t-static value of -2.46532 is more negative than the critical value of -2.0301.

Table 4.7 shows that the coefficient of D(GREV) is -0.655326. This coefficient implies that the speed of adjustment is 65.533 percent. Therefore, this means that if there is deviation from equilibrium, only 65.533 percent is corrected in each year as the variable D(GREV) moves towards restoring equilibrium. It is also important to note that the coefficient of D(LGDP) is -0.010008. This coefficient implies that the speed of adjustment is 1.001 percent. Therefore, this means that if there is deviation from the equilibrium, only 1.001 percent is corrected in each year as the variable D(LGDP) moves towards restoring equilibrium.

On the other hand, D(GEXP) has a positive error correction term in the short-run. Therefore, this means that the co-integrating equation exhibits an explosive characteristic, which indicates that any deviations from the equilibrium of the co-integrating equation will not be restored for this variable and will, instead, move further away from the equilibrium.

4.6 Vector Error Correction Granger Causality output

One of the critical aspects of this study is to determine whether there is causality between the variables. The VEC Granger-causality test is a statistical model that will be used to analyse the causality in this study.

Table 4.8 Causality test (VEC Granger causality)

Dependent variable: D(GREV)			
Excluded	Chi-sq	df	Prob.
D(GEXP)	0.180474	1	0.6710
D(LGDP)	3.850160	1	0.0497
Dependent variable: D(GEXP)			
Excluded	Chi-sq	df	Prob.
D(GREV)	0.394454	1	0.5300
D(LGDP)	0.068805	1	0.7931
Dependent variable: D(LGDP)			
Excluded	Chi-sq	df	Prob.
D(GREV)	0.976993	1	0.3229
D(GEXP)	0.406396	1	0.5238

Source: Own analysis 2021

When GREV is the dependent variable, the p-value of GEXP is 0.6710 (67.10 percent), which is greater than the 5 percent significance level. Therefore, the null hypothesis that government expenditure does not Granger cause government revenue cannot be rejected. It can be concluded that there is no causality that runs from government expenditure to government revenue. However, the p-value of LGDP is 0.0497 (4.97 percent), which is less than the 5 percent significance level. Therefore, the null hypothesis that gross domestic product does not Granger cause government revenue is rejected. It can be concluded that gross domestic product Granger cause government revenue.

When GEXP is the dependent variable, the p-value of GREV is 0.3229 (32.29 percent), which is greater than the 5 percent significance level. Therefore, the null hypothesis that government revenue does not Granger cause government expenditure cannot be rejected. It can be concluded that there is no causality that runs from government revenue to government expenditure. The p-value of LGDP is 0.7931 (79.31 percent), which is greater than the 5 percent significance level. Therefore, the null hypothesis that gross domestic product does not Granger cause government expenditure cannot be rejected. It can be concluded that there is no causality that runs from gross domestic product to government expenditure.

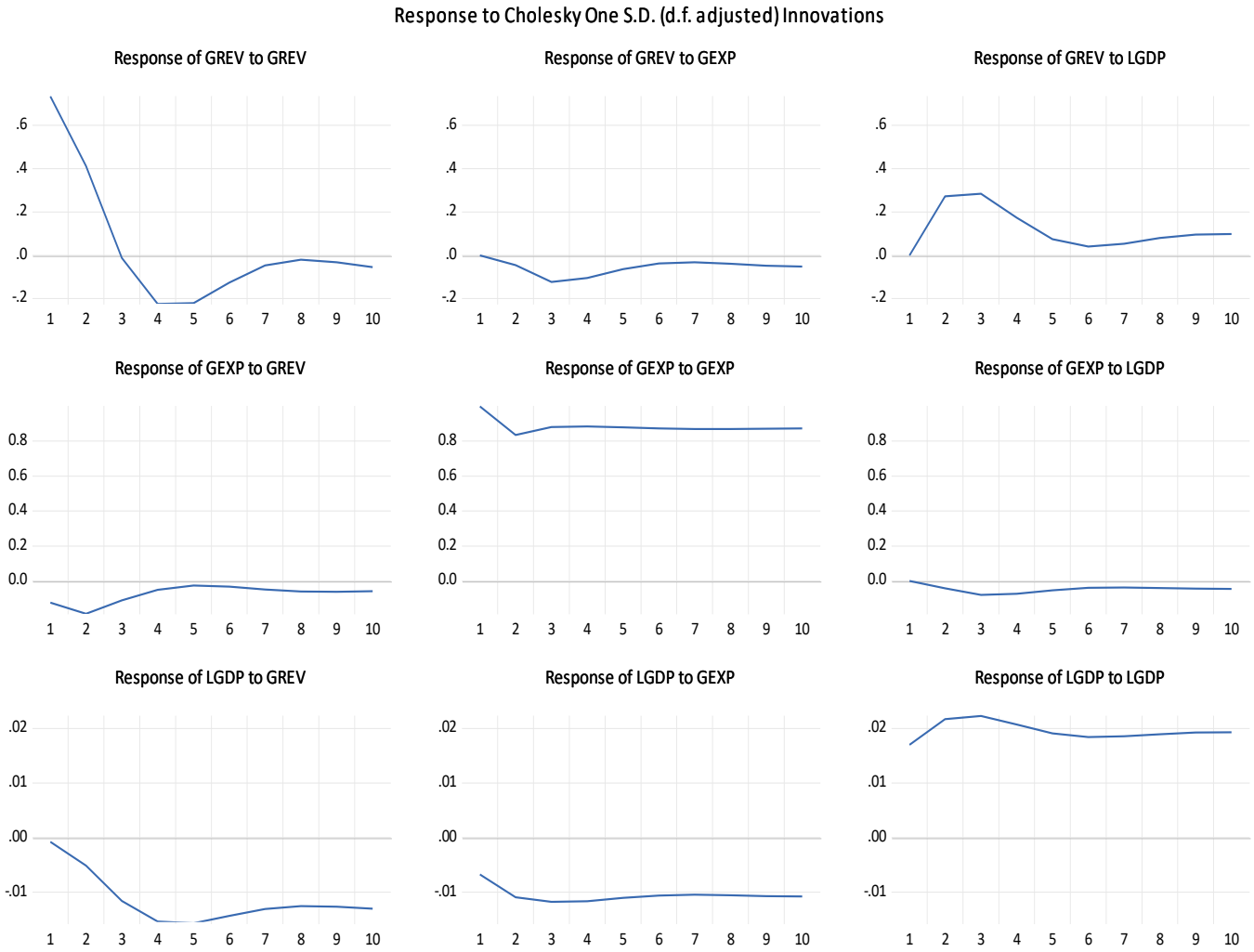
The Granger causality findings of this study endorse the fiscal neutrality hypothesis by Baghestani and McNown (1994) since there is no causal relationship between government and government expenditure. This Granger causality finding is similar to Nyamango et al. (2007) and Sere (2016), which have also examined the relationship between government revenue and government expenditure in South Africa.

When LGDP is the dependent variable, the p-value of GREV is 0.3229 (32.29 percent), which is greater than the 5 percent significance level. Therefore, the null hypothesis that government revenue does not Granger cause gross domestic product cannot be rejected. It can be concluded that there is no causality that runs from government revenue to gross domestic product. However, the p-value of GEXP is 0.5238 (52.38 percent), which is greater than the 5 percent significance level. Therefore, the null hypothesis that government expenditure does not Granger cause gross domestic product cannot be rejected. It can be concluded that there is no causality that runs from government expenditure to gross domestic product.

4.7 Impulse response functions

Figure 4.4, below, displays the impulse response of the variables in the study over a ten-year period. The impulse response functions play a critical role in determining how the variables react to its own shock as well as to the shocks of other variables.

Figure 4.4 Impulse response graphs



Source: Own analysis 2021

GREV

The impulses response of GREV to itself shows that initially there is an immediate, positive shock that is significant. However, from period three up until period four, the shock becomes negative. From period five, there is a slight increase. The shock stabilises and becomes constant from period seven. However, it remains negative and insignificant. The impulse response of GREV to GEXP shows that initially, there is no immediate shock. However, there is a decrease after period one until period three. After period three, there is a slight increase. The shock stabilises and remains constant from period six. Nonetheless, it remains negative and

insignificant. The impulse response of GREV to LGDP shows that there is no immediate shock. However, there is an increase after period one until period three. After period three, there is a slight decrease, which dies down, and the shock remains constant from period six.

GEXP

The impulse response of GEXP to GREV shows that there is initially an immediate, negative shock that is insignificant. From period two, there is a slight increase. The shock stabilises and becomes constant from period five. However, it remains negative and insignificant. The impulse response of GEXP to itself shows that initially there is an immediate, positive shock that is significant. However, after period one until period two, there is a slight decrease and after period two, there is a slight increase. The shock stabilises and remains constant from period 3. The impulse response of GEXP to LGDP shows that there is a no immediate shock. From period one until period three, there is a slight decrease and after period three, there is a slight increase. The shock stabilises and becomes constant from period six. However, it remains negative and insignificant.

LGDP

The impulse response of LGDP to GREV shows that initially there is a slight immediate, negative shock that is insignificant. After period one, there is a decrease until period four and from period five, there is an increase. The shock stabilises and becomes constant from period seven. However, it remains negative and insignificant. The impulse response of LGDP to GEXP shows that initially there is an immediate, negative shock that is insignificant. After period one, there is a decrease until period three and there is a slight increase from period four. The shock stabilises and becomes constant from period five. However, it remains negative and insignificant. The impulse response of LGDP to itself shows that initially there is an immediate, positive shock that is significant. From period three until period five, there is a slight decrease. However, from period five, the shock stabilises and remains constant.

4.8 Variance decomposition

Table 4.9 to table 4.11 displays the variance decompositions of the variables under the study over a 10-year forecast horizon. Variance decompositions are slightly different from the impulse responses because they measure the percentage of the forecast error variance of a variable that is explained by exogenous shocks (impulses) to other variables in the system.

Table 4.9 Variance Decomposition of GREV

Period	S.E.	GREV	GEXP	LGDP
1	0.732725	100.0000	0.000000	0.000000
2	0.884735	90.30089	0.258379	9.440729
3	0.937635	80.41746	1.962204	17.62033
4	0.984932	78.04379	2.892211	19.06400
5	1.014225	78.34828	3.123131	18.52859
6	1.023468	78.45494	3.196732	18.34833
7	1.026373	78.21601	3.273518	18.51048
8	1.030361	77.65007	3.390633	18.95930
9	1.036425	76.84307	3.559934	19.59699
10	1.043825	76.03116	3.752210	20.21663

Source: Own analysis 2021

In period one, 100 percent of the variation in GREV is caused by shocks to itself. GEXP and LGDP do not cause a shock to GREV in period one. In period two, 90.301 percent is attributed to changes in GREV, while 0.258 percent is attributed to changes in GEXP and 9.441 percent is attributed to changes in LGDP. As the number of periods begin to increase, the percentage that GREV attributes to changes in itself begins to decrease. However, it still attributes a larger percentage compared to the other variables. On the other hand, as the number of periods begin to increase, the percentage that GEXP and LGDP attributes begins to increase. However, it is important to note that LGDP increases by a larger margin compared to GEXP. In period ten, 76.031 percent of changes in GREV are explained by itself, while the other variables explain a total of 23.969 percent. Out of the 23.969 percent, GEXP attributes 3.752 percent and LGDP attributes 20.217 percent. Therefore, it can be concluded that GREV is mostly affected by its own shocks.

Table 4.10 Variance Decomposition of GEXP

Period	S.E.	GREV	GEXP	LGDP
1	1.006512	1.509050	98.49095	0.000000
2	1.321581	2.867208	97.03149	0.101299
3	1.594153	2.458373	97.21986	0.321762
4	1.824941	1.949345	97.64693	0.403722
5	2.026629	1.596283	98.00756	0.396155
6	2.207206	1.367189	98.26685	0.365957
7	2.373054	1.224904	98.43505	0.340045
8	2.528296	1.134750	98.54108	0.324167
9	2.675120	1.066941	98.61664	0.316414
10	2.814652	1.007458	98.68007	0.312475

Source: Own analysis 2021

In period one, 98.491 percent of the variation in GEXP is caused by shocks to itself, while GREV attributes 1.509 percent. On the other hand, LGDP does not cause a shock to GEXP in period one. The shocks that GREV attributes to GEXP increase in period two, before constantly deceasing from period three onwards. The shocks that GEXP attributes to itself decrease in period two, before constantly increasing from period three onwards. The shocks that LGDP attributes to GEXP increase from period two until period four, before constantly decreasing from period five onwards. In period ten, 98.689 of the changes in GEXP are explained by itself, while GREV attributes 1.007 percent and LGDP attributes 0.312 percent. Therefore, it can be concluded that GEXP is mostly affected by its own shocks.

Table 4.11 Variance Decomposition of LGDP

Period	S.E.	GREV	GEXP	LGDP
1	0.018316	0.184743	13.72628	86.08898
2	0.030880	2.824596	17.48191	79.69350
3	0.041511	9.412659	17.74092	72.84642
4	0.050259	15.82759	17.51181	66.66059
5	0.057111	19.86166	17.32485	62.81350
6	0.062618	21.80086	17.28941	60.90972
7	0.067427	22.56643	17.33596	60.09761
8	0.071941	22.87445	17.39727	59.72828
9	0.076301	23.10445	17.44317	59.45239
10	0.080504	23.37565	17.46928	59.15506

Source: Own analysis 2021

In period one, 86.089 percent of the variation in LGDP is caused by shocks to itself, while GREV attributes 0.185 percent and GEXP attributes 13.726 percent. As the number of periods begin to increase, the percentage that LGDP attributes to changes in itself begins to decrease. However, it still attributes a larger percentage compared to the other variables. On the other hand, as the number of periods begin to increase, the percentage that GREV and GEXP attributes to changes in LGDP increases. In period ten, 59.155 percent of changes in LGDP are explained by itself, while GREV attributes 23.376 percent and GEXP attributes 17.469 percent. Therefore, it can be concluded that LGDP is mostly affected by its own shocks.

4.9 Diagnostic tests

The diagnostic tests (consisting of the normality test, the autocorrelation test and the heteroskedasticity test) are conducted to validate the robustness of the results and to test whether the established relationships are stable over the sample period.

Table 4.12 Normality test (Orthogonalization: Cholesky (Lutkepohl))

Component	Jarque-Bera	df	Prob.
1	2.301925	2	0.3163
2	0.099715	2	0.9514
3	0.024438	2	0.9879
Joint	2.426078	6	0.8766

Source: Own analysis 2021

The p-values of lag one, lag two and lag three are greater than the 1 percent, 5 percent and 10 percent significance levels. Therefore, the null hypothesis that the residuals are normally distributed cannot be rejected at all significance levels. It can be concluded that the residuals are normally distributed.

Tables 4.13 Autocorrelation LM test

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	8.321296	9	0.5021	0.933039	(9, 63.4)	0.5032
2	4.054207	9	0.9078	0.440106	(9, 63.4)	0.9081
3	5.579853	9	0.7811	0.612750	(9, 63.4)	0.7817

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	8.321296	9	0.5021	0.933039	(9, 63.4)	0.5032
2	17.54088	18	0.4863	0.980810	(18, 65.5)	0.4917
3	25.72998	27	0.5336	0.946481	(27, 59.1)	0.5497

Source: Own analysis 2021

Both tables (serial correlation test at lag h and at lags 1 to h) indicate that the p-values of lag one, lag two and lag three are greater than the 1 percent, 5 percent and 10 percent significance levels. Therefore, the null hypothesis of no serial correlation cannot be rejected at all significance levels. It can be concluded that there is no serial correlation at lag one, lag two and lag three.

Table 4.14 Heteroskedasticity test

Test	Hypothesis	Probability
Heteroskedasticity Test (without Cross Terms)	There is no conditional heteroskedasticity	0.0637
Heteroskedasticity Test (includes Cross Terms)	There is no conditional heteroskedasticity	0.0932

Source: Own analysis 2021

The table above indicates that the heteroskedasticity test without cross terms and the heteroskedasticity test with cross terms both have p-values that are greater than the 1 percent and 5 percent significance levels. Therefore, the null hypothesis that there is no

heteroskedasticity cannot be rejected for both tests at the 1 percent and 5 percent significance levels. However, heteroskedasticity is present at the 10 percent significance level because the p-value (in both the heteroskedasticity test without cross and the heteroskedasticity test that includes cross terms) is less than the 10 percent significance level. Nonetheless, based on the results that have been obtained when analysing the p-value at the 1 percent and 5 percent significance level, it can be concluded that homoscedasticity is present.

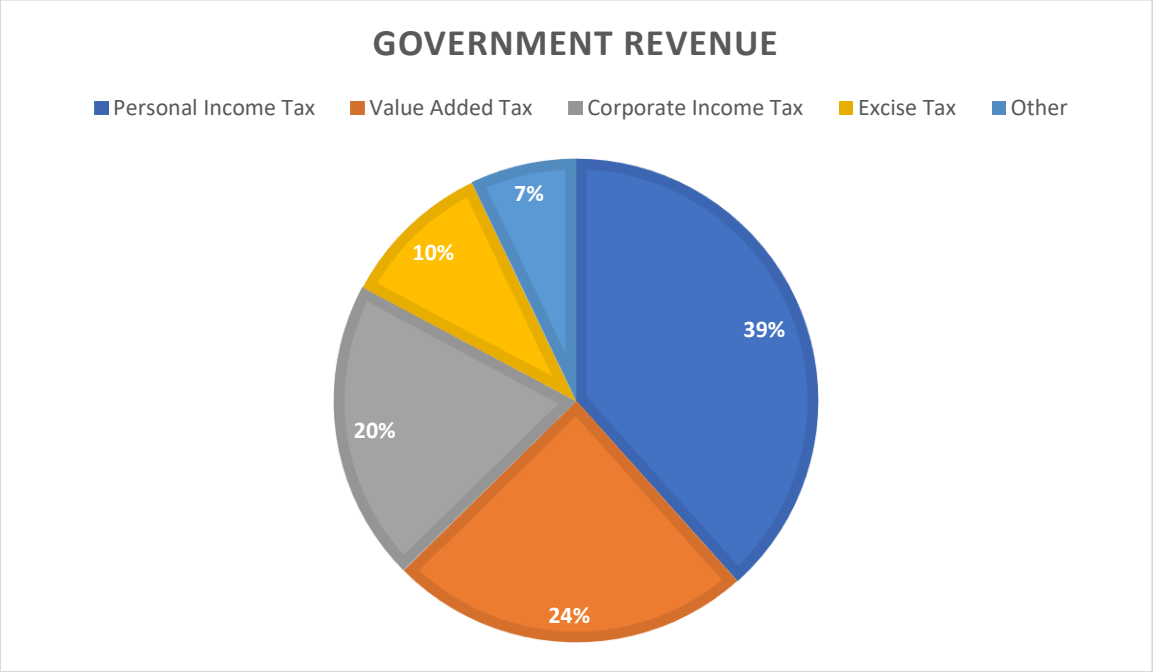
4.10 Disaggregated data analysis

The disaggregated revenue patterns are examined for the annual period from 1982 to 2019 and the disaggregated expenditure patterns are examined for the annual period from 1983 to 2019, in order to thoroughly analyse the effects that the different types of expenditure and revenue have on South Africa's fiscal position.

4.10.1 Disaggregated revenue

The figure below shows that personal income tax is the main source of government revenue for South Africa followed by value added tax, corporate income tax and excise tax, respectively.

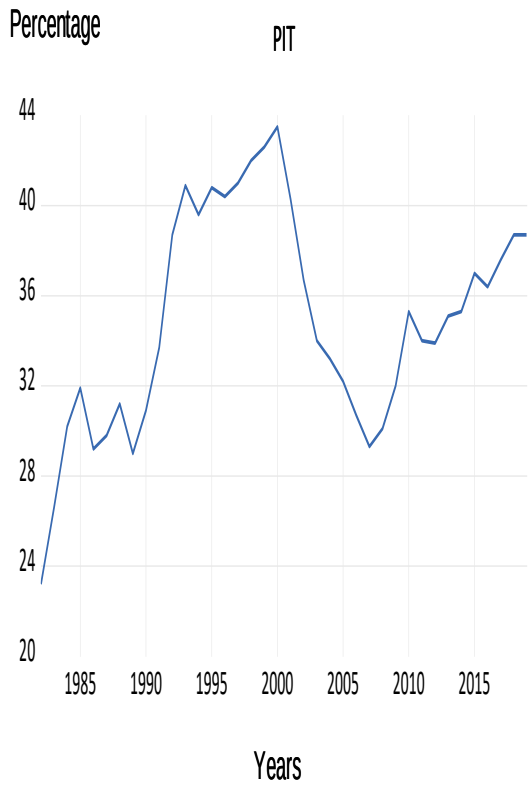
Figure 4.5 A breakdown of South Africa's tax pie



Source: Statistics South Africa (2019), own calculations

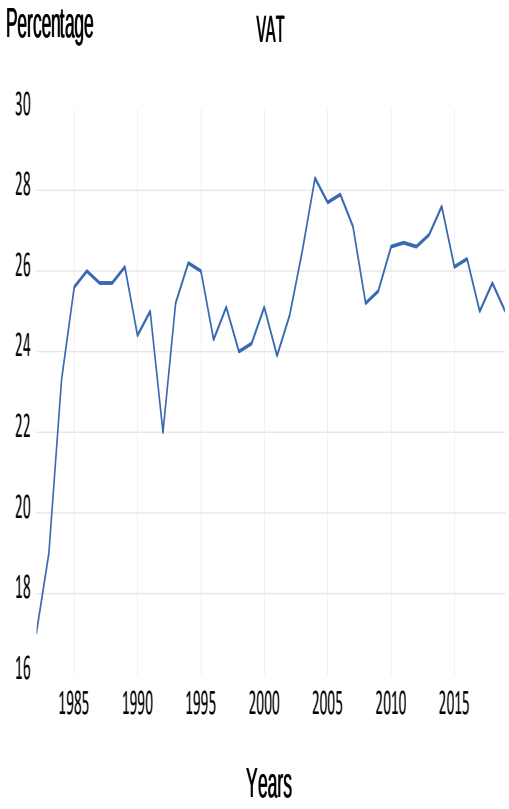
Figure 4.6 to figure 4.9, below, shows the annual trend of personal income tax, value added tax, corporate income tax and excise tax for the period from 1982 until 2019. Personal income tax is proxied by tax payable by persons and individuals as a percentage of total revenue, corporate income tax is proxied by tax payable by companies as a percentage of total revenue. Value added tax is proxied by GST/VAT as a percentage of total revenue and excise tax is proxied by other excise duties as a percentage of total revenue.

Figure 4.6 Personal Income Tax



Source: Own analysis 2021

Figure 4.7 Value Added Tax



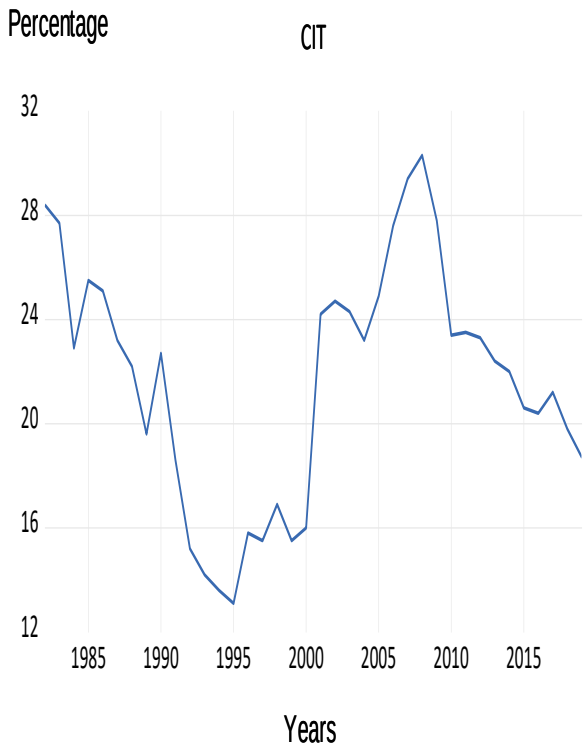
Source: Own analysis 2021

Figure 4.6 shows that there was an upward trend in personal income tax collected from 1982 until 1985. However, from 1986 until the 1990, South Africa experienced a slight drop in personal income tax collected. The reason for this is because economic sanctions were imposed by the United States of America against the country in 1986. As a result, many citizens lost their jobs and the state was unable to collect a lot of personal income tax. However, from 1991, the US began dropping some sanctions, which gave the country's economy some breathing space. As a result, there was a peak in personal income tax collected because many citizens, that were unemployed, were able to become employed. Additionally, in 1994, South Africa transitioned to a democratic state. Therefore, more investments started flowing into the country, which result in more citizens being employed. As a result, the state was able to collect more personal income tax.

However, from the year 2000, South Africa experience a large decrease in personal income tax collected. This could be attributed to the fact that South Africa has been experiencing a severe problem of unemployment since the 2000s, which is mainly driven by persistent inequality and poor government policies. Therefore, it has been unable to collect as much personal income tax as it should. Additionally, the 2008/2009 global financial crisis significantly impacted the amount of personal income tax that was collected. The South African Revenue Service (SARS) collected R196.1 billion in the 2008/2009, which was below the estimate by R3.8 billion (South African Revenue Service, 2009). Even though there has been an upward trend in personal income tax collected in the past decade, the South African Revenue Service has struggled to ensure that its tax collection mechanisms are efficient, which has had an impact on the amount of personal income tax that it has been able to collect.

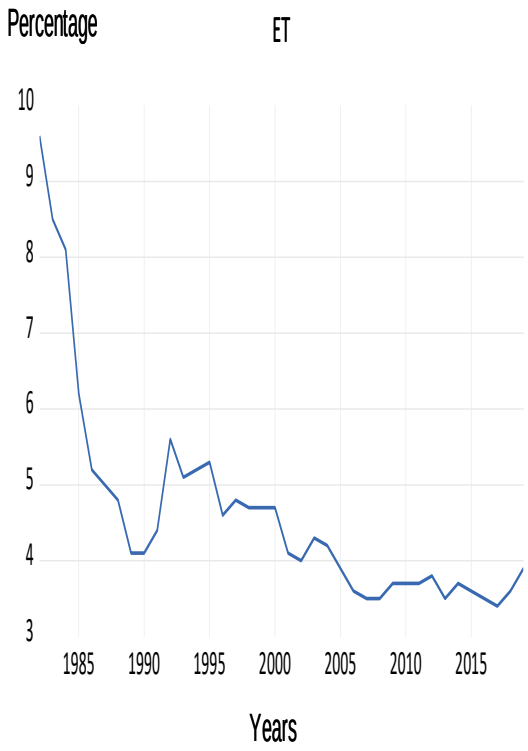
Figure 4.7 shows that there was an upward trend in VAT collected from 1982 until 2004. However, VAT collected began to decrease after 2004. The decrease got wider from 2007 until 2009 because of the global financial crises. Nonetheless, South Africa's VAT policy has been relatively stable. Additionally, it is important to note that the 1 percent increase in the VAT rate in 2018/19 only had a moderate effect on revenue collections because of the low growth in consumer consumption in recent years.

Figure 4.8 Corporate Income Tax



Source: Own analysis 2021

Figure 4.9 Excise Tax



Source: Own analysis 2021

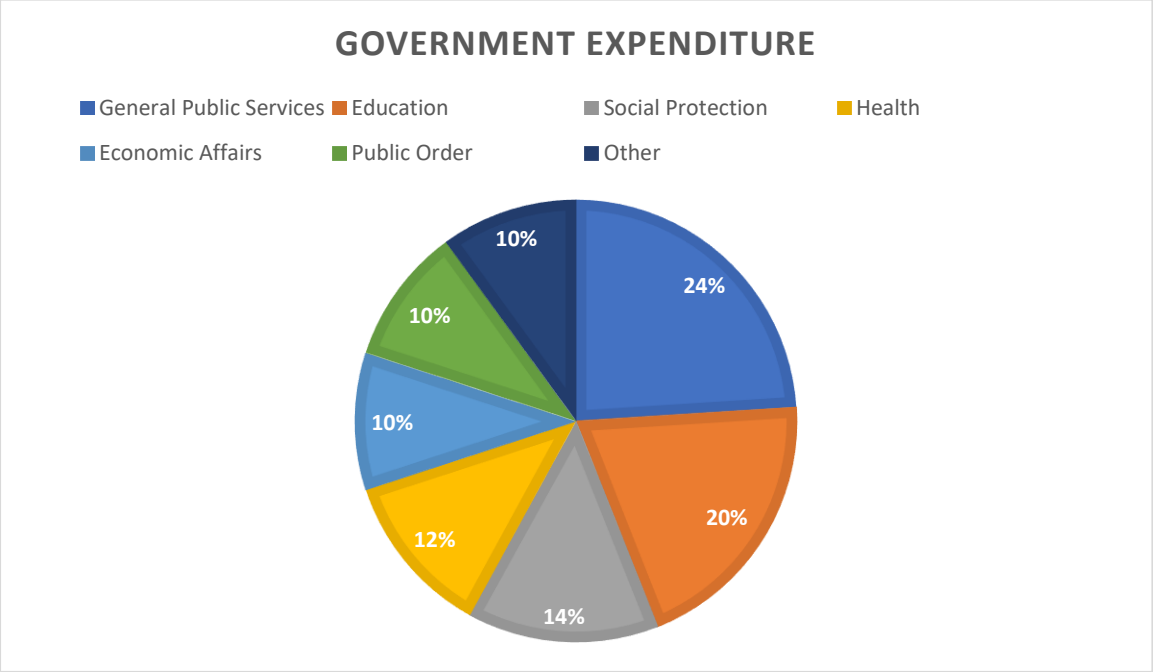
Figure 4.8 shows that there was a sharp decline in corporate income tax collected from 1986 until 1995. The reason for this was the economic sanctions that were imposed by the United States of America in 1986. After the economic sanctions were imposed on South Africa, many companies (mostly foreign companies) shut down. As a result, the country was unable to collect a large amount of corporate income tax. However, in 1994, South Africa transitioned to a democratic state. Therefore, the country started gaining a lot of investments. As a result, from 1996 until 2007, the amount of corporate income tax collected significantly increased. However, from 2008, the amount of corporate income tax collected by the country has significantly decreased because of the 2008/2009 global financial crisis, which lead to many companies shutting down. Unfortunately, since the global financial crises, South Africa has struggled to collect a large amount of corporate income tax.

Figure 4.9 shows that there has been a significant drop in excise tax that has been collected since 1982. Unfortunately, South Africa has been struggling to collect the amount of excise tax that it should because of factors such as the illicit trade of tabaco. According to a report by Tax Justice SA (2021), two out of every three cigarettes sold in the country are illicit. The report further emphasised that the illicit trade of cigarettes is costing the government billions of Rands in unpaid excise taxes.

4.10.2 Disaggregated expenditure

The figure below shows that general public services make up the largest share of South Africa's expenditure followed by education, social protection, health, economic affairs and public order, respectively. It is important to highlight that the pie chart expresses government spending in functional terms. Therefore, wages and salaries of government employees are distributed across all of the expenditures. Compensation of employees accounted for R694 billion or 41.9 percent of total government expenses in the 2018/2019 fiscal year (Statistics South Africa, 2020). It is important to highlight that in 2020, cabinet took a decision to make large reductions in non-interest spending over the next three years, amounting to R300 billion in order to narrow the deficit and stabilise the debt to GDP ratio. The majority of these reductions will be applied to the wage bill.

Figure 4.10 A breakdown of South Africa's expenditure pie



Source: Statistics South Africa (2020), own calculations

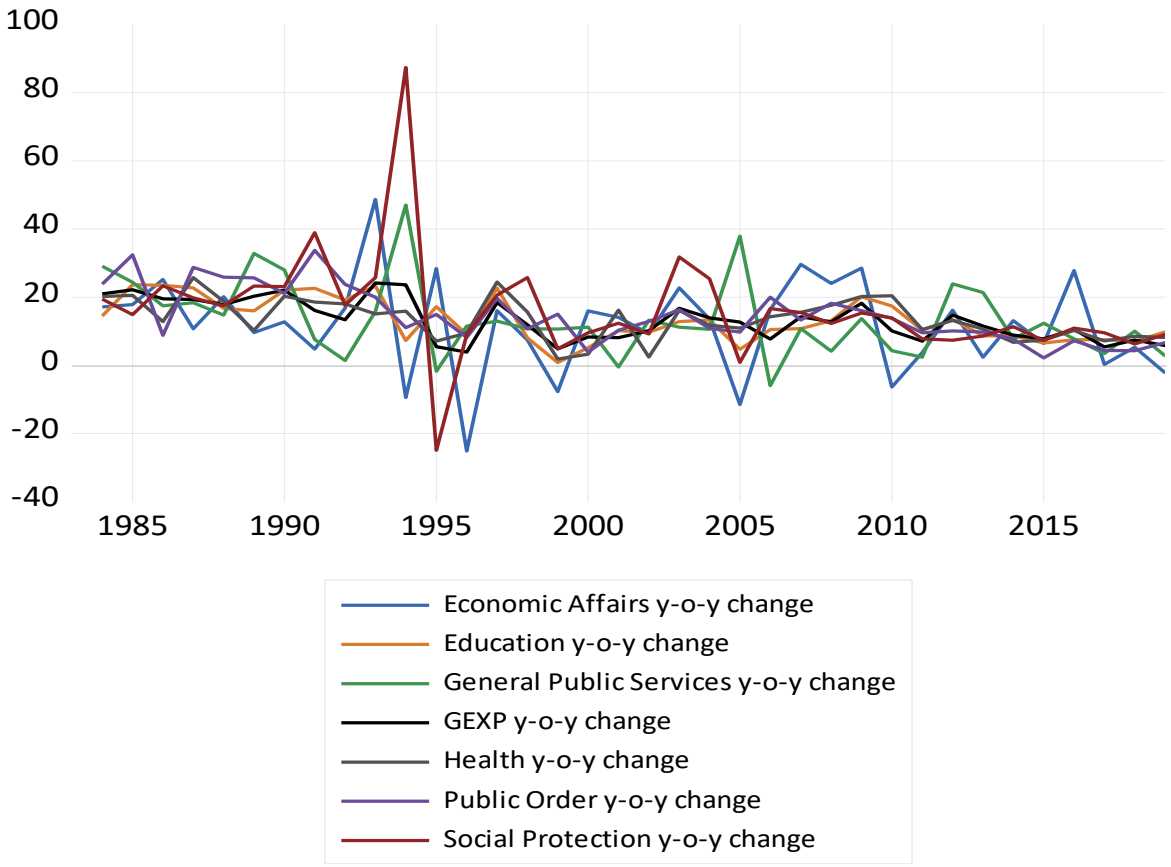
The government allocates funds to education to ensure that at a basic education level, underprivileged learners (especially from historically disadvantaged groups) have access to stationery, feeding scheme and other vital resources that can enhance their learning. At a higher education level, the funds allocated to education assist students with loans from the National Students Financial Aid Scheme (NSFAS) so that they can be able to cover their tertiary fees as well as other costs that are associated with their studies. Secondly, the government allocates funds to general public services so that it can meet its executive and legislative costs (costs related to the administration of parliament, the provincial legislature and mayoral offices). It also allocates funds to general public services so that it can service its debt. Thirdly, the government allocates funds to social protection so that it can be able to pay citizens grants such as old age pension grant, child support grant and disability grant.

Fourthly, the government allocates funds to health so that it can be able to meet the needs of those who depend on government healthcare services (especially historically disadvantaged groups). Fifthly, the government allocates funds to economic affairs so that there can be appropriate infrastructure development (building and maintaining road infrastructure),

agricultural development as well as development in mining, manufacturing, construction and energy. Lastly, the government allocates funds to public order so that it can be able to fund the police, prisons and courts.

The figure below analyses the year-on-year changes in expenditure on general public services, education, social protection, health, economic affairs and public order from 1984 until 2019. The figure shows that expenditure on all categories has been growing on a year-on-year basis, since 1984, albeit not in a linear or predictable fashion. It is also evident that the year-on-year change of the expenditure variables has been relatively higher than the year-on-year change in total government expenditure. It seems that since 1984, looking at the year-on-year change, government expenditure has been on a downward trajectory. This is the total opposite of what one would expect in a developing country- let alone a professing democratic developmental state. There was also volatility in the year-on-year trend of social protection, economic affairs and general public services between 1993 and 1995. It is reasonable to believe that such apparent volatility communicates the policy uncertainty that marked the transitory period into the 1994 democratic state.

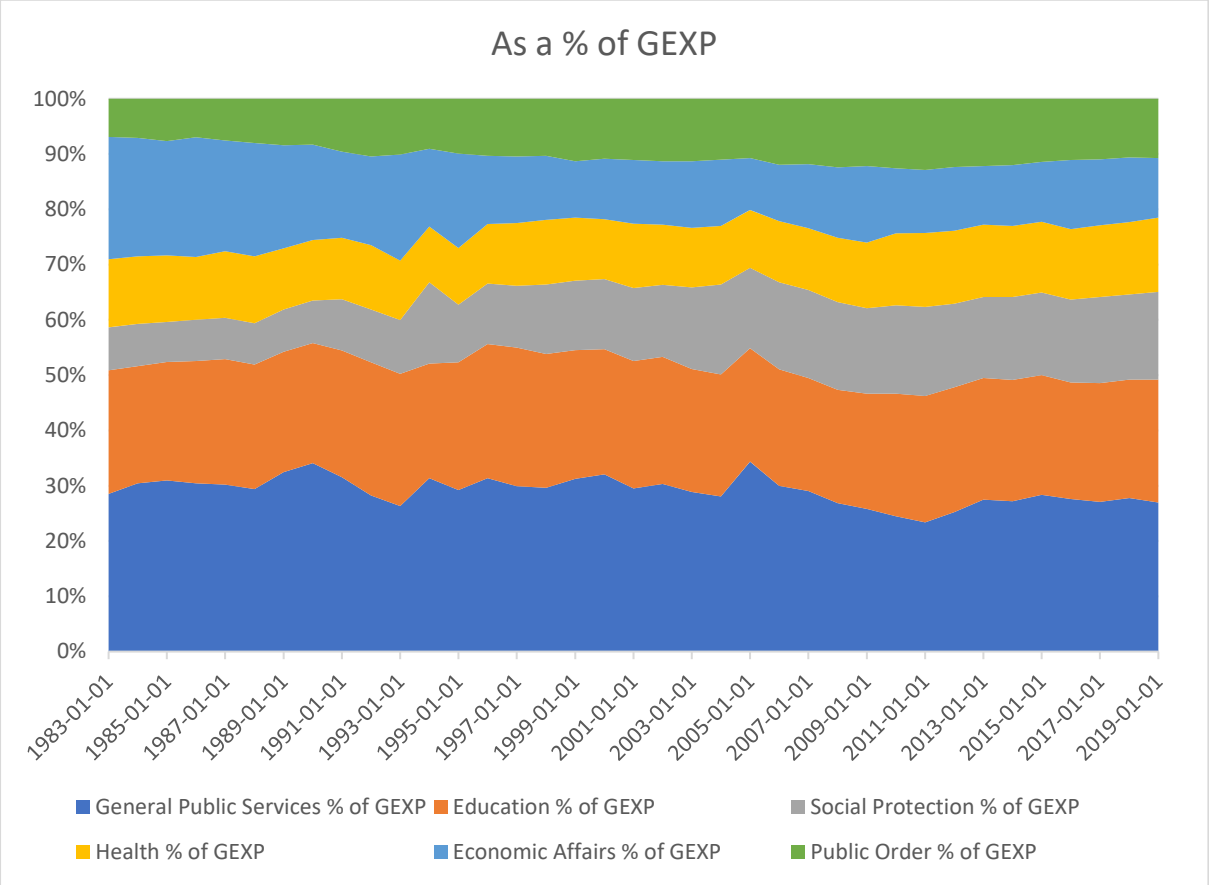
Figure 4.11 Year-on-year analysis of disaggregated expenditure data



Source: Own analysis 2021

The figure below analyses the annual change in the pattern of the disaggregated expenditure data from 1983 until 2019.

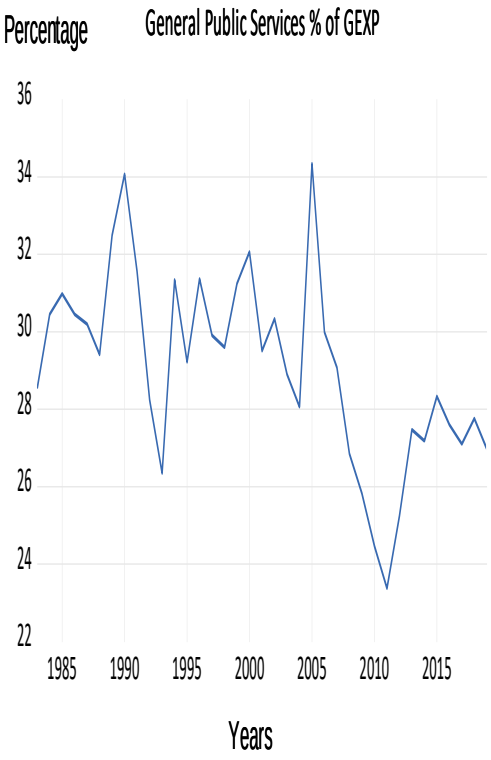
Figure 4.12 Area chart of the disaggregated expenditure data



Source: Own analysis 2021

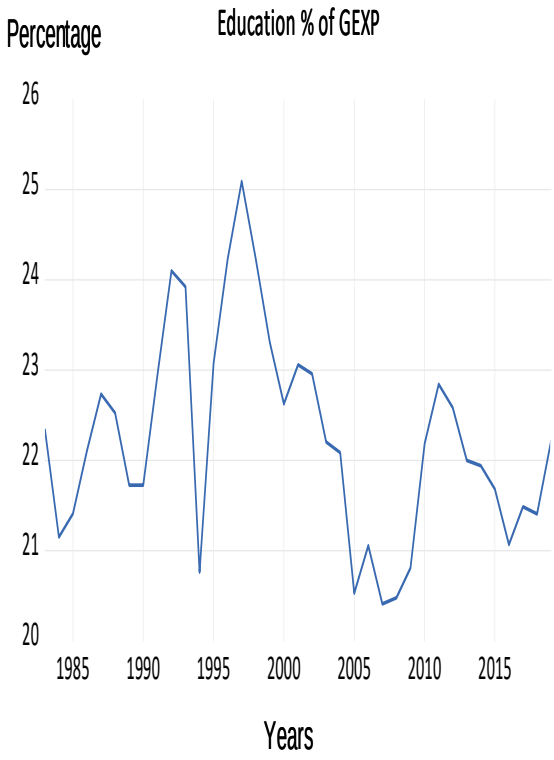
Figure 4.13 to figure 4.18, below, shows the annual trend of general public services, education, social protection, health, economic affairs and public order for the period from 1983 until 2019. All of variables are expressed as a percentage of government expenditure.

Figure 4.13 General Public Services



Source: Own analysis 2021

Figure 4.14 Education



Source: Own analysis 2021

Figure 4.13 shows that there has been a downward trend in general public services (expressed as a percentage of government expenditure) since 1983. However, from 2012, there has been an increase. There are two main reasons for the increase. Firstly, it is caused by the increase in executive and legislative services costs (which are costs that are related to the administration of parliament, the provincial legislature and mayoral offices). Secondly, the increase in funds that have been allocated to general public services is caused by the increase in debt repayments. In the 2018/2019 fiscal year, for example, for every R10 of total government spending, R1 was used on debt repayments, including interest payments on debt (Statistics South Africa, 2020).

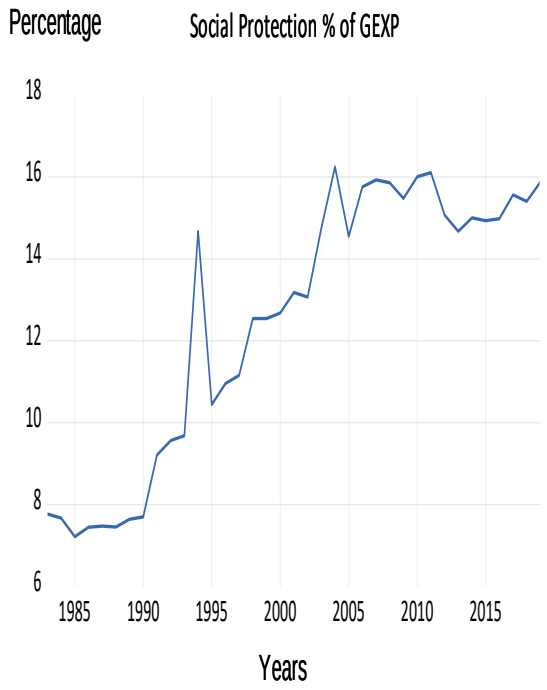
Figure 4.14 shows that expenditure on education has been somewhat erratic. However, a more careful inspection of figure 4.12 shows that since 1983, education has occupied more or less the same 20-25 percent bracket of total expenditure. Such an observation is very concerning

considering that since 1994, fee-free education has been rolled out to a wider learner base. There being no material change (necessarily an increase in expenditure on education as a percentage of total government expenditure), implies that the funds on education have been becoming too thinly spread over a growing number of pupils, leading to a smaller per capita allocation of expenditure. It is little wonder that the education outcomes in South African schools have been sub-optimal for many years (Howie et al., 2016). Figure 4.14 shows there is a discernible downward trend in education expenditure (expressed as a percentage of government expenditure) from 1995. However, from 2008, there has been an increase.

The reason for this is because many learners in the country come from disadvantaged backgrounds, as a result the government has been contributing billions towards the education department, to ensure that they have access to basic education. Nevertheless, even though more state funds have been allocated to fund basic education on a year-to-year basis, the learner outcomes that have been produced are not satisfactory. For example, a report that was published by Progress in International Reading Literacy Study (PIRLS) in 2017 showed that eight out ten grade 4 learners cannot read for meaning in any language (Howie et al, 2016).

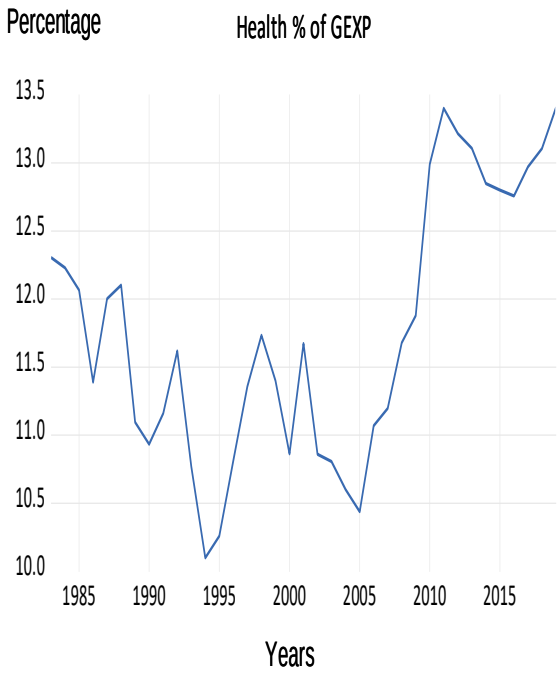
Additionally, according to a report published last year by the Ali Mazrui Centre for Higher Education Studies, the number of enrolments at universities increased by 40 percent in the last 12 years (Macupe, 2020). Therefore, there has been a need for the government to provide more financial assistance, through the National Student Financial Aid Scheme (NSFAS) in order to ensure that less fortunate university students are able to obtain tertiary education. As a result, this has also contributed to the increase in the state funds that have been allocated to the education department in the past decade.

Figure 4.15 Social Protection



Source: Own analysis 2021

Figure 4.16 Health



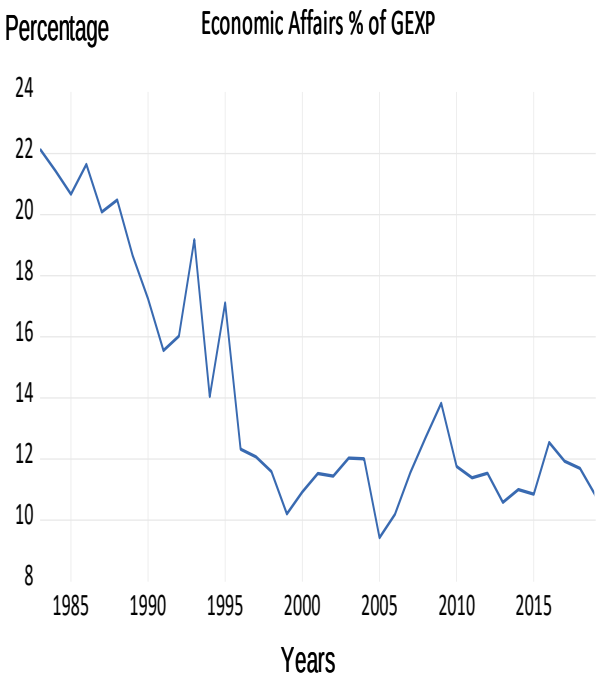
Source: Own analysis 2021

Figure 4.15 shows that there has been an upward trend in social protection (expressed as a percentage of government expenditure) since 1983. The reason for this is because when South Africa transitioned to a democratic state, many deserving citizens (especially those that were marginalised) started benefiting more from the government's old age pension as well as the disability grant. It is also important to highlight that when South Africa transitioned to a democratic state, it introduced the child support grant which aims to assist parents from lower-income households with the costs of basic needs of their child. As a result, this has led to the significant increase in the amount of funds that the government has allocated to social protection.

Figure 4.16 shows that there has been an upward trend in health (expressed as a percentage of government expenditure) since 1983. The reason for this is because during apartheid, government healthcare services mostly benefited a minority group. However, when South Africa transitioned to a democratic state, previously marginalised groups started benefiting

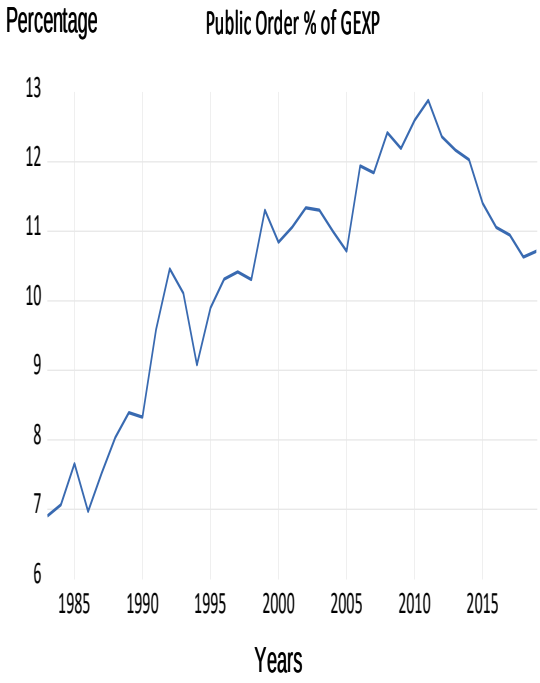
more from the country's healthcare services. It is important to note that around 80 percent of the county's population uses public healthcare, while the remaining 20 percent opt for private healthcare. However, despite this, South Africa's healthcare system is faced with enormous challenges. The country's healthcare system ranks 49th out of 89 countries on the 2019 Global Healthcare Index (Expatica, 2021).

Figure 4.17 Economic Affairs



Source: Own analysis 2021

Figure 4.18 Public Order



Source: Own analysis 2021

Figure 4.17 shows that there has been a downward trend in economic affairs (expressed as a percentage of government expenditure) since 1983. This means that the government has been allocating a greater share of government expenditure to other categories (i.e social protection, health and public order). As a result, less funds have been allocated to components of economic affairs such as public infrastructure development (building and maintaining road infrastructure), agricultural development, mining, manufacturing, construction and energy.

Figure 4.18 shows that there has been an upward trend in public order (expressed as a percentage of government expenditure) since 1983. The reason for this is because billions of Rands have been used to fund the police, prisons and courts over the years. It is important to highlight that the crime rate in South Africa is on a constant rise. South Africa is ranked the eighth most dangerous country out of the 115 countries covered in the 2021 Gallup Law and Order Index (Gallup, 2021). Additionally, the first quarter crime data for 2021 shows that between April 2021 until the end of June 2021, 5760 people were killed in the country (South African Government, 2021). It is very concerning that the crime rate is continuing to rise, despite the billions of Rands that have been allocated to public order.

4.11 Conclusion

The Augmented Dicky-Fuller unit root test and the Phillips-Perron unit root test were used to test for stationarity. Both of the tests found that the variables are stationary at first difference. Secondly, the lag selection criteria were used to determine how many lags should be used in the study. After analysing the results that were obtained from the VAR lag order selection criteria, the researcher decided to use one lag. Thirdly, the Johansen co-integration test was conducted, which found that there is one co-integrating relationship between the variables, meaning that there is a long-run relationship between the variables. The Vector Error Correction Model (VECM) was then used to determine the short-run and the long-run effects. In the long run, it was found that there is a positive relationship between government revenue and government expenditure and a positive relationship between government revenue and gross domestic product. Fifthly, the Granger causality test was conducted. It found that there is no causality between government revenue and government expenditure, which proves that the study is consistent with the fiscal neutrality hypothesis by Baghestani and McNown (1994). Lastly, the disaggregated revenue and expenditure patterns were examined in order to thoroughly analyse the effects that the different types of expenditure and revenue have on South Africa's fiscal position.

Chapter 5: Conclusion and policy recommendations

5.1 Introduction

This chapter summarises major findings in the study and makes policy recommendations based on the findings that have been obtained.

5.2 Summary of the study

The introductory chapter unpacked the background, statement of the problem, objective of the study and the organisation of the study. The second chapter reviewed both theoretical and empirical literature. The theoretical literature was analysed first, to enable the researcher to understand the different theories behind the relationship between government revenue and government expenditure. The empirical literature reviewed similar studies that were done by other researchers. The third chapter explained the research methodology that will be employed in the dissertation. The fourth chapter presented and analysed the results of the dissertation.

The aim of this study was to analyse the relationship between government revenue and government expenditure in South Africa using annual data from 1982 to 2019. Gross domestic product was also included in the study as an additional variable. The study adopted the Vector Error Correction (VECM) model to analyse the data. The results of the Johansen cointegration test found that there is a cointegrating relationship between the variables, indicating that there is a long-run relationship. The Granger causality test also found that there is no causality between government revenue and government expenditure. This outcome was found to be in line with the fiscal neutrality hypothesis that was developed by Baghestani and McNown (1994).

Additionally, the results that were obtained from the disaggregated revenue patterns, which were analysed using annual data from 1982 to 2019, show that there has been a decrease in corporate income tax, VAT and excise tax collected over the years. Even though there has been an increase in personal income tax collected, it remains below the tax target. On the other hand, the results that have been obtained from the disaggregated expenditure patterns, that were analysed using annual data from 1983 to 2019, show that there has been a significant increase in state funds that have been allocated to social protection, health and public order. However, there has been a decline in state funds that have been allocated to general public services and economic affairs. The analysis also shows that expenditure on education has been erratic.

5.3 Objective of the study and the extent to which this study has fulfilled it

The research objective of the study was to recommend an approach that could be used by the budgetary authorities as a remedial measure to effectively deal with the budget deficit in South Africa. This was also communicated in the research question of the study. The Granger causality test was conducted in chapter 4 to analyse the causality between the variables, as an aggregate, so that policy recommends can be made on how the budgetary authorities can effectively deal with the budget deficit. Additionally, chapter 4 also analysed the disaggregated revenue and expenditure patterns, so that further policy recommendations can be made.

5.4 Policy recommendations

Based on the results that have been obtained from the Granger causality test, that found that there is no causality between government revenue and government expenditure (which endorses the fiscal neutrality hypothesis by Baghestani and McNown (1994)), the recommendation to budgetary authorities is that the government should make its revenue and expenditure decisions separately.

The disaggregated revenue patterns show that there is an urgent need for the South African Revenue Service to strengthen its tax collection mechanisms, so that it can be able to collect more personal income tax, value added tax, corporate income tax and excise tax. One way of doing this is by reducing the complexities of the tax system. Secondly, the South African government must ensure that it effectively enacts economic reforms, that will stimulate rapid economic growth. This will, in turn, result in the establishment of more domestic companies and will also make South Africa an attractive investment destination for a large number of foreign companies, which will make it possible for SARS to collect more corporate income tax. Thirdly, the previous chapter highlighted that the illicit trade of tobacco is costing the South African government billions of Rands in unpaid taxes. Therefore, the government must urgently ensure that it puts measures in place that will deal with the illicit trade of tobacco, so that SARS can be able to collect more excise tax.

The disaggregated expenditure patterns show that a significant amount of state funds have been allocated to health, which must be commended. However, the government needs to ensure that the funds that are allocated to this department are efficiently utilised. This can be done by ensuring that more hospitals are built, especially in rural areas and by ensuring that the service in government hospitals is of high standard, so that South Africa can be able to adequately develop in the long-run. It is concerning that even though a lot of state funds have been allocated to public order, over the years, the crime rate has been increasing (Gallup, 2021). There is a great need for the government to urgently fight crime so that the billions of Rands that have been allocated to public order can be diverted to other departments such as education and economic affairs, that can help grow the country in long run. However, the government must ensure that the funds that are allocated to economic affairs are efficiently utilised. For example, this can be done by reducing corruption in the tender processes that are involved when the government does infrastructure development (building and maintain road infrastructure) and construction.

Lastly, the increase in state funds allocated to general public services over the past decade is also concerning. The budgetary authorities must reduce the burden that general public services have on the country's fiscal position. This can be done by, firstly, reducing the amount of debt that is taken out by the country. An increase in debt means that there will also be an increase in the amount of state funds that will be required for debt repayments, which will therefore

cause an increase in general public services. The budgetary authorities can also reduce the burden that general public services have on the country's fiscal position by reducing executive and legislative services costs. This can be done by reducing the size of the country's cabinet ministers. The salaries of cabinet ministers (without taking benefits into account) costs the state more than R135 million per annum (BusinessTech, 2019). Additionally, some of the benefits that cabinet ministers receive need to be reviewed and reduced so that the country's executive and legislative services costs can decrease.

5.5 Proposal for future research

According to the latest Auditor General municipal audit report, nearly a third of municipalities (30 percent) in South Africa ended the 2019/2020 financial year in a deficit (Merten, 2021). The report also highlighted that over a quarter of municipalities in the country face significant doubts about their ability to continue as a going concern**.** Therefore, there is a need of a study that will analyse the revenue-expenditure nexus at a municipal level, in South Africa, to suggest an approach that could be used to deal with the deficit that many municipalities face across the country.

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UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

20 August 2021

Mr Mlondi Mveli Mdluli (216037769)
School Of Acc Economics&Fin
Westville

Dear Mr Mlondi Mveli Mdluli,

Protocol reference number: 00013220
Project title: The relationship between government revenue and expenditure in South Africa: a cointegration and causality approach

Exemption from Ethics Review

In response to your application received on 16 August 2021, your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

[redacted] 20 August 2021

-[redacted]----------

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