

Impact of fiscal consolidation on domestic government debt in
South Africa 1979 to 2022

By

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This research is submitted in fulfilment of the requirements for the Doctor of
Philosophy degree in economics from the School of Economics and Finance at the
University of KwaZulu-Natal Pietermaritzburg

2023

Declaration

I **Eugene Msizi Buthelezi** student number: **210542387** declare that

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Date..... **15 April 2024**

Acknowledgement

I would like to express my deepest gratitude and appreciation to the following individuals and institutions for their invaluable support and guidance throughout my Ph.D. journey: First and foremost, I am profoundly thankful to God for granting me the strength, perseverance, and determination to undertake and complete this research.

I am immensely grateful to Professor Nyatanga, who has been like a second mother to me, for her unwavering support, expertise, and guidance. Her profound knowledge of the field and her assistance in pointing me in the right direction, providing relevant models, and suggesting insightful reading materials were instrumental in shaping this research. I would like to express my deepest gratitude and appreciation to my mother MaMbambo, who has been an incredible source of support and inspiration throughout my Ph.D. journey. I would like to extend my sincere thanks to Dr. Ntokozo Nzimande, as some of his suggestions played a significant role in shaping the trajectory of my studies.

I would also like to express my gratitude to the University of KwaZulu-Natal (UKZN) Research Committee for their supportive comments and feedback regarding my work. Their constructive criticism and valuable suggestions have significantly contributed to the refinement and improvement of this study. I am deeply grateful to the reviewers of *Economies Journal* for their comments and critiques. Their insightful feedback played a crucial role in shaping and enhancing the quality of my research. I would also like to acknowledge the young economic staff members at the University of Cape Town (UCT), where I was briefly employed, for their valuable feedback on how to conceptualize my study. Their input has been instrumental in shaping the research approach and methodology.

Special thanks goes to Economic Research Southern Africa (ERSA) for providing me with the opportunity to present my work at the 2023 ERSA National PhD Conference. The comments

and constructive criticisms I received during this event were highly valuable and contributed to the further development of my research. Lastly, I would like to acknowledge the support I received from the University of the Free State (UFS) in helping me register for the final year of my Ph.D. programme. Their assistance was pivotal in facilitating my research journey. Moreover, I like to thank Professor Johan Coetzee for always showing me support for my PHD studies. On the other hand, i also wish to exerted my gratitude to Professor Sevias Guvuriro for giving me an opportunity to present one of my PHD paper in Brown Bank that he facility with the school of Economics at UFS. I would also like to thank to office of the Dean at UFS which opened a PHD support group facilitated by Mrs Igna Du Plooy and Professor Tina Kotze. Their support was much needed in the last stage of my PHD.

The final stage of the research involved a meticulous examination of the dissertation. I am deeply grateful to the three anonymous examiners—internal, national, and international—selected by the University of KwaZulu-Natal. Their insightful comments provided valuable feedback on the research and highlighted areas for improvement, thereby enhancing its contribution to the body of knowledge. I approached each comment with humility and embraced the lessons they offered.

I would like to express my honourable thanks and deep appreciation to the following individuals.

Siyanga Dlamini

Sihle Thusi

Sambulo Vidima

Thabo Gabela

Mplilo Ngcoya

Ndumiso Mkhize

Siyabonga Dlamini

Velaphi Mahlaba

Mndudizi Sbisi

Siphokuhle Zondo

Miss Mkize (my teacher)

Miss Dlamini (my teacher)

Mrs Majwafi

Miss Mbono

Prof Johan Coetzee (my nGAP mentor)

Professor Sevias Guvuriro

Professor Tina Kotze

Mrs Igna Du Plooy

Rev. Mtshali

Rev. (Mongameli) Gwala

Rev. (son of the soul) Nene

Rev. Nene

These individuals provided invaluable support, guidance, and encouragement throughout my journey. Their influence, mentorship, and contributions have had a significant impact on my personal and academic growth. I am deeply grateful for their assistance and the knowledge and inspiration they have imparted.

To all those mentioned above, as well as to anyone else who has contributed to my academic and personal growth, I extend my heartfelt thanks. Your unwavering support, guidance, and encouragement have been indispensable for making this PhD journey a reality.

Publications from this dissertation in accredited journals

Four papers from this Ph.D. research have been successfully published in accredited journals. This reflects that all objectives and economic questions of the dissertation have a publication, listed below, which shows the publication in a Q2 journal, whereas the other two have been published in a Q3 journal. The initial two papers are directly aligned with objectives one and two of the thesis, whereas the third publication addresses objective four of the research, and publication number is aligned with objective number three:

1. Buthelezi, E. M. and P. Nyatanga (2023). Time-varying Elasticity of Cyclically Adjusted Primary Balance and Effect of Fiscal Consolidation on Domestic Government Debt in South Africa. *Economies* 11(5).<https://doi.org/10.3390/economies11050141>
2. Buthelezi, E. M. and P. Nyatanga (2023). Threshold of the CAPB That Can Be Attributed to Fiscal Consolidation Episodes in South Africa. *Economies*, 11(6), p.152. <https://doi.org/10.3390/economies11060152>
3. Buthelezi, E. M. and P. Nyatanga (2023). The Dynamic Relationship between Government Debt, Fiscal Consolidation, and Economic Growth in South Africa: A Threshold Analysis. *Cogent Economics and Finance*. <https://doi.org/20:10.1080/23322039.2023.2261329>
4. Buthelezi, E. M. and P. Nyatanga (2023). Impact of fiscal consolidation in different states of domestic government debt in South Africa 1979 to 2022. *Cogent Economics Finance* 11 (2), 2280326. <https://doi.org/10.1080/23322039.2023.2280326>

Additionally, publications in accredited journals includes :

1. Buthelezi, E. M. (2024). Impact of Fiscal Consolidation on Government Debt in South Africa: Evidence to Structural and Cyclical Effect. *Journal of Economics and Financial Analysis* 7 (2), 1-23. <http://dx.doi.org/10.1991/jefa.v7i2.a60>
2. Buthelezi, E. M. (2023). Impact of government expenditure on economic growth in different states in South Africa. *Cogent Economics Finance* 11(1): 2209959. <https://doi.org/10.1080/23322039.2023.2209959>
3. Buthelezi, E. M. (2023). BRICS Economies: Assessing the Influence of Economic Policy Uncertainty and Fiscal Consolidation on Government Debt and Economic Growth. *Millennial Asia*: 09763996231184569. <https://doi.org/10.1177/09763996231184569>
4. Buthelezi, E. M. (2023). Dynamics of Macroeconomic Uncertainty on Economic Growth in the Presence of Fiscal Consolidation in South Africa from 1994 to 2022. *Economies* 11(4): 119. <https://doi.org/10.3390/economies11040119>

Additionally, manuscripts still under review include the following:

1. Uncertainty of Fiscal Consolidation in Impact on Total Foreign Debt in South Africa
2. Revisiting Government Debt's Impact on OECD Economic Growth: Analyzing Fiscal Consolidation Effects on Primary Fiscal Balance, a Threshold Analysis.
3. Analyzing South African Inflation Response to Fiscal Policy Shocks Using Bayesian Vector Autoregressions with Hierarchical Prior

Abstract

This study delves into the intricate dynamics of fiscal consolidation and its ramifications on government debt and economic growth within the context of South Africa. Employing a variety of methodologies and frameworks, it scrutinizes the efficacy of fiscal policy measures in curbing government debt while stimulating economic growth. Fiscal consolidation, characterized by cuts in government expenditures and tax increases, aims to alleviate debt burdens by reducing interest rates and fostering economic expansion. However, existing measures such as the Cyclical Adjusted Primary Balance (CAPB) face limitations in capturing the nuanced variations in fiscal policy effectiveness and thresholds. Addressing these shortcomings, this study utilizes innovative approaches including Time-Varying Parameter Structural Vector Auto-Regression (TVP-VAR), Threshold Autoregressive Regime (TAR), Markov-switching dynamic regression (MSDR), and Two-Stage Least Squares (2SLS) models.

Key findings reveal significant fluctuations in CAPB elasticity over time, highlighting the need for dynamic measures in assessing fiscal policy impact. Thresholds identified through TAR deviate from conventional benchmarks, underscoring the importance of context-specific thresholds in fiscal planning. MSDR analysis uncovers distinct states of government debt, each eliciting varied responses to fiscal consolidation measures. Notably, while fiscal consolidation proves effective in debt reduction under certain conditions, its impact on economic growth appears nuanced.

Policy implications highlight the importance of tailored fiscal policies aligned with South Africa's economic. By discerning the intricate interplay between fiscal consolidation, government debt, and economic growth, policymakers can devise more targeted strategies to navigate prevailing challenges. This study advocates for a nuanced approach to fiscal consolidation, emphasizing the need for context-specific thresholds and dynamic measures to foster sustainable economic growth while mitigating debt burdens.

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Chapter 1

Introduction of the study

1.1 Introduction

This chapter serves as the introduction to this study. Firstly, the background of this study which is fiscal consolidation in the context of South Africa, is discussed. Secondly, there is a discussion of the problem statement outlining the problems identified in the study, as well as specific questions to be investigated. Thirdly, this chapter outlines the significance of the study. Finally, a general outline of the structure of this study is provided.

1.2 Background

The debate on the use of fiscal consolidation through tax increases and government expenditure cuts in an efforts to reduce domestic government debt and increase economic growth has been at the center of macroeconomics ([Romer and Romer, 2010](#); [Gunter et al., 2021](#); [Buthelezi, 2023](#))¹. The thinking around fiscal consolidation is that fiscal authorities undertake a cut in government expenditure and increase in tax. The present forward-looking economic agents will anticipate a reduction in tax and interest rates. This will increase permanent income and crowd in investment. As such, economic activities will increase, leading to higher economic growth and higher tax collection, which can be used to reduce government debt ([Alesina and Perotti, 1995](#); [Romer and Romer, 2010](#); [Blanchard, 1990](#)).

No consensus has been reached regarding the measures or impact of fiscal consolidation. More-

¹[Buthelezi \(2023\)](#) is a recent work undertaken by the author of this thesis and published in an accredited journal. This is not part of this thesis, but is related to the topic of this thesis.

over, there is a difference in the theoretical explanations and empirical results, which remain an issue of concern (Giavazzi and Pagano, 1990; Romer and Romer, 2010; Devries et al., 2011a; Yang et al., 2015; Arizala et al., 2017). In particular, (McDermott and Wescott, 1996; Heylen and Everaert, 2000; Afonso et al., 2006; Alesina and Ardagna, 2010), among others, have found that fiscal consolidation can reduce government debt and stimulate economic growth. Kleis and Moessinger (2016); Attinasi and Metelli (2017) are among the scholars that have found that fiscal consolidation is self-defeating and there is a negative impact on government debt as well as economic growth.

Given that fiscal consolidation is discretionary ² of fiscal authority, there has been the development of measurement using economic variables to find fiscal consolidation to analyse its impact on government debt and economic growth. There are three fiscal consolidation episode measures: definition approach, Cyclically Adjusted Primary Balance (CAPB), and narrative approach. The definition approach is based on larger changes in fiscal variables, such as government debt, tax, and consumption, among others Bergman and Hutchison (2010) and Hebous and Zimmermann (2014). With the definition approach, according to Baldacci et al. (2013), fiscal consolidation episodes occur when the government debt share to GDP falls for at least two consecutive years. Alesina and Ardagna (2010), deem fiscal consolidation episodes when government debt share to GDP falls by 4.5%. Barrios et al. (2010), indicates that when government debt share to GDP falls by 5% from the initial value this reflects fiscal consolidation episodes.

On the other hand, CAPB is concerned with the identification of discretionary fiscal policy changes that are exogenous in such a way that they are not influenced by the economic environment (Bergman and Hutchison, 2010) Gupta et al. (2005), Alesina and Perotti (1997) and Schaltegger and Weder (2014), and identifies fiscal consolidation episodes when CAPB improves by 1.5%. Zaghini (2001), identifies fiscal consolidation episodes when CAPB improves by 1.6% for two years successively. Alesina and Ardagna (2013), expand the definition from 1.5% to 3% improvement in CAPB for three consecutive years. The CAPB has been criticized for not fully identifying exogenous fiscal policy, as it may be associated with other economic factors, such as asset prices (Alesina and Ardagna, 2010). Nevertheless, the narrative approach advocated by Romer and Romer (2010) and (Devries et al., 2011a) solves this problem by identifying fiscal consolidation episodes using historical economic documents. Such historical economic documents include policy documents, plans, strategy documents, budget speeches, and government reports

²Fiscal authority actions that are not associated with the cyclical movement in the economy

or government policy documents that outline the adoption of fiscal consolidation.

There is no consensus on the impact, definition, measures, and rationale of fiscal consolidation on government debt and economic growth. Therefore, country-based investigations of fiscal consolidation are critical for drawing conclusions, particularly in South Africa (SA), where there is a willingness to adopt fiscal consolidation. However, there has been limited research on this topic. At the policy level, fiscal consolidation has been advocated in South African budget reviews (BR, 1990, 2020). At the policy level, SA's fiscal authorities have implemented policy interventions to curb government debt. These interventions include the 1996 Growth Employment and Redistribution Act (GEAR) and the Public Finance Management Act of 1999 (PFMA) (Weeks, 1999). In 2014, the Financial and Fiscal Commission (FFC) recommended that the government adopt more fiscal consolidation stances to restore its fiscal position and reduce government debt (BR, 2014).

Fiscal consolidation, characterized by measures such as tax increases and government spending cuts, is often pursued as a means to address burgeoning government debt levels and stimulate economic growth. Understanding the intricate relationships between these variables is essential to developing effective fiscal policies and promoting sustainable economic development. Fiscal consolidation strategies, as evidenced by studies such as Romer (1994), Gunter et al. (2021), Buthelezi and Nyatanga (2023a), play a pivotal role in shaping economic outcomes. Policymakers aim to create a conducive environment for investment by curbing government debt through expenditure cuts and revenue enhancements, thereby fostering economic growth. However, the effectiveness of fiscal consolidation measures in achieving these objectives remains a subject of debate in academic and policy circles. Government expenditure, as a component of fiscal policy, is a key determinant of economic activity and social welfare. Decisions regarding the allocation of public funds impact infrastructure development, social programs, and overall aggregate demand. Moreover, the relationship between government expenditure and economic growth is complex, with varying empirical evidence suggesting both positive and negative effects, depending on the context and implementation of fiscal policies (Primiceri, 2005). The nexus between fiscal consolidation and economic growth is further nuanced by factors such as consumer confidence, investment behavior, and external economic conditions. While proponents argue that fiscal discipline can instil confidence in financial markets and spur private sector investment (Alesina and Perotti, 1995; Blanchard, 1990), sceptics raise concerns about potential contractionary effects on aggregate demand and employment (Kleis and Moessinger, 2016; Attinasi and Metelli, 2017).

1.3 Problem Statement

This section outlines the problem that this study seeks to investigate. Firstly, the OECD and the International Monetary Fund (IMF) assume constant tax revenue and government expenditure elasticities throughout the analysis on the composition of the CAPB ([Bouthevillain et al., 2001](#); [Turrini and Larch, 2009](#); [Girouard and André, 2006](#); [Primiceri, 2005](#)). These elasticities are used to identify discretionary actions by fiscal authorities in an effort to reduce domestic government debt through an increase in taxes and cuts in government expenditure. This study identifies this as a problem because the constant tax revenue and government expenditure elasticity in CAPB do not account for the responsiveness to changes in these economic variables over time. The applicability of constant elasticity in government expenditure does not adequately capture government interventions over time or the fiscal framework that may be taken in an effort to reduce domestic government debt. However, there is an economic dynamic in government revenue, and constant elasticity ignores every change in the tax system and tax rates. In this regard, the assumption of constant elasticity in tax revenue and government expenditure categories by the OECD and IMF approaches can have a significant bias. This leads to the incorrect composition of CAPB as well as the identification of fiscal consolidation episodes ³.

The second problem identified in this study is that there is no specific rate or threshold for how much improvement in CAPB, fall in government debt, and a deficit can be attributed to fiscal consolidation episodes. The thresholds in the literature are defined by a large change in CAPB and government debt. The thinking is that large rates best represent exogenous or discretionary changes in fiscal policy because these are not close to the economic fluctuation ([Alesina and Perotti, 1997](#); [Yang et al., 2015](#))⁴. On the other hand, scholars have used different rates without effectively explaining how large is large and how to get this large value that reflects the fiscal consolidation episodes. On the other hand, empirically there is no consensus on what threshold to be used can be attributed to fiscal consolidation episodes including [Alesina and Perotti \(1995\)](#), [Alesina and Ardagna \(1998\)](#), [Alesina et al. \(2019\)](#), [Turrini and Larch \(2009\)](#), [Jalles \(2017\)](#), [Woo et al. \(2013\)](#), [Xiang et al. \(2021\)](#), [Yartey et al. \(2017\)](#) amongst others. Given the

³This object has resulted in the publication one can't find at [Buthelezi and Nyatanga \(2023d\)](#), with the title: Time-Varying Elasticity of Cyclically Adjusted Primary Balance and Effect of Fiscal Consolidation on Domestic Government Debt in South Africa

⁴[Blanchard \(1990\)](#) in defining fiscal consolidation as large observed improvements in the cyclically adjusted primary balance (CAPB). CAPB is intended to capture discretionary fiscal policy by excluding the estimated effects of business cycle fluctuations on the government budget. Therefore, taxes and transfers are cyclically adjusted, and net interest payments are subtracted. CAPB is a discretionary measure of fiscal policy as it excludes interest payments from past government liabilities on accumulated debt.

lack of agreement on the specific rate to be used, this may result in different fiscal consolidation episodes being identified even if scholars use the same data. As such, scholars will have different results and conclusions; thus, there is no consensus on the threshold or an effective method for obtaining larger values. Moreover, the thresholds are not defined to decrease domestic government debt, as advocated by the narrative approach ([Devries et al., 2011a](#))⁵.

South African domestic government debt reflects upward and downward swings from 1979 to 2022. Domestic government debt before democracy in 1994 is characterized by a variation cycle that ranges between 29% and 41.80%. From 1979 to 1994, the mean domestic government debt was 32.03%. After 1994, domestic government debt increased to a rate of 44.66% in 1999. Domestic government debt began a downward trend until it reached a minimum value of 21.99%. However, afterwards domestic government debt increased drastically, surpassing the previous cycle rate of 41.8% in 1994 and reaching a rate of 42.22% in 2015. In the 2014 MTBP, domestic government debt approached the upper limit of sustainability [MTBPS \(2014\)](#). The expense of debt payments jeopardizes the stability of the national budget, which puts the development of public services and investment at risk. To protect public finances, the government must act within its financial means in a long-lasting manner [MTBPS \(2015\)](#). Another factor that contributed to high government debt was the 2009 financial crisis. Domestic government debt continued to increase until it reached a rate of 71.72% in 2021. This rate of 71.72% is above the 60% threshold advocated by the SADC countries, of which South Africa is a member [SADC \(2006\)](#); [Busato \(2022\)](#).

The third problem is that there has been an up-and-down movement in domestic government debts. This fluctuation reflects a certain level of instability in domestic government debt. As such, it is critical to investigate the effect of fiscal consolidation on different states of domestic government debt. As such, it is critical to understand the impact of fiscal consolidation when domestic government debt is at its highest and when it is at its lowest rate. This study uses cyclical adjusted primary balance (CAPB) (with time-varying elasticity), which proxies fiscal consolidation, to investigate the impact of fiscal consolidation on different states of domestic government debt. By employing CAPB with time-varying elasticity, the study aims to capture the dynamic nature of fiscal policy responses and their implications for domestic government debt. this study endeavors to shed light on how fiscal consolidation measures influence the tra-

⁵This object has resulted in the publication one cannot find in [Buthelezi and Nyatanga \(2023c\)](#), with the title: Threshold of the CAPB That Can Be Attributed to Fiscal Consolidation Episodes in South Africa

jectory of domestic government debt during different phases of its cyclical movement. Through this investigation, policymakers and researchers can gain valuable insights into the effectiveness of fiscal policy interventions in managing government debt levels across varying economic contexts⁶.

The fourth problem that has been identified is that domestic government debt is now above the threshold of 60%, which is deemed to be stable in SADC countries. As outlined above, South Africa has experienced cyclical fluctuations in domestic government debt. These fluctuations reflect both lower and higher levels in recent years. On the other hand, the rate of domestic government debt above 60% is concerning [SADC \(2006\)](#); [Busato \(2022\)](#). The problem that has been identified is that domestic government debt is now above the threshold of 60%, which is deemed stable in SADC countries. South Africa is one of the strongest countries in SADC, and the rate of domestic government debt in South Africa is above 60% [SADC \(2006\)](#); [Busato \(2022\)](#). However, what is true for regional groupings may not necessarily be true for one country. Therefore, it is critical to investigate the threshold impact of domestic government debt on economic growth, particularly in the presence of fiscal consolidation. There is no policy in South Africa as to what the cap of government debt is. However, there is no consensus among scholars on the impact of fiscal consolidation on government debt. The case in point [Blanchard \(1990\)](#), [Alesina and Perotti \(1995\)](#), [Mupunga and Le Roux \(2015\)](#), [David and Leigh \(2018\)](#), [Al-dama and Creel \(2019\)](#), [Afonso et al. \(2022b\)](#), [Makhoba et al. \(2021a\)](#), among others, finds that fiscal consolidation reduces government debt. While [Müller \(2014\)](#), and [du Plessis et al. \(2014\)](#), [Georgantas et al. \(2023\)](#) among others, outline that fiscal consolidation increases government debt; therefore, it is self-defeating. There has been a gap in the literature looking at the aspect of the threshold impact of government debt and fiscal consolidation in the presence of fiscal consolidation. Moreover, the point of departure or contribution is the estimation of the threshold of government debt using the first difference, dummy variables, and TAR in the presence of fiscal consolidation in South Africa. In contrast, the gross domestic product (GDP) growth rate was recorded at 1.3% in 2022, and the projections for 2023–2025 are lower. These rates of economic growth are below the 5% target stipulated in the 2013 National Development Plan (NDP). This raises the question of whether fiscal consolidation—touted as a policy to reduce government debt—is effective in South Africa. The expectation is that government debt will decrease if South Africa adopts fiscal consolidation measures. Consequently, it is expected that funds previously allocated to debt servicing will be redirected to other economic activities, ultimately leading to

⁶This object has resulted in the publication one can't find at [Buthelezi and Nyatanga \(2023b\)](#), with the title: Impact of fiscal consolidation in different states of domestic government debt in South Africa 1979 to 2022

an increase in economic growth. However, discrepancies arise as South Africa has implemented fiscal consolidation policies; yet, economic growth remains sluggish. Consequently, this study aims to investigate the impact of fiscal consolidation on economic growth at the macroeconomic level⁷.

1.3.1 Research objectives of the study

The broad objective of this study is to investigate the new fiscal consolidation measures, thresholds, and impact of fiscal consolidation on domestic government debt in South Africa. The objectives of this study were as follows:

1. Investigate the difference between the CAPB with time-varying elasticity and time-invariant elasticity as a proxy for fiscal consolidation.
2. Investigate the threshold of the CAPB that can be attributed to fiscal consolidation.
3. Investigate the impact of fiscal consolidation in different states of domestic government debt.
4. Investigate the threshold impact of domestic government debt on gross domestic product per person in the presence of fiscal consolidation.

1.3.2 The study questions

1. What is the difference between the CAPB with time-varying elasticity and time-invariant elasticity as a proxy for fiscal consolidation?
2. What threshold of the CAPB can be attributed to fiscal consolidation?
3. What is the impact of fiscal consolidation in different states of domestic government debt?
4. What is the threshold impact of domestic government debt on gross domestic product per person in the presence of fiscal consolidation?

1.3.3 The hypotheses

The following are the descriptions of the hypotheses of this study informed by the above study questions:

⁷This object has resulted in the publication one can't find at [Buthelezi and Nyatanga \(2023a\)](#), with the title: The dynamic relationship between government debt, fiscal consolidation, and economic growth in South Africa: A threshold analysis

1. Hypothesis

Null : $H : \beta = 0$ There is no difference between CAPB with time-varying elasticity and time-invariant elasticity as a proxy for fiscal consolidation.

Alt : $H : \beta \neq 0$ There is a difference between CAPB with time-varying elasticity and time-invariant elasticity as a proxy for fiscal consolidation.

2. Hypothesis

Null : $H : \beta = 0$ There is no threshold for CAPB, which can be attributed to the fiscal consolidation episode.

Alt : $H : \beta \neq 0$ There is a threshold for CAPB that can be attributed to the fiscal consolidation episode.

3. Hypothesis

Null : $H : \beta = 0$ Fiscal consolidation has no impact on the different states of domestic government debt.

Alt : $H : \beta \neq 0$ There is an impact of fiscal consolidation in different states on domestic government debt

4. Hypothesis

Null : $H : \beta = 0$ There is no threshold effect of domestic government debt on gross domestic product per person in the presence of fiscal consolidation.

Alt : $\neq 0$ There is a threshold effect of domestic government debt on gross domestic product per person in the presence of fiscal consolidation.

1.4 Significance of the study

Overall, empirical studies and the literature thus far have not provided a clear consensus on the debate on the impact of fiscal consolidation on domestic government debt and economic growth. Therefore, this topic is worth undertaking to help policymakers, the government, and researchers in general, especially given the limited research on this topic in South Africa. The topic is relevant and timely given that South Africa is attempting to improve its fiscal position through fiscal consolidation. This has been outlined in budget reviews and medium-term pol-

icy statements (BR, 1990, 2001, 2013, 2017, 2020; MTBPS, 2014, 2015, 2017), among others. The first part that reflects the significance of this study is that it contributes to the body of knowledge by adjusting the methodology of constant elasticity to the time-varying elasticity of the IMF and OECD when calculating CAPB as a measure of fiscal consolidation (Bouthevillain et al., 2001; Turrini and Larch, 2009; Girouard and André, 2006; Primiceri, 2005). This study is significant because it fills this gap by investigating CAPB using time-varying elasticity and seeks to find a different element of the time-varying elasticity CAPB. It is believed that the CAPB with time-varying elasticity will provide information about economic fluctuations triggered by discretionary fiscal policy over time, which may not be noted in the constant elasticity calculation of the CAPB. Moreover, this study examines CAPB with time-varying elasticity in a disagreeable manner. This is achieved by examining the CAPB with time-varying elasticity from the government expenditure as well as the government revenue side. This study also analyzes the time-varying elasticity of CAPB dynamics in relation to domestic government debt over time from both the government expenditure and government revenue sides.⁸

Secondly, there is no clear explanation for how the CAPB threshold is determined. Literature only gives intuition when there is a large change in fiscal economic variables of interest such as deficit and government debt, for example, a 1.5% change in the CAB could be deemed to be a fiscal consolidation episode as outlined in Alesina and Ardagna (2010); Afonso et al. (2006); Yang et al. (2015) amongst others.⁹ This study is designed to fill the gap in the unexplained threshold methodology of fiscal consolidation episodes. Therefore, this study aims to resolve the problem of finding inconsistent results of fiscal consolidation episodes while using the same data set because different thresholds can be used from the currently unexplained proposed threshold in the literature.¹⁰

The third component of this study, , investigates the impact of fiscal consolidation on domestic government debt. This question is not unique to South Africa because it has been investigated by Duperrut (1998) and Burger et al. (2016) among others. Nevertheless, in this study, we use new data that accounts for the time-varying elasticity CAPB. Moreover, this study uses government expenditure fiscal consolidation and the impact of government debt on tax fiscal consolidation.

⁸This study is the point of departure from the work of Duperrut (1998) in South Africa who used the CAP with constant elastic and threshold. In contrast, Burger et al. (2016) used a fiscal function to ascertain fiscal consolidation. This study uses time-varying elasticity in the CAPB to proxy fiscal consolidation.

⁹particularly when these variables fall, it will reflect fiscal consolidation or government interventions.

¹⁰The belief is that the threshold of 5%, 1.5%, and 2.5% may give different thresholds that can be attributed to fiscal consolidation. Therefore, country-based fiscal consolidation threshold measures need to be investigated.

This study also expands the limited research on fiscal consolidation, as measured by CAPB, by adopting disaggregated component shocks to inform policies.

The fourth aspect that shows the level of significance is the investigation of the threshold impact of economic growth. However, the question is not unique to South Africa, as investigated by [Baaziz et al. \(2015\)](#) and [Ndoricimpa \(2022\)](#). Nevertheless, this point of departure is related to the presence of fiscal consolidation. This study considers the tax and expenditure components of fiscal consolidation.

1.5 Structure of the study

Chapter 2 outlines fiscal consolidation definitions and measurements. In this chapter, different definitions and measures of fiscal consolidation, including the CAPB, primary approach, Blanchard approach, asset price approach, and European Commission and IMF approaches, are examined. The second section of this chapter focuses on various theories related to fiscal consolidation. This study discusses the definition approach, which emphasises the need to reduce government deficits and debt levels to promote long-term economic stability. This chapter also explores the classical view of fiscal consolidation, which advocates for reducing government spending and lowering taxes to promote private sector growth. Additionally, the chapter examines Wagner's law view of fiscal consolidation, which argues that government spending tends to increase as economies develop. Finally, the chapter discusses the Keynesian view of fiscal consolidation, which emphasises the role of government spending in promoting economic growth.

Chapter 4 and ¹¹ focuses on a literature review of empirical studies related to various aspects of fiscal consolidation. This chapter discusses several empirical studies that provide insights into the relationship between fiscal consolidation and various economic variables. The studies discussed in this chapter were grouped into four categories. Objective one of This literature review examines the elasticity of CAPB and fiscal consolidation. This objective is addressed by analysing various empirical studies that investigate the relationship between CAPB and fiscal consolidation. Objective two of the literature review focuses on the threshold of CAPB, which can be attributed to fiscal consolidation episodes. Several empirical studies are reviewed in this objective which aims to identify the CAPB threshold that is associated with fiscal consolidation. Objective three of the literature review is dedicated to analysing the relationship between

¹¹Overall, the literature review in this chapter presents a comprehensive analysis of the empirical studies related to fiscal consolidation and provides insights into the various aspects of this topic.

fiscal consolidation and the state of domestic government debt. Various empirical studies provide insights into the impact of fiscal consolidation on government debt. Objective four of the literature review aims to investigate the relationship between government debt threshold, economic growth, and fiscal consolidation. Several empirical studies have explored the relationship between these three variables.

In Chapter 3, various policies and reviews aimed at achieving fiscal consolidation in South Africa are discussed. Specifically, the chapter covers the CAPB, the narrative approach, government expenditure reforms, and tax reforms. Each of these topics is examined for its role in promoting fiscal consolidation in South Africa.

Chapter 5 discusses the methodology employed to investigate the four objectives of this study. The aim is to provide readers with a comprehensive understanding of the research design and theoretical frameworks adopted. The chapter begins by providing a detailed explanation of the theoretical framework adopted for the study. Furthermore, this chapter delves into the model specifications for each objective, providing a detailed account of the research design. Objective one, in particular, utilises the CAPB framework and the Solow growth model as its theoretical framework. The CAPB framework is utilised to assess the government's budget constraint, while the Solow growth model is employed to understand the long-term economic growth rate. With regard to the model specifications, this chapter discusses the various models employed to achieve the research objectives. For instance, the TVP-VAR model is utilised to analyse the time-varying relationships between the variables under investigation. The threshold autoregressive regime model was employed to analyse the nonlinear relationships between the variables, while the Markov-switching dynamic regression model was used to examine the presence of regime changes in the data.

Chapter 6 focuses on the econometric results and findings of this study. Firstly, it discusses the economic results for objective number one, which aims to examine the impact of a particular intervention on a specific outcome. Secondly, the chapter delves into the econometric results for objective two, which involves analysing the relationship between two or more variables. Additionally, the chapter outlines the econometric results for objective three, which explores the potential moderators or mediators of the relationship under investigation. Lastly, the chapter discusses the econometric results for objective four, which seeks to determine the causal effect of an intervention or treatment on a particular outcome. This chapter provides a comprehensive

analysis of the econometric results and findings of the study, contributing to a broader understanding of the phenomenon under investigation.

In Chapter 7 presents the views and analyses of the various objectives of the study. Firstly, the author discusses the objective, which focuses on developing a new measure of elasticity of fiscal consolidation in South Africa. This study aims to provide a better understanding of how changes in fiscal consolidation affect the South African economy. The chapter also includes the author's discussion of objective two, which explores the threshold of the cyclically adjusted primary budget balance (CAPB) that can be attributed to fiscal consolidation episodes in South Africa. This objective is to identify the level of CAPB necessary to achieve sustainable fiscal consolidation in South Africa. Furthermore, the author discusses objective three, which focuses on the impact of fiscal consolidation on different states of domestic government debt in South Africa. This study aims to provide insights into the relationship between fiscal consolidation and government debt in South Africa. Lastly, the chapter includes the author's discussion of objective four, which examines the threshold impact of government debt on economic growth in the presence of fiscal consolidation. This objective aims to determine the level of government debt that can hinder economic growth even in the presence of fiscal consolidation.

Chapter 8 presents the conclusion of this study, which encompasses all the objectives of the empirical work undertaken. Firstly, the significance of different empirical studies is discussed. Secondly, this study's limitations were addressed. Finally, the study provides an outline of recommendations based on different empirical studies, followed by a conclusion.

Chapter 2

Fiscal consolidation definitions and theoretical review of literature review

2.1 Introduction

This chapter reviews various definitions and measures of fiscal consolidation used to identify episodes of fiscal consolidation. Firstly, this chapter outlines the descriptive definition of fiscal consolidation. Secondly, the CAPB definition is discussed. Thirdly, there is a discussion of the narrative approach, its rationale, and the framework to measure fiscal consolidation episodes. Lastly, there is a discussion of the definition approach with its threshold and definition. This chapter is divided into three sections. Firstly, there is a discussion of economic theories related to fiscal consolidation, namely the classical, standard Keynesian, and non-Keynesian schools of thought. Secondly, there is a discussion of economic growth, namely the Harrod-Domar, Solow growth, and Endogenous growth models. Finally, the conclusions of this study are presented.

2.2 Fiscal consolidation

Fiscal consolidation is a policy undertaken by cutting government expenditure and tax increases (Alesina and Perotti, 1995; Alesina and Ardagna, 1998; Alesina and Perotti, 1997; Alesina and Ardagna, 2010; Blanchard, 1990). This was performed to reduce the ratio of government debt to GDP and the deficit. The rationale is that with government expenditure cuts, the interest

rate will fall. This is because the government is deemed a big borrower; as such, cuts in government expenditure financed by debt will mean fewer loanable funds, and the price, which is the interest in the financial market, will fall. When the interest rate is low, it is expected that this will crowd in private investment into the economy, which will increase business activities, employment, and output produced in the economy, and ultimately reduce the government debt ratio to GDP (Alesina and Perotti, 1995).

There are descriptive definitions of fiscal consolidation adopted by different scholars, including (Alesina and Ardagna, 1998; Alesina and Perotti, 1997; Alesina and Ardagna, 2010). They advocate that fiscal consolidation is a policy adopted to reduce the underlying fiscal deficit and reduce the accumulation of debt stock at the national and subnational levels by cutting government expenditure and increasing total revenue through a tax increase. On the other hand, research on government policies in Denmark and Ireland by Giavazzi and Pagano (1995) noted that these countries adopted government expenditure cuts and tax increases in the 1990s to reduce the government debt ratio to GDP. As such, Giavazzi and Pagano (1995) concluded that fiscal consolidation may be defined as “contractionary-expansionary fiscal policy”, unlike the Keynesian school of thought, which advocates for an increase in government expenditure, an effort to stimulate low aggregate demand. Giavazzi and Pagano (1995), note that fiscal consolidation is the opposite of the policy advocated by the Keynesian school of thought and found it to stimulate private investment in Denmark and Ireland through lower interest rates. In all budget review documents, the South African National Treasury defines fiscal consolidation as a policy aimed at reducing government deficits and debt accumulation (BR, 2020).

The descriptive definitions given above reflect that the fiscal consolidation goal is to reduce the government debt ratio to GDP by reducing government expenditure and increasing taxes. However, among scholars, there have been great differences when they factor in the fact that government expenditure cuts and tax increases can be induced by discretionary actions of the government, and they may also be induced by the automatic movement of economic variables such as unemployment. Moreover, regarding government expenditure cuts and tax increases, cyclical changes are not related to the discretionary actions of the government (Alesina and Perotti, 1995). Given this acknowledgment, scholars have admitted that discretionary government intentions to reduce the government debt ratio to GDP need to be clearly defined in an effort to identify fiscal consolidation episodes. As such, cyclical or automatic movements in government expenditure cuts and tax increases need to be disassociated from discretionary government

intentions of cutting expenditure as well as increasing taxes. If this is achieved, scholars note that this will fully define fiscal consolidation episodes ([Alesina and Perotti, 1997](#); [Alesina and Ardagna, 1998](#); [Alesina and Perotti, 1995](#); [Alesina and Ardagna, 2010](#); [Hernández De Cos and Moral-Benito, 2013](#); [Schaltegger and Weder, 2014](#); [Gupta et al., 2005](#)).

The rationale for disassociating cyclical or automatic movements of government expenditure cuts and tax increases in an effort to find discretionary actions by the government has not been the same among scholars. This has led to different definitions of fiscal consolidation triggered by different institutions, measures, and methodologies of disassociating cyclical or automatic movements from government expenditure cuts and tax increases to find discretionary government intentions of expenditure cuts and tax increases. There have been broad themes in this regard, namely the CAPB advocated by [Romer and Romer \(2010\)](#) and [Devries et al. \(2011a\)](#) and the definition approach advocated by [Alesina and Perotti \(1997\)](#); [Alesina and Ardagna \(1998\)](#); [Gupta et al. \(2005\)](#); [Alesina and Ardagna \(2010\)](#); [Hernández De Cos and Moral-Benito \(2013\)](#); [Schaltegger and Weder \(2014\)](#). All these definitions of fiscal consolidation are discussed in the following section.

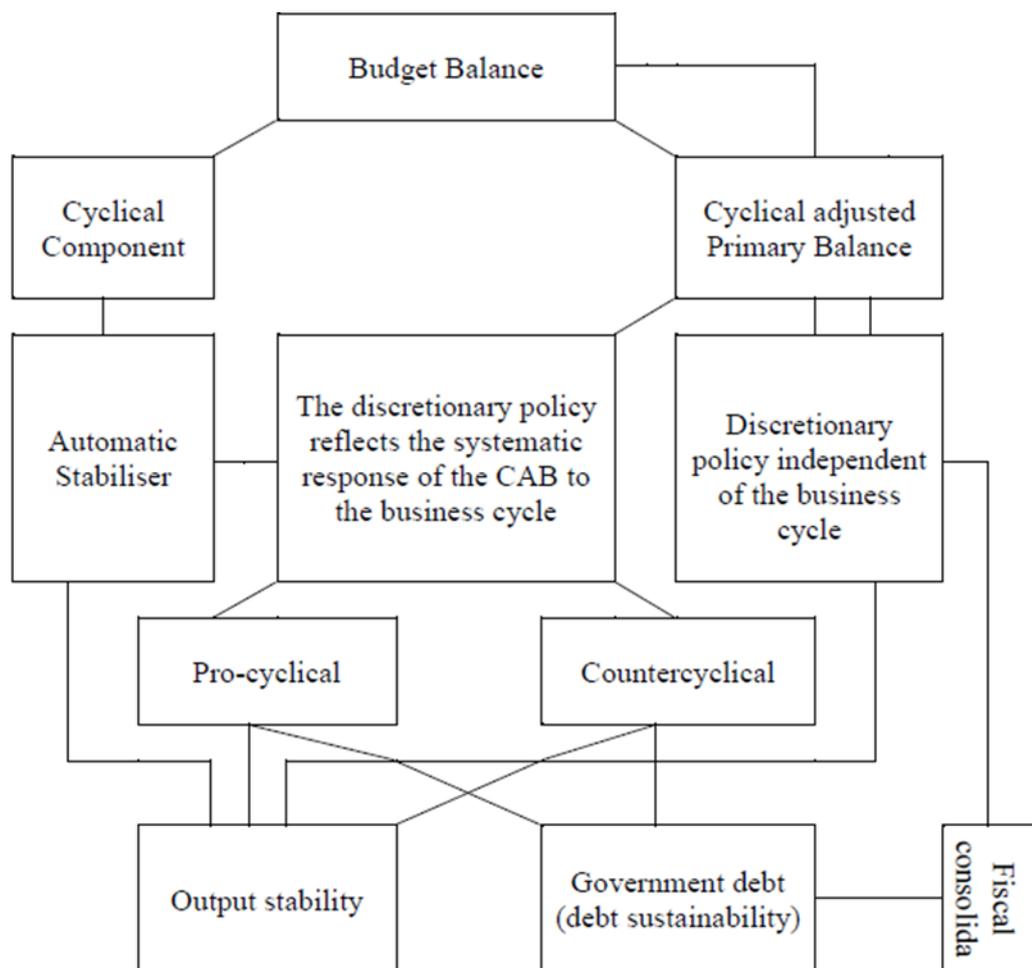
2.3 The cyclically adjusted primary balance

One of the broad measures of discretionary government intervention to reduce the government debt ratio of GDP, which defines fiscal consolidation episodes, is the CAPB. The measure is concerned with the identification of discretionary fiscal policy changes in tax and government expenditure by filtering out changes due to economic fluctuations in tax as well as government expenditure [Alesina and Perotti \(1995\)](#). Figure 2.1 shows the CAPB and discretionary changes that are made in an effort to find fiscal consolidation and reduce government debt share to GDP. The budget balance, which constitutes the government's total revenue and expenditure, is reflected at the top of Figure 2.1. The left-hand side of figure 2.1 reflects the cyclical component of the budget balance of government expenditure and tax, which affects output stability. The rationale is that the cyclical component of CAPB is brought about by an increase in unemployment in the economy, among other economic variables ([Alesina and Perotti, 1995](#)).

When unemployment increases, there will be an automatic fall in total tax revenue, and government expenditure will increase. The automatic fall in total revenue is triggered by an increase in unemployment, which results in less income for households that provide labour services and

less taxable income from workers by the government. Unemployment automatically triggers a fall in tax. This reflects that cyclical movements in the economy are not related to government discretion or intervention in an effort to reduce government debt or the deficit. This cyclical component of the budget balance is noted to affect the output because with the increase in unemployment, which results in the cyclical movement of government expenditure and tax, there will be less production, holding all other factors constant (Alesina and Perotti, 1995).

Figure 2.1: Discretionary fiscal consolidation episodes of the CAPB.



As such, it is argued that the cyclical component of the budget balance needs to be filtered out to avoid biased predictions of the discretionary action of fiscal authorities that can be attributed to fiscal consolidation episodes. There is a need for a discretionary policy to reflect the systematic response of CAPB to the business cycle. This is achieved through countercyclical policy interventions by the government, which will offset the cyclical component. As such, this reflects the discretionary action of fiscal authorities that can be attributed to fiscal

consolidation in an effort to reduce government debt in the economy (Alesina and Perotti, 1995).

In Figure 2.1, the right-hand side of the CAPB is a component of the budget balance that filters out all automatic movements in the economy. This is done to find discretionary movements in fiscal variables that can be attributed to the fiscal consolidation episode. To move from a discretionary fiscal policy that is independent of the business cycle to fiscal consolidation is shown in Figure 2.1 Alesina and Perotti (1997); Alesina and Ardagna (1998); Gupta et al. (2005); Alesina and Ardagna (2010); Hernández De Cos and Moral-Benito (2013); Schaltegger and Weder (2014), and Yang et al. (2015), which outlines some of the key components that need to be accounted for in an effort to ensure that there is no bias in the CAPB. This component includes (1) adjustment of the output composition effect; (2) once-off effects that temporarily increase or decrease revenue, as well as expenditure; (3) changes in asset prices, commodity prices, or terms of trade; and (4) interest rate among things, as advocated by Burger et al. (2016) and Attinasi and Metelli (2017). When such an effort has been made, a discretionary policy independent of the business cycle can be identified, and this will fully reflect fiscal consolidation that is directed at reducing government debt.

Figure 2.1 outlines the systematic response of CAPB to the business cycle in two parts. First, when these are countercyclical and second, when there are procyclical actions of the government. Countercyclical responses come from the conventional wisdom of the Keynesian school of thought. This is when it is advocated that there is a benefit to increasing government spending during a recession. According to Keynesian theory, the reason is that when the economy is in recession, unemployment is high; as such, higher government spending and lower tax rates are required to increase aggregate demand (Alworth and Arachi, 2012). Contrary to the Keynesian school of thought, a fiscal consolidation policy undertaken by cutting government spending or increasing taxes during a recession may help economic recovery. This finding agrees with the rationale that a cut in government expenditure will result in a decrease in the interest rate and stimulate private investments and business activities. Thus, firms will make high profits, and they will not be disinduced by an increase in tax, holding all other factors constant (Alworth and Arachi, 2012).

Figure 2.1 reflects how the discretionary policy with the systematic response of the CAPB can be pro-cyclical. It should be noted that there are components of the CABP that fluctuate positively or negatively with cycle fluctuations in GDP (Eyraud and Weber, 2013). The govern-

ment's pro-cyclical actions are deemed to be discretionary; however, they do not constitute the characteristics of fiscal consolidation because pro-cyclical responses have a positive relationship with economic mood. Nevertheless, procyclical responses affect output as well as government debt sustainability. (Eyraud and Weber, 2013), found that pro-cyclical policies harm output. As such, when there is an increase in economic growth and the government increases tax as well as expenditure, it crowds out private investment.

Despite the intuition given in Figure 2.1, there has been a great debate on how to remove the cyclical component in the economic variable of interest for government debt share to GDP and tax in an effort to find fiscal policy episodes Giavazzi and Pagano (1990); Romer and Romer (2010); Devries et al. (2011a); Yang et al. (2015) and Arizala et al. (2017). The debate has resulted in five main developments in the CAPB: the primary approach, the Blanchard approach, the asset price approach, the OECD approach, and the IMF approach.

2.3.1 Primary approach

The primary approach rationale is the CAPB, which can be seen by the changes in the primary deficit, as advocated by Alesina and Perotti (1995) is reflected in equation 2.1.

$$\Delta CAPB_t = (TGR_t - G_t) - (TGR_{t-1} - G_{t-1}) \quad (2.1)$$

Where TGR_t is total government revenue and G_t is total government expenditure while t reflects the time. When the difference between the current government revenue and total government expenditure ($TGR_t - G_t$) is accounted for against ($TGR_{t-1} - G_{t-1}$) the previous difference in government revenue and total government expenditure will result in the discretionary actions of the government in an effort to reduce the government debt ratio to GDP. Thus, when $CAPB$ is positive, it reflects the existence of fiscal consolidation episodes (Alesina and Perotti, 1995). On the other hand, it rationalized that when the economy moves from a deficit to a surplus, it characterizes the fiscal consolidation episode as such, reflecting discretionary government intervention in the economy (Alesina and Perotti, 1995).

One of the key benefits of this approach is that it is not complex given that fiscal consolidation episodes are identified through changes in total revenue and total government expenditure. The importance of accounting for changes in government expenditure and tax is noted in Alesina and Perotti (1995, 1997). These scholars investigate the importance of change and the composition

of fiscal adjustment in an effort to identify fiscal consolidation episodes. They concluded that fiscal adjustments based on government expenditure on public wages and welfare spending are long-lasting in an effort to reduce the government debt ratio to GDP. However, adjustments that rely primarily on tax hikes do not lead to permanent consolidation of government finances.

At the measurement level, the drawback is that it is silent on other factors that impact the primary deficit, such as unemployment, which triggers a cyclical movement of government expenditure and revenue, as the government needs to automatically pay people who are unemployed or retired. As such, these automatic changes need to be factored into the primary approach to ensure that it is not biased in the edification of fiscal consolidation episodes. Moreover, once-off effects that temporarily increase or decrease revenue, expenditure, and changes in asset prices, commodity prices, or terms of trade, as well as interest rates, among others advocated for by (Yang et al., 2015; Attinasi and Metelli, 2017), need to ensure that there are no biases in the primary approach. The Blanchard approach addresses some of the limitations of factoring in unemployment as a cyclical variable in the primary approach. The Blanchard approach is discussed in the following section.

2.3.2 Blanchard approach

In an effort to develop the primary approach, Blanchard (1990) noted that economic variables that show changes or deviations from full employment are critical to be factored into the model to find the CAPB that can be attributed to fiscal consolidation. Moreover, Blanchard (1990) points out that unemployment triggers cyclical movements in tax and government expenditure. As such, Blanchard (1990) proposes that unemployment changes be filtered in an effort to find discretionary changes in fiscal policy that can be attributed to fiscal consolidation. The principle of Blanchard (1990) which considers the primary deficit and is adjusted for unemployment in the prior year, is reflected in Equation 2.2.

$$\Delta CAPB_t = (TGR_t - G_t(UNE_{t-1})) - (TGR_{t-1} - G_{t-1}) \quad (2.2)$$

Where UNE_{t-1} is unemployment for the prior year, and the other economic variables are as indicated above. The drawback of this approach is that unemployment in a country may be affected by external factors which include, amongst others, the oil price. An increase in oil prices increases the price of production and price levels. This can result in a fall in demand for goods within the economy, leading to high unemployment. This oil price change was not within

the government's control. As such, a moment of unemployment may not reflect the economic condition of the domestic economy; rather, it reflects the multiplier effect of external factors of a change in oil price.

2.3.3 Asset price approach

The CAPB is affected by measurement errors from the economic cycle influences. One of these economic cyclical influences is the movement in asset prices that results in changes in the CAPB, which are not associated with policy actions. For example, a boom in the stock market improves CAPB by increasing capital gains and cyclically adjusted tax revenues, and is also likely to raise domestic demand [Yang et al. \(2015\)](#). As outlined above, the price of oil can also have an impact on cyclical movements in economic variables.

[Devries et al. \(2011a\)](#) argue against the investigation by [Alesina and Ardagna \(2010\)](#) of the CAPB in Ireland in 2009. They pointed out that the CAPB to GDP changes were due to the sharp tax fall in stock and house prices, which may have resulted in an outlier and inaccuracy in finding the CAPB, which could be attributed to fiscal consolidation. However, when [Devries et al. \(2011a\)](#) factor in asset price fluctuations, Ireland's CAPB improved by 1.3%. To address the above shortcomings, as noted in the primary and Blanchard approaches, the asset price approach is proposed and measures the changes in the CAPB in an effort to find fiscal consolidation episodes following the work of ([Alesina and Perotti, 1995, 1997](#); [Alesina and Ardagna, 2010](#)). The asset price approach advocates that cyclically adjusted spending by the government must consider time trends as well as unemployment, as shown in Equation 2.3.

$$G_t = \alpha_0 + \alpha_1 Trend + \alpha_2 UNE_t + e_t \quad (2.3)$$

Where G_t is government expenditure, $Trend$ is the trend in government expenditure and UNE_t is the level of unemployment in the economy. In an effort to find the primary adjusted government expenditure for business cycles and the changes in unemployment, Equation 2.4 follows.

$$G_t(UNE_{t-1}) = \alpha_0 + \alpha_1 Trend + \alpha_2 UNE_t + e_t \quad (2.4)$$

Where $(\alpha_0, \alpha_1, \alpha_2)$ are the estimated coefficients, e_t are the residuals, and UNE_{t-1} is the preceding annual unemployment rate in $(t - 1)$. A comparable process was applied to calculate

the cyclically adjusted revenues. Moreover, we add the asset price index, as shown in Equation 2.5.

$$TGR_t = \alpha_0 + \alpha_1 Tremd + \alpha_2 UNE_t + \alpha_3 Assetprice_t + e_t \quad (2.5)$$

Where $Assetprice_t$ is the asset price index and discretionary revenue changes, as shown with the account of the last year's asset price difference ($t - 1$), as shown in Equation 2.6.

$$TGR_t(UNE_{t-1}, Assetprice_{t-1}) = \alpha_0 + \alpha_1 Tremd + \alpha_2 UNE_t + \alpha_3 Assetprice_t + e_t \quad (2.6)$$

Finally, the changes in discretionary fiscal policy are obtained in Equation 2.7.

$$\Delta CAPB = [TGR_t - TGR_{t-1}] - [G_t - G_{t-1}] \quad (2.7)$$

The asset price approach, while offering insights into the CAPB and providing a nuanced understanding of fiscal policy adjustments, also presents several drawbacks. Implementing the asset price approach requires a significant amount of data on asset prices, which can be challenging to obtain and analyze accurately (Adam and Nagel, 2023). However, asset prices can be highly volatile and subject to sudden shifts due to market sentiment, speculation, and external shocks. This volatility can introduce noise into the analysis, making it difficult to distinguish between genuine and short-term market fluctuations (Hennig et al., 2023). Changes in asset prices may not solely reflect underlying economic fundamentals but could also be influenced by policy actions, investor behaviour, or other exogenous factors. This endogeneity can complicate the interpretation of the results and undermine the reliability of the conclusions drawn from the analysis. Although asset prices provide valuable information about market expectations and investor sentiment, they may not always accurately predict future economic conditions or policy outcomes. Relying solely on asset prices to guide fiscal policy adjustments may lead to suboptimal decision making, particularly during periods of market turbulence or uncertainty. The asset price approach often assumes that market participants behave rationally and efficiently, incorporating all available information into asset prices. However, behavioural biases, information asymmetries, and irrational exuberance can distort asset prices and undermine the validity of this assumption (Adam and Nagel, 2023; Hennig et al., 2023).

2.3.4 OECD and European Commission

Despite the developments discussed above regarding the CAPB, which were undertaken in an effort to find discretionary action of government expenditure and tax considering the asset price, the view of the OECD and the European Commission (EU) is that it is best to focus on the elasticity of government expenditure and tax in an effort to find the discretionary action that can be attributed to fiscal consolidation. As such, the development of the CAPB undertaken by the OECD and EU is embedded in the rationale that discretionary changes are best presented when the present primary deficit would have prevailed if expenditure in the previous year had grown with potential GDP, and revenues had grown with actual GDP (Alesina and Perotti, 1997; Mourre et al., 2013). The rationale of the OECD and EU when undertaking CAPB is shown in Equation 2.8.

$$\Delta CAPB_t = \frac{[(\sum_{j=1}^4 TGR_t^{\varepsilon_r} - G_t^{\varepsilon_g}) - (\sum_{j=1}^4 TGR_{t-1}^{\varepsilon_r} (1 + y_t) - G_{t-1}^{\varepsilon_g} (1 + y_t))]}{Y_{t-1}} \quad (2.8)$$

where y is nominal GDP and Y is the growth of the nominal potential of GDP, which is estimated based on country-specific production functions ¹ Where G is the government expenditure and TR is the aggregate tax revenue. The OECD and EU approaches offer a much broader scope of CAPB because they involve a disaggregated approach and elasticity of ε_r tax revenue and ε_g government expenditures (Mourre et al., 2013). There are four tax revenue categories: *CIT* or corporate income tax, *PIT*, personal income tax *SSC*, social security contributions, and *IT* indirect taxes. On the expenditure side, there are only *umplb* unemployment benefits. On the contrary, $\Delta CAPB$ is derived from constant cyclically adjusted tax revenue and government expenditure accounting elasticity, as well as the output gap (Alesina and Perotti, 1997; Mourre et al., 2013). The output gap is calculated using the Hedrick-Prescott filter, while the generalized least squares (GLS) is used to estimate the elasticity for each country and the seemingly unrelated regression procedure (SURE). The four elasticities are explained by the output gap, as shown in Equations 2.9 to 2.12.

$$\Delta \log CIT_t = \beta_0 + \beta_1 \log CIT_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (2.9)$$

$$\Delta \log PIT_t = \beta_0 + \beta_1 \log PIT_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (2.10)$$

¹In this study, we use the HM filter to find the growth of nominal potential GDP. We explain this in the following section.

$$\Delta \log SSC_t = \beta_0 + \beta_1 \log SSC_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (2.11)$$

$$\Delta \log IT_t = \beta_0 + \beta_1 \log IT_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (2.12)$$

The OECD and EU proxy for government expenditure with *umplb* unemployment expenditure benefits proportional to U unemployment is explained by the output gap, as shown in Equation 2.13.

$$\Delta \log \frac{UNE_t}{UNE_t} = \beta_0 + \beta_1 \log umplb \left(\frac{y_t}{Y_t} \right) + \mu \quad (2.13)$$

where $\frac{y}{Y}$ is the ratio of the potential to the actual output, TR^{CA} is the cyclically adjusted tax revenue, and G^{CA} is the cyclically adjusted government expenditure accounting for elasticity as well as the output gap (Mourre et al., 2013), as shown in Equations 2.14 to 2.15 respectively.

$$TGR_t^{CA} = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_r} \quad (2.14)$$

$$G_t^{CA} = G_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_g} \quad (2.15)$$

The overall CAPB of the OECD and EU Mourre et al. (2013) is shown in Equation 2.16.

$$\Delta CAPB_t = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_r} - G_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_g} \quad (2.16)$$

One of the key drawbacks of the CAPB is that there is a possibility of it being affected by temporary factors like once-off operations and asset price cycles. The OECD's cyclically adjusted balances exclude once-off revenue. Asset-price-based taxes are excluded from the cyclically adjusted balances. Nonetheless, the OECD stresses that it is important to find elasticity, as it reflects the responsiveness of government expenditure and tax, which are key components of the CAPB and fiscal consolidation (Mourre et al., 2013).

2.3.5 International Monetary Fund Approach

Similar to the OECD, the IMF follows an approach similar to finding the CAPB, as shown in Equation 2.17.

$$\Delta CAPB_t = \frac{[(\sum_{j=1}^4 TGR_t^{\varepsilon_r} - G_t^{\varepsilon_g}) - (\sum_{j=1}^4 TGR_{0,t-1}^{\varepsilon_r} (1 + y_t) - G_{0,t-1}^{\varepsilon_g} (1 + y_t))]}{Y_{t-1}} \quad (2.17)$$

The only difference is that the IMF uses the generalized method of moments (GMM) to find elasticity using Equations, similar to Equations 2.9 to 2.12. To obtain the potential output, the IMF utilizes the Hedrick-Prescott (HP) filter, which is a data smoothing technique over all data points of actual GDP using weighted moving averages. The deviations calculated by subtracting the actual output from the estimated trend output are symmetric over the business cycle, irrespective of structural breaks.

2.4 Narrative approach

Fiscal consolidations are implemented by fiscal authorities; therefore, they are discretionary actions of fiscal policymakers. As such, in the measurement of fiscal consolidation, it is critical to distinguish between tax and government expenditure due to economic fluctuations and those due to discretionary fiscal policy changes. One of the key drawbacks of the CAPB discussed in the previous section is that it may be influenced by economic conditions as noted by [Romer and Romer \(2010\)](#); [Devries et al. \(2011a\)](#). Scholars have suggested the use of a narrative approach to remedy this problem. The narrative approach is based on the rationale that historical documents that outline the intentions of fiscal authorities to increase tax and reduce government expenditures fully reflect discretionary changes by fiscal authorities that can be attributed to fiscal consolidation [Romer and Romer \(2010\)](#); [Devries et al. \(2011a\)](#). They built the fiscal consolidation episodes in Equation 2.18.

$$FC_t = FC_t^G + FC_t^T + \epsilon_t \quad (2.18)$$

The Equation 2.18 shows the composition of fiscal variables of fiscal consolidation, which are tax increases and government expenditure cuts to reduce government debt and deficits, as stipulated in historical documents. where FC_t is the narrative fiscal consolidation episode, FC_t^G is the government expenditure cut and FC_t^T is the tax increase. Fiscal consolidation episodes were identified using the following guidelines (d1 to d2):

- Policy documents advocate a tax increase, to achieve the reduction in government debt and the budget deficit (d1).
- Policy documents that advocate a cut in government expenditure to achieve a reduction in government debt and the budget deficit (d2).

All numerical values of the fiscal consolidation instrument, from government expenditure cuts to

Table 2.1: Definition Approach to Threshold

Variable	Definition Approach to Threshold
Government debts share to gross domestic product	A 4.5% decrease in government debt shares to gross domestic product in $(t+1)$, $(t+2)$ and $(t+3)$ (Alesina and Ardagna (2010); Bi et al. (2013)). Mean less than 5% from the initial government debt share to GDP for 3 successive years (Alesina and Perotti, 1995; Alesina and Ardagna, 1998; Tavares, 2004; Banday and Aneja, 2019).
Government deficit	A decrease of 2% below the initial rate for the government deficit in $(t+1)$, $(t+2)$ and $(t+3)$ (Alesina and Perotti, 1995; Alesina and Ardagna, 2010).
Economic Growth	Economic growth was higher for two successful years for the mean growth rate of cases where there was fiscal consolidation (Alesina and Ardagna, 1998). The average economic growth rate at (t) , is higher than that at $(t-1)$ and $(t-2)$ (Giudice et al., 2007).
The cyclically adjusted primary balance	If there is a 1% change in the cyclically adjusted primary balance over three years, (Tavares, 2004). The cyclically adjusted primary balance improves by 1.5% in (t) (Alesina and Perotti, 1997; Alesina and Ardagna, 1998; Gupta et al., 2005; Alesina and Ardagna, 2010; Hernández De Cos and Moral-Benito, 2013; Schaltegger and Weder, 2014), The cyclically adjusted primary balance improve by 1.5% in $(t+1)$, $(t+2)$ (Alesina and Ardagna, 1998). The cyclically adjusted primary balance increased by 2% in $(t+1)$ (Alesina and Ardagna, 1998). The cyclically adjusted primary balance is improved by the mean (μ) plus the standard deviation (σ) in (t) (Yang et al., 2015). The cyclically adjusted primary balance increases by the mean, (μ) , plus the standard deviation, (σ) , in (t) , and has cumulative changes at last, $(\mu + \frac{4}{3}\sigma)$, and $(\mu + \frac{1}{3}\sigma)$, in two and three years or more, respectively, (Yang et al., 2015).

tax increases, are found in policy documents (Yang et al., 2015). Such historical economic documents include policy documents, plans, strategy documents, budget speeches, and government reports that outline the fiscal consolidation of government expenditure cuts and tax increases (Devries et al., 2011a).

2.5 Definition Approach

Fiscal consolidation episodes measured by the definition approach are based on thresholds or specific changes in fiscal variables, such as government debt, CAPB, and deficit (Bergman and Hutchison, 2010). The intuition of the definition approach is that a fall in government debt and deficit, which is the ultimate objective of fiscal consolidation, best presents discretionary action by fiscal authorities if it reaches a specific threshold. The idea is that a specific threshold change in fiscal variables is exogenous or discretionary economic fluctuation that is not associated with the economic cycle Bergman and Hutchison (2010).

In Table 2.1, some of the economic variables used in the definition approach are government debt share to GDP, deficit share to GDP, economic growth, and the CAPB. With the government debt share to GDP, [Baldacci et al. \(2013\)](#) note that discretionary fiscal consolidation episodes using the definition approach when government debt share to GDP falls for at least two consecutive years by 3.5%. On the other hand, [Alesina and Ardagna \(2010\)](#) deem discretionary fiscal consolidation episodes when the government debt share to GDP falls by 4.5%.

[Barrios et al. \(2010\)](#), argue that when government debt share to GDP falls by 5% from the initial value, this reflects discretionary fiscal consolidation episodes. On the other hand, [Alesina and Perotti \(1995\)](#); [Alesina and Ardagna \(1998\)](#) argue that a government deficit that successfully falls by 2% per year would be regarded as a fiscal consolidation episode. They also outline that when there is economic growth for two successful years above the mean growth rate, this is deemed a fiscal consolidation episode [Alesina and Ardagna \(1998\)](#). The CAPB was used by [Gupta et al. \(2005\)](#); [Baldacci et al. \(2013\)](#); [Alesina and Ardagna \(2010\)](#); [Schaltegger and Weder \(2014\)](#) to identify fiscal consolidation episodes when the CAPB improves by 1.5%. [Zaghini \(2001\)](#), to identifies fiscal consolidation episodes when CAPB improves by 1.6% for two years successively. [Alesina and Ardagna \(2013\)](#), expand the definition from 1.5% to 3% improvement in CAPB for three consecutive years. The CAPB is criticized for not fully identifying exogenous fiscal policy, as it may be associated with other economic factors, such as asset prices [Alesina and Ardagna \(2010\)](#). The key aspect of this approach is its simplicity, and it can be back-tested to ensure that there is no biasedness. A limitation of this approach is that there is no consensus on the threshold to be used. Moreover, the literature is silent on the derivation of this threshold.

2.6 Theoretical view of fiscal consolidation

The theoretical explanations of the effects of fiscal consolidation are not conclusive. The classical school of thought states that fiscal consolidation has no effect. On the other hand, the standard Keynesian school of thought advocates that fiscal consolidation has a detrimental effect on economic growth and limits the reduction in government debt share to GDP ([Mankiw, 2014](#)). Nevertheless, non-Keynesians argue that fiscal consolidation has positive effects. These positive effects are a result of expectations embedded in credibility, which induces investments and triggers an increase in future wealth ([Alesina and Ardagna, 2013](#)). Further discussions of these theories are presented in the following sections.

2.6.1 The classical view of fiscal consolidation

The classical school of thought view is that fiscal policy, particularly the use of fiscal consolidation, is not needed to resolve government debt and deficit. The classical school of thought advocates that less government intervention in the economy is needed, as the economic system eventually self-corrects economic distress through a phenomenon known as the invisible hand (Povarova, 2018). Such principles are embedded in the classical school of thought assumptions that the economy swiftly adjusts to an equilibrium in which the economy will be at full employment because prices are flexible. Moreover, economic agents possess perfect market information. As such, when the economy is in disequilibrium, market forces adjust the economy to equilibrium. In this regard, the fiscal consolidation policy, achieved through government expenditure cuts, is not necessary for the economy to stabilize GDP or increase it, which can ultimately assist with the reduction in government debt ratio to GDP (Mankiw, 2014; Povarova, 2018).

The criticism of the classical school of thought stems from its emphasis on full employment and the belief that the economy will naturally return to equilibrium levels. Keynesian economists argue that this perspective overlooks the possibility of an underemployment equilibrium, where aggregate demand falls short of generating full employment. In such cases, the economy may remain stuck at an output level below its potential, leading to persistent unemployment or underutilization of resources (Stanley, 2016). Keynes famously stated, "In the long run, we are all dead," to underscore the urgency of addressing short-term economic problems. He criticized the classical school's reliance on long-term economic solutions, arguing that many economic issues, particularly those related to unemployment and recession, require immediate intervention. Keynes believed that waiting for market forces to self-correct in the long run was insufficient to resolve short-term economic crises (Mankiw, 2014; Stanley, 2016; Povarova, 2018). Therefore, critiques of the classical school emphasize the importance of addressing short-term economic challenges and the limitations of relying solely on long-term solutions. Keynesian economics advocates for active government intervention, such as fiscal stimulus, to manage aggregate demand and stabilize the economy during periods of a downturn or recession. This perspective highlights the need for a more dynamic and flexible approach to economic policy, one that considers both short-term and long-term objectives in addressing economic problems.

2.6.2 Wagner's law view of fiscal consolidation

The idea of fiscal consolidation is that when there is high government debt, there is a need for government expenditure cuts. The rationale for fiscal consolidation is that it reduces the interest rate, which then increases private investment, resulting in increases in employment, income, consumption, and GDP, leading to a decrease in the government debt ratio to GDP (Irاندoust, 2019; Funashima and Hiraga, 2017). However, Wagner's law, which suggests the idea of fiscal consolidation, may not hold. Wagner's Law argues that there is a law of increasing state activity, meaning that when there is an increase in gross domestic product, there is a need for the government to increase its expenditure (which is contrary to what is advocated by fiscal consolidation) while providing the necessary infrastructure and education, among other things. This will make the business environment enrolment good for business activities with good infrastructure and education that private investment may not be able to provide for most of the population in the economy (Irاندoust, 2019; Nirola and Sahu, 2020).

Fiscal consolidation policy aims to reduce the ratio of government debt to GDP. The policy makes assumptions about the knock-on effects of cutting government expenditure, which entails increased business activities through private investment induced by a fall in interest rates as well as an increase in GDP (Nirola and Sahu, 2020; Funashima and Hiraga, 2017). Nevertheless, given this knock-on effect, Wagner's Law suggests that this is not possible because an increase in GDP may also increase industrialization and economic development. Wagner's Law advocates that an increase in industrialization and economic development increases government functions as well as expenditure. In the period of industrialization, there is an increase in real income per capita as well as government expenditure, which is contrary to fiscal consolidation, in an effort to maintain or further increase GDP, which could eventually reduce the government debt ratio to GDP. As such, the policy of fiscal consolidation to cut government expenditures will not hold (Irاندoust, 2019; Nirola and Sahu, 2020).

Wagner's Law contradicts the objectives of fiscal consolidation, which seeks to reduce government debt through expenditure cuts. The notion that economic growth necessitates increased government spending undermines the effectiveness of fiscal consolidation (Alesina and Perotti, 1995; Vaquero-García et al., 2022). Increased government spending, as advocated by Wagner's law, may crowd out private investment, as businesses may rely on government-provided services and infrastructure instead of investing independently (Stanley, 2016; Povarova, 2018).

Finally, the theory outlines the complexity of economic relationships, indicating that simplistic approaches to fiscal policy may overlook broader economic factors. This necessitates a more nuanced understanding of the interplay between economic growth, government expenditure, and fiscal policy.

2.6.3 Keynesian view of fiscal consolidation

The theoretical development of the use of fiscal consolidation policy has not been the same among schools of thought, as noted above. The traditional Keynesian school of thought was highly advocated in the 1970s as a fiscal policy tool for stabilising macroeconomics (Brady, 2015). Contrary to fiscal consolidation policy, the traditional Keynesian school of thought advocates that there are short-run detrimental effects induced by fiscal consolidation policy achieved through government expenditure cuts. The Keynesian school of thought is embedded in the belief that government intervention is critical in the economy which is contrary to the view of the Classical school of thought. However, this is partially supported by Wagner's law and Armeý's theory. Moreover, under the Keynesian school of thought, wages and prices tend to be sticky. Given these assumptions, demand is determined by savings, investment, and interest rates (Keynes, 1937; Mankiw, 2014; Afonso et al., 2022a).

The intuition of the Keynesian school of thought about fiscal consolidation through tax increases and government expenditure cuts is twofold. Firstly, when fiscal consolidation is adopted through a tax increase directed at businesses, this may result in a fall in business activities, which will, in turn, trigger a slowdown in economic growth with less production. In this regard, the government will have less income from tax, which will impose limitations on the government, as well as an increase in government debt and a possible deficit (Keynes, 1937; Mankiw, 2014; Peña, 2021; Brady, 2015). On the other hand, if the tax increase is directed toward consumer goods and services, this may result in a reduction in the buying power of consumers because the increase in consumer tax indirectly reduces consumer disposable income. As the disposable income falls, this triggers the slowing economic growth in the country, especially in developing economies that have economic growth that is sensitive to the fall in disposable income. Given this intuition, the Keynesian school of thought finds fiscal consolidation achieved through tax to not hold in an effort to increase economic activity that will increase GDP, which will, in turn, reduce the government debt ratio to GDP (Keynes, 1937; Mankiw, 2014; Brady, 2015).

Secondly, the Keynesian school of thought considers that if governments undertake fiscal consolidation through government expenditure cuts, it will collapse the aggregate demand of the nation. This is because of the assumption of the Keynesian school of thought that government intervention does not hold (Brady, 2015). Moreover, according to the traditional Keynesian school of thought, a government expenditure cut is seen as money withdrawn and not used in potential economic projects or factors that may stimulate greater returns, leading to an increase in economic growth that can trigger a reduction in government debt as well as deficit (Peña, 2021; Mankiw, 2014). Similar to the Armey curve theory, the Keynesian school of thought argues that the timing of fiscal policy implementation is critical. However, the fiscal consolidation achieved through government expenditure cuts has a detrimental effect on economic growth, which may increase the government debt ratio to GDP. The Keynesian school of thought suggests a reduction in the government debt ratio to GDP, a deficit, and an increase in economic growth. This can be achieved by implementing the opposite fiscal policy instruments of fiscal consolidation, which are cuts in tax and increases in government expenditure (Keynes, 1937; Mankiw, 2014; Peña, 2021). Therefore, the Keynesian school of thought supports the government's notion of running a government deficit, government debt, and increased government expenditure when the economy is in recession to boost the aggregate demand deficit. This is because firms face the challenge of increasing costs in a recession, and may resort to reducing their labour force, resulting in a fall in economic growth. To counteract this in the recession, the Keynesian school of thought supports government expenditure increase, which is contrary to the views advocated by fiscal consolidation and the use of government debt to compensate firms so that they do not increase prices or reduce the labour force. By doing so, economies may maintain or increase economic growth (Keynes, 1937; Mankiw, 2014; Peña, 2021).

The Keynesian theory is critiqued for only providing an analysis of the short-run impact of government expenditure. Therefore, all policies based on the Keynesian school of thought provide short-term solutions, while many economies need a long-term suitable solution. Despite this being pointed out as a limitation, Keynes argues that 'in the long run, we are all dead', using it as a matter to suggest that long-run implications are not that significant or necessary (Aizenman et al., 2012). Nevertheless, at a later stage, Keynes came to recognize that there is a long-run implication associated with the increase in government expenditure, especially when it is financed by debt. Keynes notes that an increase in government expenditure financed by debt results in higher interest rates and inflation. With a high interest rate, we anticipate a high level of unemployment. The standard Keynesian is short as a policy tool for recognising pub-

lic expectations about government discretion changes implemented through fiscal consolidation (Cömert, 2019; Brady, 2015). However, the standard Keynesian approach stresses the adoption of expansionary policy, which is the opposite of fiscal consolidation, during a recession. This is viewed as a reactionary policy rather than a proactive policy tool. This may result in longer time spent for economies to recover, especially developing economies, which will need to redirect their financial resources to try and stimulate economic growth (Cömert, 2019).

The drawback of the Keynesian theory is that it does not consider moral hazards when countries make government expenditures financed by government debt. The Keynesian school of thought advocates that governments need to spend time when the economy is in recession, even by making use of government debt. However, developing economies cannot use government debt in a recession, as there is a greater possibility of putting such economies into a recession that could create a generational burden. A case in point is that it was estimated that during the 2008 financial crisis, most developing economies needed to spend about 4% of their GDP to stimulate economic growth, which was found to be difficult for many developing economies (Krugman, 2008; Brady, 2015). It is impossible and would be irresponsible for endlessly increasing government expenditures or reducing the level of taxation in an economy. The analysis of the standard Keynesian approach is limited to identifying the policy implications of the open economy, as it is restricted in its analysis of the closed economy. This may result in biased policy recommendations, especially in an ever-changing economy influenced by international factors (Krugman, 2008; Cömert, 2019). In this regard, the standard Keynesian approach provides a static view of macroeconomic analysis. Therefore, the standard Keynesian approach may not provide much information in the dynamic environment of real economies. In this regard, it does not assist policymakers in tracing how economic growth is and will be affected by current discretionary fiscal policy changes. The standard Keynesian government stresses the need for intervention to counteract negative effects on economic growth. This may hinder many economies where there is no effective government and political instability (Okwori and Abu, 2018; Brady, 2015).

2.6.4 Multiplier model view of fiscal consolidation

The Keynesian school of thought regarding fiscal consolidation is also based on the multiplier effect. The multiplier model is Equation 2.19.

$$\frac{1}{1 - MPC} \tag{2.19}$$

where MPC is the marginal propensity to consume, reflecting the proposition that economic agents are willing to consume from their income. The core rationale of the multiplier is that one additional unit government expenditure cuts may lead to a decrease in economic growth of more than one unit, whereas the opposite is true (Rochon and Gnos, 2008; Banerjee and Zampolli, 2019). This change is reflected in Equation 2.20.

$$\Delta Y = \frac{1}{1 - MPC} \Delta G \quad (2.20)$$

where ΔY is economic growth and ΔG is the change in the government expenditure cut. If the country adopts fiscal consolidation with government expenditure cuts, this would result in a fall in economic growth. The magnitude of the decrease in economic growth is subject to the size of the multiplier in the short term. The intuition behind this is that a government expenditure cut is a leakage that results in a lack of business activities, leading to less income, resulting in a wealth effect, disposable income, and buying power (Rochon and Gnos, 2008; Alesina et al., 2017; Banerjee and Zampolli, 2019). This triggers a cumulative negative effect on economic growth, which is greater than the initial decrease in government expenditure. This indicates that fiscal consolidation will have a negative effect on multiplier intuition. Moreover, a decrease in economic growth leads to a decrease in government revenue (Rochon and Gnos, 2008; Banerjee and Zampolli, 2019). Therefore, this means that countries will have little chance to reduce the government debt share to GDP. The multiplier reflects that the objective of fiscal consolidation to reduce the government debt ratio to GDP through government expenditure cuts does not hold (Rochon and Gnos, 2008; Banerjee and Zampolli, 2019).

On the contrary, if a country adopts fiscal consolidation through a tax increase, this will lower the planned expenditure, disposable income, and autonomous consumption (Rochon and Gnos, 2008). The change in the economic growth function expressing the effect of fiscal consolidation based on a tax increase is shown in Equation 2.21.

$$\Delta Y = \frac{-c\Delta T}{1 - MPC} \Delta T \quad (2.21)$$

where ΔT denotes the increase in the tax change and $-c\Delta T$ denotes the lower change in the planned expenditure. The multiplier value triggered by an increase in tax determines a fall in economic growth. The rationale is that tax increases result in a fall in consumption due to lower income in real terms, and lower overall economic growth is anticipated (Rochon and Gnos, 2008; Barrell et al., 2013; Alesina et al., 2017). The combined expression of the multiplier based on

government expenditures and tax-based fiscal consolidation can be expressed as Equation 2.22.

$$\Delta Y = \frac{1}{1 - MPC} \Delta G - \frac{c\Delta T}{1 - MPC} \Delta T \quad (2.22)$$

In the case where the changes in government expenditure and tax are in the positive direction with the same amount, $\Delta G = \Delta T$, the multiplier will be zero. The government plays an important role in ensuring that any changes made in fiscal policy do not negatively affect economic growth. Through the multiplier model, the standard Keynesian school of thought concludes that fiscal consolidation harms economic growth. Irrespective of whether fiscal consolidation is undertaken through government expenditure cuts or tax increases, economic growth falls. Thus, the ultimate objective of fiscal consolidation, which is to reduce the gross ratio of government debt to GDP, cannot be achieved (Rochon and Gnos, 2008; Barrell et al., 2013).

The limitation of the Multiplier model relies on simplified assumptions about consumer behaviour and government spending patterns. For instance, it assumes a constant marginal propensity to consume, which may not hold true in real-world scenarios, where consumer behaviour can be dynamic and complex. Moreover, the Multiplier model overlooks the potential crowding-out effects, where increased government spending or taxation may crowd out private investment, leading to offsetting effects on economic growth. This could result in the multiplier effect being dampened or even reversed in certain circumstances (Rochon and Gnos, 2008; Barrell et al., 2013; Alesina et al., 2017).

2.6.5 Ricardian equivalence view of fiscal consolidation

The standard Keynesian school of thought deems that fiscal consolidation harms economic growth and proposes that governments adopt the opposite fiscal instruments of government expenditure increase and tax reduction in an effort to increase economic growth (Alesina and Perotti, 1997; Du Plessis et al., 2007; Alesina and Ardagna, 2010; Burger et al., 2016). The Ricardian Equivalence theorem counterargues the proposal of the standard Keynesian school of thought of using fiscal instruments, namely, government expenditure increases and tax reductions, to stimulate the economy. The assumptions of the Ricardian Equivalence are that households are homogenous, agents are rational and have a finite life, perfect capital markets, and no liquidity constraints; agents are forward-looking at the changes in the fiscal policy and agents are willing to save for a future tax increase. The Ricardian view advocates that increasing government expenditure, financed by government debt, would not increase aggregate demand or

economic growth. This is because agents are forward-looking and do not base their consumption only on their current disposable income, but they also consider the future implications of fiscal policy changes on their disposable income (Mankiw, 2014; Ferrara and Tirelli, 2017; Lombard, 1998; McKibbin, 1994; Sardoni, 2021).

The rationale of forward-looking by Ricardian equivalence assumes that agents have a finite lifetime and perfect capital markets and that information is deemed perfect. Therefore, given that agents are assumed to be rational, they will know that the increase in government expenditure financed by government debt in the present time will mean higher taxes in the future for the government to repay borrowed funds. Therefore, agents face the opportunity cost of spending either now or later. This is because they know that consuming more now will burn the future generation, holding all other factors constant (Mankiw, 2014; Ferrara and Tirelli, 2017; Lombard, 1998; McKibbin, 1994; Sardoni, 2021). As a result, agents in the present time will not spend more today; they will save so that they will compensate for their spending (income) if taxes increase. As agents save, there is no change in consumption; therefore, it does not increase economic growth, as articulated in the standard Keynesian school of thought (Ferrara and Tirelli, 2017; Lombard, 1998; McKibbin, 1994; Sardoni, 2021). The core idea of Ricardian equivalence is that there will be no effect on the economy because of an increase in government expenditure, which is financed by the government because agents are forward-looking. In this regard, the framework of the multiplier is explained in the standard Keynesian school of thought in the context of the Ricardian Equivalence theorem. If governments run a deficit, this will have an impact on consumption, not on the total amount left for investment. Therefore, this will mean the multiplier model is zero (Mankiw, 2014; Ferrara and Tirelli, 2017; Lombard, 1998; McKibbin, 1994; Sardoni, 2021).

The concept of forward-looking by the Ricardian Equivalence theorem suggests that fiscal consolidation undertaken by government expenditure cuts may increase economic growth and reduce the government debt ratio to GDP. This is because when there is a cut in government expenditures, the economic agent expects a tax reduction in the future (Ferrara and Tirelli, 2017; Lombard, 1998; McKibbin, 1994; Sardoni, 2021). As such, economic agents reduce savings that they would have used when they were expecting tax increases and a fall in tax because of the cut in government expenditure. An economic agent brings future consumption to the current period. This will increase aggregate demand, which will ultimately result in a reduction in the government debt ratio to GDP. This is the same principle advocated by fiscal consolidation pol-

icy ([Bouthevillain et al., 2001](#)).

Robert Barro supported the critique and supporting arguments of the Ricardian Equivalence view of 1974 based on the rationale of the future generation. Barro advocates that the current generation and future generations should not be viewed as independent economic actors. Accordingly, the individual's decision on how much to buy is not only based on his or her income but also on the income of future members of his or her family, holding all other factors constant ([Gale and Potter, 2002](#)). As such, the economic agent anticipates that the next generation will not pay more tax because of the government expenditure cut, as advocated by the fiscal consolidation policy. Barro suggests that fiscal consolidation will be effective in stimulating consumption and GDP which may result in a fall in the government debt ratio to GDP holding all other factors constant.

The drawback of the Ricardian equivalence is the assumption of a finite lifetime. This implies that if the government takes debt, it is because people today will save and finance government debt through taxes in the future because they have a finite lifetime. However, this may not hold true because of the different life spans and lifetimes of individuals. The Ricardian equivalence rationale of forward-looking by the public is critiqued by another concept known as myopia, which assumes that individuals do not have full information when making decisions on consumption and savings. In other words, the public does not consider government debt or deficits when they make decisions to buy goods and services. Therefore, the general public or taxpayers, in general, are short-sighted about the implications of current government debt's impact on future taxes ([McKibbin, 1994](#); [Sardoni, 2021](#)). Moreover, the public may not have perfect information about what will even happen in the future. In this way, the Ricardian equivalence may not hold if the economy has many economic agents that abide by the 'Myopia' concept. As a result, the concept of fiscal consolidation will not be able to hold. The Ricardian equivalence assumption of the finite horizon is criticized for not being realistic because Keynes argues that in the long run, we will all die, suggesting the insignificance of the long run when dealing with fiscal policy. However, if agents have an infinite lifetime, they will still adjust their savings because they are rational in the effort to save for expected future tax increases ([Banday and Aneja, 2019](#); [Ferrara and Tirelli, 2017](#); [Lombard, 1998](#); [McKibbin, 1994](#); [Sardoni, 2021](#)). Other scholars point out that the Ricardian equivalence has limitations as they found that the agent's expenditure behaviour is significantly influenced by current disposable income rather than the future tax increase [Kormendi and Meguire \(1985\)](#) among other scholars have concluded that budget deficits do not

influence consumption in the countries they have studied and therefore found support for the validity of the Ricardian equivalence.

2.6.6 Government budget constraints

Government budget constraints state that governments can spend an amount equal to tax receipt or less [Blanchard \(1990\)](#); [Makin \(2019\)](#); [Menna and Tirelli \(2017\)](#). However, the government is not limited to tax, as it can source finance through government debt and bonds, among others. In this regard, there is a greater chance that the government may have outstanding debt for a long time and increase the amount of government debt over time [Blanchard \(1990\)](#); [Miao et al. \(2023\)](#); [Maliar and Maliar \(2014\)](#). The evolution of government deficit is defined as government debt, interest payment, government expenditure and less tax ([Blanchard, 1990](#); [Miao et al., 2023](#); [Maliar and Maliar, 2014](#)). The budget deficit of the year t is given as reflected in the Equation 2.23

$$Deficit = rGD_{t-1} + G_t - TGR_t \quad (2.23)$$

where t and r denote time and interest rates, respectively. On the other hand, GD_{t-1} denotes government debt and rGD_{t-1} indicates government debt service at a real interest rate at time t . The government spending on goods and services at time t and taxes at time t are subtracted. Scholars that focus on government deficit evolution like, [Blanchard \(1990\)](#); [Makin \(2019\)](#); [Menna and Tirelli \(2017\)](#) point out that government deficit can be explained by government debt and changes at time t . Therefore, such changes are equivalent to the deficit at time t , which can also be reflected in Equation 2.24

$$GD_t - GD_{t-1} = Deficit \quad (2.24)$$

Therefore, Equation 2.24 implies that government debt increases when a country has a deficit. However, government debt will fall when the country has a surplus [Blanchard \(1990\)](#); [Miao et al. \(2023\)](#); [Maliar and Maliar \(2014\)](#). Given the acceptance of Equation 2.24, Equation can be revised and expressed as Equation 2.25.

$$GD_t - GD_{t-1} = rGD_{t-1} + G_t - TGR_t \quad (2.25)$$

where $GD_t - GD_{t-1}$ denotes the adjustments in government debt at time t , rGD_{t-1} reflects interest payments, and $G_t - TGR_t$ denotes the government's primary deficit. Thus, Equation

can be reformulated and expressed as Equations 2.26 and 2.27.

$$GD_t = GD_{t-1} + rGD_{t-1} + G_t - TGR_t \quad (2.26)$$

$$GD_t = (1 + r)GD_{t-1} + G_t - TGR_t \quad (2.27)$$

At the end of the period, t , debt equals $(1 + r)$ multiplied by debt, $t - 1$. The implication of a one-period decrease in taxes for the path of debt and future taxes assumes that until year one, the government has balanced its budget so that the initial debt is equal to zero. To repay such debt, the government must have a surplus that equals $(1 + r)^{t-1}$ for the year t . If taxes are reduced by 1 in period 1, this would cause an increase in taxes of, $(1 + r)^{t-1}$, during the period, t (Mankiw, 2014; Miao et al., 2023; Maliar and Maliar, 2014). If the government does not change its spending, there will be an increase in future taxes, real interest rates, and an eventual increase in taxes. During a recession, a government may desire to run large deficits, such that the cyclically adjusted deficit is positive. As such, debt may not be stabilized by output returns. The government needs to cut spending and increase taxes in the future to decrease the deficit (Mankiw, 2014; Miao et al., 2023; Maliar and Maliar, 2014).

Like many economic theories, the government budget constraint theory often relies on simplifying assumptions. It assumes static economic conditions, full information, rational behaviour by economic agents, and perfect capital markets. In reality, these assumptions may not hold, leading to potential inaccuracies in the theoretical predictions. This theory may not fully account for the political factors that influence fiscal policy decisions. Governments may prioritize short-term political objectives over long-term fiscal sustainability, leading to deficits, excessive borrowing, and unsustainable debt. While the theory acknowledges the necessity of financing government spending by borrowing when tax revenue falls short, it may not adequately address the long-term implications of accumulating government debt. High levels of debt can lead to debt servicing costs, crowding out private investment, and potential fiscal crises if not managed prudently (Duncan and Smith, 1995).

2.7 Growth Theories

The Harrod-Domar model, Solow growth model, endogenous growth theory and endogenous growth theory (extended by Robert Barro) are important in discussing the impact of fiscal consolidation on economic growth. Harrod-Domar model emphasizes the relationship between

investment, savings, and economic growth. Investigating the impact of fiscal consolidation on GDP growth aligns with the Harrod-Domar model's focus on investment as a driver of economic expansion (Mankiw, 2014). Understanding how changes in fiscal policy affect investment levels and, subsequently, economic growth, can provide insights into the effectiveness of fiscal consolidation measures. There is a discussion of the Solow model which highlights the role of technological progress and capital accumulation in economic growth. Analysing the impact of fiscal consolidation on GDP growth can be viewed through the lens of the Solow model by examining how changes in government spending and taxation policies influence savings, investment, and capital formation, thereby affecting long-term growth rates (Mankiw, 2014). Endogenous Growth Theory indicates the importance of investments in education, training, and healthcare as essential drivers of economic growth. A skilled and educated workforce contributes to productivity enhancement and innovation, leading to higher long-term growth rates (Roberts and Setterfield, 2007; Mankiw, 2014; Howitt, 2010). Barro (1990)'s extension of the endogenous growth theory incorporates the role of government spending in shaping long-term economic growth. Investigating the impact of fiscal consolidation on GDP growth can be explored within this framework by considering how changes in government expenditure and taxation policies.

2.7.1 Harrod–Domar Model

The Harrod–Domar model is an economic growth model that stresses that economic growth is achieved or depends on the level of savings and the capital-output ratio within the economy. The core rationale of the Harrod–Domar model is that for economies to realize an increase in economic growth, there is a need for an increase in the savings rate (Mankiw, 2014). Therefore, the change in income, output, or growth in the Harrod–Domar model is given by Equation 2.28.

$$Y = SI - K \tag{2.28}$$

Where S is savings, I is investment, δ is depreciation, K is capital, and Y denotes the change in economic growth or income. This model is based on several assumptions: (1) $(Y = F(K))$ c output is a function of capital stock, (2) $(F(0) = 0)$ capital is necessary for output, (3) $(sY = S = I)$ savings rate to income and output equals savings, which equals investment, (4) $K = I - K$ the change in capital stock equals investment minus depreciation, and $(\frac{dY}{dK} = c \rightarrow \frac{dY}{dK} = \frac{Y}{K})$ the marginal product of capital is constant. Capital K in the rationale of the Harrod–Domar model is greatly influenced by investment (Mankiw, 2014). This is also supported by model assumption 4 that a change in capital stock equals investment minus the depreciation of the capital stock.

Equation 2.28, exhibits a marginal product of capital that is constant as indicated in assumption number 5. Therefore, based on the Harrod–Domar model, economic growth increases when there is an increase in savings S (Mankiw, 2014).

The Harrod–Domar model is critiqued to provide a static view of economic growth. This implies that capital K is a given value for all plants and equipment in the economy regardless of the year in which it was produced. On the other hand, Y is the value of output in the current year (Mankiw, 2014). Given these differences in the variable’s time frame, the Harrod–Domar model may lead to empirical limitations and can have detrimental implications when the model is applied in the real world using real data. Another critique of the Harrod-Domar model in Equation 2.28 is that it does not factor in labour, which is an important factor in many economic growth functions, production functions, and models.

The Harrod–Domar model is mostly suggested for use by developing economies (Blume and Sargent, 2015). This suggests that, if developing countries such as those in ECOWAS and SADC want to achieve economic growth, the government needs to encourage savings. On the contrary, (Okafor and Tyrowicz, 2009) argue that developing countries do not have sufficient savings essential for economic growth. Moreover, developing countries have high opportunity costs between spending and saving to stimulate economic growth.

Despite critiques of the Harrod–Domar model, Jagadeesh (2015) investigated the role of savings on economic growth in Botswana, an SADC country. The author used the rationale of the Harrod–Domar model as well as the autoregressive distributed lagged (ARDL) model with data from 1980 to 2013. It was found that there is a statistically significant positive relationship between savings and economic growth, which is in line with the Harrod–Domar growth model.

2.7.2 Solow growth model, theory of growth

The Solow growth model was first introduced in 1956, and provides a dynamic view of how savings, investment, and population affect economic growth. (Feldstein et al., 1992; Mankiw, 2014). The Solow growth model is described by Equation 2.29.

$$Y_t = F(K_t, L_t * E) = A (K_t)^\alpha (L_t)^{1- \alpha} \quad (2.29)$$

Where Y is economic growth, L is labour, K denotes capital, A indicates technological

progress, and E stands for efficiency of labour, which indicates public knowledge about production methods, which is triggered by the improvement in technology denoted by A . The Solow growth model is dynamic and is denoted by subscript t in each variable of the model. The exponential subscript of $1 - \alpha$ in Equation 2.29 is the share of output paid to labour, and α is the share of output paid to capital. The assumptions of the Solow growth model are (1) perfect competition, (2) a closed economy, (3) saving equals investment, (4) there is perpetual full employment of labour, (5) there is exogenous technical progress, (6) diminishing returns to capital, (7) there are constant returns to scale, (8) capital depreciates at the constant rate (d) and (9) the population grows at a constant rate (n). In the Solow growth model, it is rationalized that the economy will reach a steady state, which is the value of per capita capital (k^*), such that, if the economy has $k_0 = k^*$ then $k_t = k^* \forall t > 1$ (Mankiw, 2014). In the steady state, the Solow growth model advocates that savings are equal to the amount needed to provide equipment (investment) for any additional workers, n , and compensate for the depreciation of equipment, d , given by $sf(k) = (n + d)k$. Since n and d are constant and $f(k)$ satisfies the Inada condition, the consumption is proportional to output, $c = (1 - s)f(k)$. The possible choice for s is that one will produce the highest possible steady-state value for c , which is called the golden rule savings rate (RA, 1956; Dykas et al., 2023; Mankiw, 2014).

Therefore, we assume that the economy is at a steady state or equilibrium point. The rationale of the Solow growth model is that an increase in savings S will increase capital stock K and investment I , triggering an increase in Y economic growth. However, the increase in capital stock is reduced by equipment depreciation d which reflects a diminishing marginal return on capital, as noted by assumption 6. As diminishing marginal returns begin, economic growth gradually increases at a decreasing rate until the economy reaches a new steady state in the long run (Mankiw, 2014). The Solow growth model assumes that technology is exogenous in explaining economic growth. It is further thought that technological progress leads to an increase in the efficiency of labour E which eventually grows at a constant rate g . This constant rate of growth is known as labour-augmenting technological progress (LATP) (RA, 1956; Dykas et al., 2023). Moreover, each unit of labour E grows at rate g while the labour force L grows at rate n therefore, the quantity of effective workers is given by $L * E$ and will grow at the rate of $n + g$. Therefore, when the economy is in a steady state, the economic growth rate of output per worker depends solely on the technological progress rate (RA, 1956; Dykas et al., 2023; Mankiw, 2014).

Endogenous theory critiques the Solow growth model for not explaining the technological process

and considers it exogenous in explaining economic growth (Reinhart et al., 2012). The Solow growth model is critiqued for implying that if economies are given the same level of savings, they will converge at a similar growth rate. There are arguments that such convergence of economic growth rates may not be realised in the real world, especially in developing countries (Stähler and Thomas, 2012). The Endogenous theory critiques the Solow growth model for focusing on physical investments rather than knowledge investments, which is an important factor for economic growth (Mankiw, 2014). Notwithstanding the shortcomings of the Solow growth model, it provides a vital rationale for factors that influence long-run economic growth. Moreover, the model has contributed significantly to the macro analysis of economic growth because it is dynamic (Mankiw, 2014). Parente (2001), argues that the Solow growth model in growth theory is much more appropriate than the Endogenous growth theory. This is because it assumes a diminishing marginal return on capital, which is much more realistic in the real world than the constant marginal return advocated by the Endogenous theorem.

2.7.3 Endogenous growth theory

Endogenous growth theory bridges the gap in the Solow growth model, which assumes that technology is external in explaining economic growth. Endogenous growth theory is known as the AK model, which is used interchangeably with the Endogenous growth model (Aghion et al., 1998; Roberts and Setterfield, 2007; Mankiw, 2014). The AK or Endogenous growth model is expressed as Equation 2.30.

$$Y = AK \tag{2.30}$$

Where A is a positive constant reflecting the level of technology. It also indicates a constant measure of the output volume produced for each unit of capital. The subscript K is capital stock; however, unlike in the Solow model, where capital K indicates only equipment and fixed or physical capital. In Endogenous growth theory, capital, K is viewed as the current knowledge of people. Moreover, the Endogenous growth theory advocates the assumption that constant returns to capital are more suitable than diminishing returns to capital, as advocated by the Solow growth model. Therefore, the production function in Equation 2.30 does not exhibit diminishing marginal return on capital. This assumption is the key distinction between the Endogenous growth theory and the Solow growth model (Roberts and Setterfield, 2007; Mankiw, 2014; Howitt, 2010).

Given the acceptance of constant returns to capital in Endogenous growth theory, the subscript A is vital as an indication of a constant measure of the volume of output produced for each unit of capital. Therefore, Endogenous growth theory shows that irrespective of how much capital exists, if one extra unit of capital is produced, there will be one extra unit of output (Mankiw, 2014; Aghion et al., 1998). The assumptions of the Endogenous growth model are (1) economic growth depends on population growth (2) economies have “non-rivals” and (3) economic growth depends on capital accumulation. The model’s first assumption is that economic growth depends on the population. This is because, with the increase in population, there is a greater chance of an increase in new ideas that can help a country move forward. Moreover, there is the belief that new ideas can trigger an increase in nations’ economic activities and economic growth. In economic theory, there are no challenges to sharing information. Therefore, there is no competition for information because new information is considered to drive economic growth (Howitt, 2010; Mankiw, 2014).

The Endogenous growth theory is supported by explaining technological progress as an important internal factor that increases economic growth. However, it has been criticized for its weakness in explaining the conditional convergence. Under an Endogenous growth model, economies may achieve increased economic growth when technology and human capital are employed. This is because technology and human capital have triggered an increase in RD. As research and development increases, this results in new ideas, designs, and solutions that generate an increase in economic activities as well as economic growth (Aghion et al., 1998; Roberts and Setterfield, 2007). However, when technology advances to a level where human capital is not required, it becomes detrimental to economic growth, especially in developing economies. Moreover, the productivity effect of learning-by-doing is limited as technology increases (Howitt, 2010; Mankiw, 2014). Romer (1994), also critiques the Endogenous growth theory for being practically difficult to test when using real economic data. Moreover, conditional convergence is not explained in the Endogenous growth model.

2.7.4 Robert Barro extended the endogenous growth model

Barro (1990) extended the endogenous growth model to incorporate the role of government spending. In traditional growth models, such as the Solow model, technological progress and exogenous factors are considered drivers of economic growth (Chandra, 2022; Okafor and Tyrowicz, 2009). However, Barro’s extension suggests that government spending can also play a

significant role in influencing long-term economic growth rates.

$$g = T = ry = rK^{1-\alpha}g^\alpha \quad (2.31)$$

where T is government revenue and r is the tax rate. I normalized the number of households to unity, so that g corresponds to aggregate expenditures and T to aggregate revenues (Barro, 1990; Chandra, 2022). By incorporating government spending into the model, Barro (1990) aimed to analyze the impact of fiscal policy on economic growth. He argued that government expenditure could affect the accumulation of human capital, research and development, and infrastructure, all of which are crucial determinants of long-term economic performance (Chandra, 2022).

Thach (2020) critics argue that Barro (1990)'s treatment of government spending in the model is overly simplistic. It assumes that government spending directly contributes to economic growth without considering the potential inefficiencies or misallocations of resources that can arise from government intervention. Another limitation is that the model operates under the assumption of perfect markets, in which all agents have perfect information and there are no market imperfections (Thach, 2020). This assumption may not accurately reflect real-world conditions in which markets can be imperfect and information may be asymmetric. However, it tends to downplay the potential positive role of government intervention in promoting economic growth beyond providing public goods and infrastructure (Gruzina et al., 2021). It overlooks the possibility that targeted government policies, such as investments in education, healthcare, and RD, could have significant long-term growth effects. Moreover, the model often neglects policymakers' endogenous responses to changes in economic conditions. In reality, policymakers may adjust fiscal and monetary policies in response to economic shocks, which can affect the dynamics of growth and effectiveness of policy interventions (Thach, 2020; Gruzina et al., 2021). Barro (1990)'s model typically assumes homogeneity among agents and overlooks distributional effects. In reality, the benefits of government spending or policies may not be equally distributed among different groups within a society, leading to potential social and economic inequalities (Barro, 2023; Thach, 2020). The work of Barro (1990) work opened up new avenues for studying the interactions between fiscal policy and economic growth. This highlights the importance of considering government behavior and policies to understand the dynamics of economic development. Additionally, it provided a framework for policymakers to evaluate the implications of different fiscal strategies on long-term growth prospects.

2.7.5 Structuralist growth theory

Structuralist economists, such as Raúl Prebisch and Gunnar Myrdal, argue that government intervention is necessary to overcome structural barriers to economic development, including market failures, inequality, and underdevelopment. Structuralist theories advocate active government involvement through industrial policies, redistribution measures, and progressive taxation, to promote inclusive and sustainable economic growth (Puntigliano and Appelqvist, 2011; Calcagno, 2021). Structuralist theories, championed by economists such as Raúl Prebisch and Gunnar Myrdal, advocate significant government intervention to address structural barriers to economic development. While these theories offer valuable insights into the challenges of market failure, inequality, and underdevelopment, they also face limitations. One limitation is the potential for government intervention to lead to inefficiency and unintended consequences. Excessive regulation and intervention may distort market signals, hinder competition, stifle innovation, and ultimately undermine economic growth. Additionally, implementing industrial policies and redistribution measures can be politically contentious and prone to capture vested interests, leading to rent-seeking behaviour and corruption (Puntigliano and Appelqvist, 2011; Calcagno, 2021). Furthermore, structuralist approaches may overlook the importance of market mechanisms in efficiently allocating resources. By prioritising government intervention, these theories may neglect the potential benefits of market-based solutions and entrepreneurship in driving economic development. Moreover, the effectiveness of government interventions in promoting inclusive and sustainable growth depends on institutional capacity and governance quality. Weak institutions, lack of transparency, and corruption can undermine the implementation of structuralist policies, limiting their impact on economic development (Puntigliano and Appelqvist, 2011; Calcagno, 2021).

2.8 Conclusion of chapter

This chapter reviews different definitions and measures of fiscal consolidation used to find discretionary fiscal consolidation episodes. This chapter outlines three broad definitions and measurements of fiscal consolidation: the CAPB, the narrative approach, and the definition approach. The CAPB was said to be concerned with the identification of discretionary fiscal policy changes in tax and government expenditure by filtering out changes due to economic fluctuations in tax as well as government expenditure. The chapter notes that the CAPB is supreme for its simplicity and application; hence, it uses a fiscal variable of tax and government expenditure. However,

the cyclically adjusted primary balance was said to have a limitation, as it can be affected by cyclical economic movements.

Given the limitations, the debate on CAPB has resulted in the five main developments of the CAPB, namely, the primary approach, the Blanchard approach, the asset price approach, the OECD approach, and the IMF approach. The primary approach rationale is that the CAPB can be represented by changes in the primary. On the other hand, the Blanchard approach develops the primary approach by factoring unemployment as one of the key economic variables that represent cyclical movement. The asset price approach notes that asset prices also need to be filtered out to find discretionary action through the CAPB. The OECD and IMF approaches note that elasticity from government expenditure and tax is in an effort to find fiscal consolidation.

The chapter also discusses the narrative approach for identifying fiscal consolidation episodes. The narrative approach states that there is a need to use a government policy document that outlines fiscal authorities' intention to reduce government debt and deficit using government expenditure cuts as well as a tax increase. Finally, the chapter discusses the definition approach based on thresholds or specific changes in fiscal variables, such as government debt, CAPB, and deficits. This indicates that fiscal consolidation occurs when these economic variables change by a specific amount.

This chapter discusses some of the key theories related to fiscal consolidation that touch on aspects of government expenditure and tax. The Classical school of thought suggests that there is no need for government intervention in an economy. This is because, if the economy is in disequilibrium, market forces will self-correct back to equilibrium. The Classical school of thought suggests that fiscal consolidation has no effect, whether positive or negative, because the net effect depends on the size of fiscal consolidation. Similar to classical thought, Wagner's law suggests that fiscal consolidation may not hold. This is because fiscal consolidation policies aim to reduce the debt-to-GDP ratio of the government. The policy makes assumptions about the knock-on effects of cutting government expenditure, which include increased business activities through private investment induced by a fall in the interest rate as well as an increase in GDP. Wagner's Law notes that because of the "law of increasing state activity," this increases GDP, and there is a need for the government to increase its expenditure by providing necessary infrastructure and education, among other things. This results in fiscal consolidation not being

achieved.

Unlike the Classical school of thought and Wagner's law, the Armey curve theory is two-fold and acknowledges the short run as well as the long run. Armey curve theory first notes that government expenditure cuts in the short run will not be effective in stimulating economic activities. However, in the long run, fiscal consolidation may be achieved when the country has high GDP. Contrary to the Classical school of thought, the traditional Keynesian Ricardian Equivalence argues that economic agents are forward-looking, meaning that an increase in government expenditure financed by debt triggers an expectation of higher taxes in the future. As a result, economic agents in the present time will spend less and save more in anticipation of future tax increases that they will need to pay to settle debt. In such a situation, increasing government expenditures through debt financing will not trigger economic growth, as demand will remain unchanged. On the other hand, contrary to the traditional Keynesian school of thought, the non-Keynesians point out that fiscal consolidation has a positive effect on economic growth. Non-Keynesians advocate that if the Ricardian Equivalence concept of forwarding looking is accepted, a government expenditure cut will lead to agents' expectations of the reduction of tax in the future. This will increase the agent's permanent income because of the tax reduction; therefore, agents will spend, and economic growth will increase. As such, it is expected that the ratio of government debt to GDP will fall, reflecting the success of fiscal consolidation.

Chapter 3

Policies and review for fiscal consolidation in South Africa

3.1 Introduction

This chapter reviews the relevant policies and government interventions that have been undertaken to implement fiscal consolidation in South Africa. Moreover, this chapter discusses fiscal variables concerning fiscal policy and consolidation in South Africa. This chapter first discusses the CAPB in South Africa as a measure of fiscal consolidation. Secondly, the chapter discusses the narrative approach to fiscal consolidation in the context of the South African economy. Thirdly, in this chapter, there is a discussion of the definition approach of fiscal consolidation in South Africa. Finally, this chapter discusses the fiscal variables concerning fiscal consolidation. These fiscal variables include tax, government expenditure, government debt, and deficits, among others.

3.2 Fiscal consolidation in South Africa

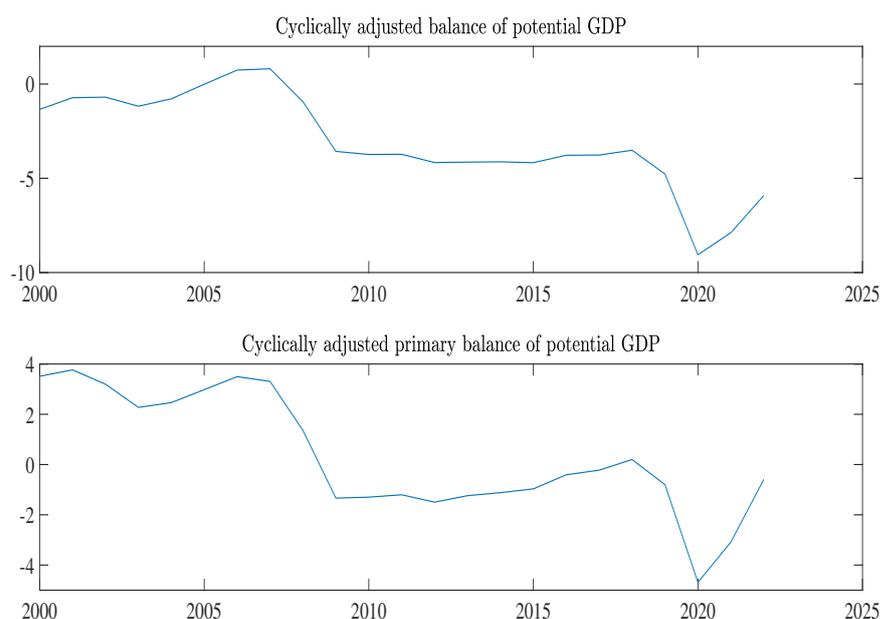
This section discusses fiscal consolidation, ranging from the CAPB to the narrative and definition approaches.

3.2.1 Cyclical adjusted primary balance in South Africa

This section discusses the trends of the CAPB in South Africa. To assess fiscal consolidation, it is necessary to determine fiscal authorities' discretionary actions through fiscal variables that

are not associated with the cyclical movement of the economy (Alesina and Perotti, 1995, 1997). As outlined in Chapter 2, the CAPB filters out the cyclical movement in tax and government expenditure in an effort to find a discretionary fiscal policy that will, in turn, be attributed to fiscal consolidation episodes Carnazza et al. (2020). The CAPB began to be measured in South Africa in 2000 with the assistance of the IMF, using the IMF methodology outlined in Chapter 2 IMF (2020). Figure 3.1 shows the CAPB and cyclically adjusted balance from 2000 to 2022.

Figure 3.1: Cyclical adjusted primary balance in South Africa



Sourced: (IMF, 2022).

Figure 3.1 shows that between 2000 and 2022, the average cyclically adjusted balance is at a negative rate of 2.70%. Most scholars, such as Alesina and Perotti (1997); Attinasi and Metelli (2017) point out that the cyclically adjusted balance rate change of 1.5% can be attributed to the fiscal consolidation episode. Such a negative average rate of 2.70% in the cyclically adjusted balance reflects the weak consolidation that has been adopted over the period¹ in South Africa. Nevertheless, the cyclically adjusted balance has the challenge of filtering out fiscal consolidation that is not related to the economic movement, as outlined in Chapter 2. Moreover, the cyclically adjusted balance may give a biased indication of fiscal consolidation, while fiscal consolidation was not adopted in the real world. As such, it is critical to use a narrative approach that makes

¹Section 3.2.3 and 3.2.4 of chapter 5 will give details of the policy and the fiscal stance of fiscal consolidation that South Africa has adopted over time.

use of a government document outlining the expenditure cut and tax increase as part of fiscal consolidation, as stressed by [Romer and Romer \(2010\)](#) and [Devries et al. \(2011a\)](#) amongst other scholars.

The maximum amount of cyclically adjusted balance between 2000 and 2022 was recorded in 2007 at a rate of 0.80%. This reflects a weak fiscal consolidation in South Africa, with the only fiscal consolidation initiative taken as the adoption of the Protocol on Finance and Investment (PFI), which stipulates that all member countries of SADC need to have a rate of government debt share to GDP that is equal to below 60% as a member of SADC ([SADC, 2006](#); [Buthelezi and Nyatanga, 2018](#)). From 2009 to 2017, the cyclically adjusted balance recorded negative rates of 1.34% and 0.22%, respectively. This reflects fiscal authorities' gradual willingness to adopt fiscal consolidation. In 2017, fiscal authorities outlined a government expenditure cut of R4 billion provincial conditional expenses to support fiscal consolidation. Moreover, the IMF noted that, in 2017, ARTICLE IV reported that fiscal consolidation initiated by fiscal authorities in South Africa in 2013 resulted in a reduction in the government deficit share of GDP from 5.4% in 2013 to 4.2% in 2017 ([AIRSR, 2017](#)).

The minimum rate of cyclically adjusted balance between 2000 and 2020 was recorded at a negative rate of 9.05% in 2015. This reflects that fiscal consolidation was not adopted by either tax increases or government expenditure cuts by fiscal authorities. This was done as a result of the tax burden on businesses as well as the public, coupled with the country's weak financial position. As such, non-fiscal consolidation instruments were implemented with a delay in tax payments and an increase in government expenditures in an effort to fight the COVID-19 pandemic ([BR, 2020](#)).

Figure 3.1 shows the CAPB from 2000 to 2025, where the average CAPB was 0.56%. The CAPB reflects fewer net interest payments from the cyclically adjusted balance. This is because of the high correlation between interest payments and cyclical movements in the economy ([Alesina and Perotti, 1995, 1997](#); [Carnazza et al., 2020](#)). The maximum amount of CAPB was recorded at a rate of 3.77% in 2001. This reflected the effects of fiscal consolidation at the time and the slipover effect of 1998, when an additional R300 million government expenditure cut to the implemented infrastructure development projects was proposed ([BR, 1998](#)). The CAPB recorded positive rates from 2000 to 2008; in 2008, the rates were 3.51% and 1.356% in 2008. The CAPB recorded negative rates from 2009 to 2025, with rates of 1.34% in 2009 and 4.69%

in 2025. The minimum rate of CAPB between 2000 and 2025 is recorded at a negative rate of 4.69% in 2025.

3.2.2 The narrative approach in South Africa

One of the key shortcomings of the CAPB is that there are cyclical economic changes that may influence what is deemed discretionary by the fiscal authorities. Therefore, the CAPB may be limited in reflecting fully exogenous fiscal consolidation episodes (Romer and Romer, 2010; Devries et al., 2011b; Yang et al., 2015). To remedy the problem, the narrative approach advocated by Romer and Romer (2010) and Devries et al. (2011a) outline that to find fiscal consolidation episodes it is necessary to find fiscal policies and stances in government documents that outline the intentions of fiscal authorities increase tax and government expenditure cuts in an effort to reduce government debt as well as the deficit. As outlined in Chapter 2 section 2.4 of this study, the narrative approach remedies endogeneity that may arise with the use of the CAPB (Devries et al., 2011a). Moreover, the narrative approach ensures the identification of exogenous fiscal changes attributed to the fiscal consolidation episodes.

In this section 3.2.2 of Chapter 3 of this study, there is a discussion of policy reforms and fiscal stance, both from government expenditure cuts and tax increases that have been used in South Africa over the years as part of fiscal consolidation. Section 2.4 of chapter 2 of this study follows Romer and Romer (2010); Devries et al. (2011a) and the South African National Treasury's rationale for applying fiscal consolidation. The discussion follows the principles of the narrative approach in an effort to discuss fiscal consolidation in South Africa.

- a) The pronouncement of government expenditure cuts by fiscal authorities stipulated in government documents to achieve the reduction in government debt and budget deficits. The pronouncement by fiscal authorities of tax increases stipulated in government documents to achieve the reduction in government debt and budget deficit.
- b) The South African National Treasury reduction in the government expenditure ceiling to achieve the reduction in government debt and budget deficit.
- c) The pronouncement of the intention to change government debt and deficit by the specific rate to achieve the reduction in government debt, and budget deficits.
- d) The pronouncement of a policy intended to achieve the reduction in government debt and

budget deficit.

The discussion of fiscal consolidation in this chapter is guided by the above fiscal consolidation definitions. They all have the principles of the narrative approach given that it will be stipulated in the government documents to reduce government debt and deficits.

3.2.3 Government expenditure reforms and fiscal consolidation in South Africa

One of the key economic policies adopted after democracy in South Africa was the Reconstruction and Development Program (RDP) of 1994. The RDP aimed to integrate every citizen into the economy and fight socio-economic ills caused by the previous apartheid regime (Adelzadeh and Padayachee, 1994). The RDP has five programs: meeting basic needs, developing human resources, and building the economy, among others (Adelzadeh and Padayachee, 1994). RDP was an expenditure-based policy; as such, it had no characteristic of fiscal consolidation. However, government expenditure through RDP helped the country, with employment opportunities of about 250 000 jobs over five years (Adelzadeh and Padayachee, 1994). This personal income tax gain is a key aspect of fiscal consolidation. Although RDP has had positive outcomes, there are still socio-economic issues, low economic growth, and government debt in South Africa.

Given these developments, at a policy level in 1996, there was an introduction to the Growth Employment and Redistribution Programme (GEAR) in South Africa with the objective of increasing economic growth, reducing government debt, stabilizing inflation, and providing basic services, among other things (Weeks, 1999). A key aspect that reflected fiscal consolidation in the GEAR stipulates a need for acceleration of the fiscal reform process, including a tighter short-term fiscal stance, counter inflation, an appropriate medium-term deficit target to eliminate government dissaving, a further revision of the tax structure, and a range of budgetary restructuring initiatives to sharpen the redistributive thrust of expenditure and contain costs (Weeks, 1999). The promotion of a tighter short-term fiscal stance, reduction in deficit, and containment costs are fundamental for fiscal consolidation). These fundamentals of fiscal consolidation in the GEAR were reflected, as it specified that the deficit needed to be reduced to less than 3% of GDP over four years and to achieve an economic growth rate of 6% by 2000 (Weeks, 1999). Another fiscal consolidation that occurred in the period of the GEAR was the reduction in the government wage bill by 3% of the GDP through sectors such as health, education, wel-

fare, and land reform from 1994 to 1996 (Weeks, 1999). The privatization of government entities also played a role in reducing public debt as it increased government revenue; however, it was not part of fiscal consolidation.

A sound fiscal framework is important for fiscal consolidation, as in South Africa, which was reflected in 1997 with the adoption of the Medium Term Expenditure Framework (MTEF), which is a multi-year plan that rolled out what would happen in the next three years concerning government revenue as well as expenditure (BR, 2012). The MTEF was effectively introduced in the 1998 Medium Term Budget Policy Statement (MTBPS). However, fiscal authorities were less on the side of fiscal consolidation in this period, as there was an adoption of a more expansionary fiscal policy. A case in point is that in the 1998 MTBPS fiscal authorities outline, it was noted that there would be an additional R1.0 billion for national government departments expenditure; R1.2 billion in additional expenditure for the provinces, of which R200 million was to supplement provision for textbook supplies; R300 million in additional expenditure for the improvement in conditions of service of both national and provincial government employees and R2 billion of expenditure rolled over from 1997 to 1998, offset by expected savings and allocations to be rolled forward from 1999 to 2000 amounting to R2.1 billion (MTBPS, 1990).

On the other hand, the adoption of the Public Finance Management Act of 1999 is a fiscal reform that seeks to have principles of fiscal consolidation as the active advocate for legislated financial reporting, expenditure control, financial policy, and budget procedures Siebrits and Calitz (2004). Some of the key objectives of the Act are to modernize the system of financial management in the public sector, enable public sector managers to manage, but at the same time be held more accountable, ensure the timely provision of quality information, and eliminate waste and corruption in the use of public assets (Madue, 2007). In 2001, there was an indication that an additional R2.6 billion would be provided to local governments for infrastructure (BR, 2001). In 2002, there was an additional expenditure of R6 billion in unforeseen and unavoidable expenditures voted in the adjustment estimate in November 2001 (BR, 2001).

In 2005, fiscal authorization in South Africa adopted the Accelerated and Shared Growth Initiative for South Africa (ASGISA) as a developmental strategy post-1994. The key objective of ASGISA was to reduce poverty and unemployment and increase economic growth by 2010 (Gelb, 2007). The ASGISA did not have a fiscal consolidation stance as it was an expenditure-based policy in an effort to achieve it objectively. Given the high and increasing government debt

in South Africa, in 2006, the country adopted the Protocol on Finance and Investment (PFI), which stipulates that all member countries should have a rate of government debt share to GDP equal to below 60% when the country is a member of SADC (Buthelezi and Nyatanga, 2018; SADC, 2006). Moreover, under Article 2 of the PFI in the section on principles of macroeconomic convergence, member countries need to maintain a prudent fiscal stance to avoid large budget deficits, monetization of deficits, and high or rising ratios of public and public guaranteed debt to GDP. However, countries need to have long-term debt (maturity of six or more years), medium-term debt (maturity of three to five years), and short-term debt (maturity of one to two years). These principles are key aspects of fiscal consolidation embedded in the PFI (Buthelezi and Nyatanga, 2018; SADC, 2006).

In 2010, the New Growth Path (NGP) was adopted to address structural unemployment and inequalities and accelerate growth in South Africa. Some of the key drivers of the NGP were infrastructure, focusing on the main economic sectors, and investment in social capital. As far as the fiscal consolidation of the NGP shows, without application with an indication that a countercyclical fiscal stance through the business cycle would manage demand in support of a more competitive currency while achieving critical public spending goals (NGP, 2010). The NGP was also an expenditure-based policy; as such, the policy brought about less fiscal consolidation. Given the resolution of 2012, in 2019 fiscal authorities outlined the adoption of expenditure ceilings to manage government expenditure levels given the fiscal framework, which was constrained by increasing government debt. Thus, the government is committed to limiting real expenditure growth to an average of 2.9% per year (BR, 2012). This reflected an act of fiscal consolidation through the expenditure ceiling, which was backed by the rationale that it would “ensure that the government closes its structural budget deficit over the medium term” ² (BR, 2012). To maintain the expenditure ceiling, the government expenditure was not cut across the board. The FFC also recommended fiscal consolidation in 2012 to reduce government debts (BR, 2012).

In 2013, the fiscal authorities introduced the National Development Plan (NDP) Vision 2030. The NDP is South Africa’s long-term socioeconomic development plan, and its objectives include increasing sustainable production, value addition in key growth opportunities, strategic infrastructure acceleration, enhancing human capital development, and strengthening mechanisms for equality among others (NDP, 2013). In 2013, fiscal authorities outlined that in the South

²In national departmental budgets, major cuts were limited to non-essential goods and services and provinces and municipalities had been encouraged to follow the same approach in their budgets all inane effort to achieve fiscal consolidation.

African economy, a “deteriorating current account deficit and an increasing debt-to-GDP ratio underscore the need to continue fiscal consolidation” (MTBPS, 2014). In an effort to support the policy, fiscal authorities introduced cost-containment measures in the PFM (MTBPS, 2014). As such, the government outlined expenditure cuts on non-core goods and services in 2013 and 2014 to R1.5 billion (MTBPS, 2014). Moreover, since 2013 R10.4 billion in government expenditure cuts have been reported over three years in response to tight fiscal conditions (MTBPS, 2014). In 2014 the Financial and Fiscal Commission (FFC)³ recommendations to Parliament and provincial legislatures about financial issues affecting the three spheres of government. recommended that the government adopt more measures of fiscal consolidation to resort to fiscal positions and reduce government debt (BR, 2014). The government reflected its commitment to the recommendation stated in the MTBPS of 2014: *“Fiscal consolidation can no longer be postponed. Ensuring continued progress towards a better life obliges the government to safeguard the public finances by acting within fiscal limits that can be sustained over the long term. To do otherwise would risk exposing the country to a debt trap, with damaging consequences for development for many years to come”* (MTBPS, 2014). In 2014, a budget review⁴ was outlined that the country would implement fiscal consolidation through maintaining the expenditure ceiling, reprioritizing resources to areas where they are most needed, eliminating wasteful expenditure, and adopting rigorous cost-containment measures for every aspect of public spending (MTBPS, 2014).

In the 2015 budget review, it was stated that two years of fiscal consolidation would put public finances on a sustainable footing and approach budgeting, with a greater focus on long-term expenditure planning and alignment with the government’s policy objectives. As such, fiscal authorities outlined that there would be a reduction in the expenditure ceiling by R25 billion over 2 years from 2015 to 2016 (BR, 2015). Moreover, it was indicated that there would be budget preparation and expenditure controls to improve the efficiency of resource allocation and the composition of spending. As far as public debt challenges and the need for fiscal reforms are concerned, the FFC recommended that the government should not resort simply to cutting costs to reduce public debt. The need to restrain spending is an opportunity to reform programs and service delivery. Simple cost-cutting measures may be effective in achieving deficit reduction targets but it does not encourage longer-run fiscal stability or allow for reforms that

³The Financial and Fiscal Commission (FFC) is an independent body established by the Constitution to make

⁴2014 budget strikes a balance between continued real growth in expenditure and fiscal consolidation.

would generate more value for money spent (BR, 2015)⁵. The FFC notes that fiscal consolidation needs to go beyond the reduction in government debt and deficit, and account for long-term fiscal sustainability. The budget review of 2015 stated that in the event of a shortfall in revenue, further fiscal consolidation may be applied to focus on the use of cost-cutting as an opportunity to reform programs and service delivery⁶. In 2015, the Davis Tax Committee found no global evidence that higher rates of luxury goods would meaningfully improve equity in the VAT system. However, the committee did observe that multiple rates add significantly to the complexity and administrative burden of tax. Furthermore, the committee pointed out that ad valorem exercise duties are already charged for several luxury goods (thereby increasing the price on which VAT is charged) (BR, 2015).

In 2016 fiscal authorities in South Africa outlined that antagonistic fiscal consolidation would hold the deficit and stabilize government debt. However, there was a possibility that such a policy might weaken economic growth (MTBPS, 2016). Nevertheless, if fiscal authorities were not implementing fiscal consolidation, there was a possibility of a downgrade. As such, fiscal authorities opted to propose a combination of tax policy measures that would raise an additional R43 billion from 2016 to 2017, and a government expenditure cut of R26 billion in 2016 and 2017 (MTBPS, 2016). Part of the R26 billion was the government expenditure cut from the human settlements development grant which amounted to R871 million in 2017 and by R946.6 million in 2018 all in an effort to support fiscal consolidation (MTBPS, 2016). Moreover, fiscal authorities noted that at the time continued policy uncertainty would affect the government debt and deficits, which may have hindered fiscal consolidation efforts (MTBPS, 2016).

In 2016 fiscal authorities in South Africa decided that fiscal consolidation and reprioritisation should be applied in all spheres of governments (MTBPS, 2016). As such, 2017 saw a move from a national-level government expenditure cut to a provincial government expenditure cut to support fiscal consolidation. A case in point is that there was a government expenditure cut of R4 billion of provincial conditional grants, and there was an R1.6 billion reduction to the provincial equitable share, which reflected the total amount across all provinces (BR, 2014).

Resolution was obtained in 2016. Fiscal authorities have reprioritized government expenditures

⁵The National Treasury has undertaken a careful review current expenditure trends to identify areas where spending on non-essential items can be reduced. The government's major programmes to reduce poverty and create jobs have been protected. This includes expenditure on social grants, public employment programs, and economic incentives. Major cuts have focused on nonessential goods and services, including catering, entertainment, and travel budgets.

⁶The rationale was that simple cost-cutting may be effective in achieving deficit reduction targets.

and grant cuts. In 2017, fiscal authorities outlined that there would be cuts in four local government conditional grants: the public transport network grant, the water services infrastructure grant, the municipal infrastructure grant, and the urban settlement development grant. This is supported by fiscal consolidation. Even when fiscal authorities cut this grant, a 5% increase was still observed (BR, 2017; MTBPS, 2017).

A significant announcement by fiscal authorities in 2017 indicated that there was an identification of expenditure cuts totalling R85 billion over the MTEF period of 2017. About R53 billion of this amount has been cut at the national government level, including large programs and transfers to public entities. At the subnational level, conditional infrastructure grants from provincial and local governments have been reduced by R28 billion. Additionally, all national and provincial departments are required to reduce their spending on administration (BR, 2017). Nevertheless, these amounts were not reported back if they were implemented as part of fiscal consolidation or if they remained as the amount that was identified only. The 2017 budget review indicated that to support fiscal consolidation, the health facility revitalization grant baseline would be reduced by R327.3 million over the 2017 MTEF period, and this reflected the total amount across all provinces (BR, 2017). The government proposed a balancing act between spending and tax increases (BR, 2017).

In 2018, after accounting for all re-prioritization, fiscal consolidation, and additions, the net revisions to the provincial direct and indirect allocations amounted to a reduction of R1.4 billion. The 2018 budget review reflected various strategies for fiscal consolidation, which have also contributed to the revised debt stabilization projection (BR, 2018b). These strategies include a 100 basis point increase in value-added tax (VAT), spending re-allocations as well as a reduction in the expenditure ceiling by R26.1 billion over 3 years from 2018 to 2020 (BR, 2018b). This fiscal consolidation could be self-defeating given that the government at the time allocated R57 billion towards free higher education which was going to be funded by an increase in VAT (BR, 2018b). The fiscal authorities noted that the funding of higher education would have significant gains in increasing the employability of many poorer individuals, reducing unemployment, thereby stimulating growth (BR, 2018b). In the long run, it was believed that employment would also contribute to government revenue through personal income tax.

In an effort to implement fiscal consolidation, the budget review of 2018, noted that it is important to prioritize government expenditure into key sectors of the economy that will produce

a budget surplus. A continued budget surplus will enable the state to significantly reduced the public debt burden. Moreover, it was outlined that fiscal consolidation requires significant budget restructuring in which state expenditure must be directed toward structural interventions, and wasteful expenditures must be reduced (BR, 2018b). On the other hand, monetary policy must accommodate fiscal consolidation and provide expansionary stimuli during periods of low growth. To maintain the expenditure ceiling, reprioritizing resources in areas where they are most needed is critical. As such, the Cabinet subcommittee cut the MTBPS amount to R85 billion (BR, 2018b).

In 2018, the Fiscal Responsibility Bill (FRB) was a table for discussion in the parliament of South Africa, however, the bill is not yet adopted. The bill seeks to introduce a government expenditure cut and limit the amount of new government borrowing in the an effort to ensure a low level of government debt as well as fiscal stability (BR, 2018a). The FRB aims: to promote fiscal responsibility by obligating the Republic of South Africa to reduce its debt levels and its exposure to debt; to introduce fiscal rules for the management of debt and government guarantees to provide reporting requirements. to provide for the review of the fiscal rules; to provide for certain exemptions from the fiscal rules; to increase transparency and fiscal responsibility and provide for matters connected therewith. Dispute the FRB not being adopted fiscal authors noted that prudent fiscal policy decisions could help South Africa's government debt alongside improvement in policy certainty, governance, and economic reforms to support fiscal consolidation (BR, 2018a). The school infrastructure backlogs resulted in fiscal consolidation; the grant's baseline is reduced by R3.6 billion during the MTEF period of 2018.

In 2018, the Fiscal Responsibility Bill (FRB) was tabled for discussion in the parliament of South Africa; however, the bill is yet to be adopted. The Bill seeks to introduce a government expenditure cut and limit the amount of new government borrowing to ensure a low level of government debt and fiscal stability (BR, 2019). The 2019 Budget announced that an additional R10 billion in tax revenue would be raised in 2020 to 2021 to support fiscal consolidation (BR, 2019). In 2020, the fiscal authorities outlined that to contain the budget deficit and move towards debt stabilisation, there is a need for a significant reduction in the public service wage bill (BR, 2020).

3.2.4 Tax reforms and fiscal consolidation in South Africa

There have been extensive reforms to the tax system in South Africa, and the country has one of the most effective financial systems in the world (BR, 2020). One of the key fiscal consolidation instruments is the tax increase. This study focuses on tax reforms of the main biggest contributors of tax revenue in South Africa which is a VAT, corporate income tax⁷ and personal income taxes. The early reforms in the tax system in South Africa started with the Franzsen Commission in 1968 which was set up to inquire (a) the tax system; (b) the existing financial structure; and (c) the fiscal and monetary policies (Van Niekerk, 1969). In the 1960s it was noted that only 8% of the population in the country was paying personal income tax which contributed two-thirds of the country's total tax revenue (Van Niekerk, 1969). Given this burden, the Franzsen Commission recommends a reverse fiscal consolidation policy stance. This is also shown in table 3.1, with the reduction of the high marginal rate of the personal income tax as recommended by the Franzsen Commission from 50% to 45% in 1970 (Van Niekerk, 1969). Nevertheless, in 1971 fiscal consolidation stance was adopted with the increase in the higher marginal rate of personal income tax, from 45% to 60% (Van Niekerk, 1969).

⁷Corporate Income Tax (CIT) is a tax imposed on businesses incorporated under the laws of the Republic of South Africa and which derive income from within the Republic or through a branch or permanent establishment within the Republic of South Africa.

Table 3.1: Tax rates and characteristics of fiscal consolidation in South Africa

Value Added Tax			Corporate Income Tax			Personal Income Tax		
Tax	Year	Rates	Tax	Year	Rates	Tax	Year	Rates
						PIT	1961	50%
						PIT	1970	45%
						PIT	1971	60%
GST	3/7/1978	4%						
						PIT	1979	55%
			CIT	1/3/1980	40%	PIT	1980	50%
GST	1/3/1982	5%	CIT	1/3/1982	42%			
GST	1/9/1982	6%						
GST	1/2/1984	7%	CIT	1/3/1984	50%			
GST	1/7/1984	10%						
GST	25/0/1985	12%						
						PIT	1987	45%
GST	8/5/1989	13%						
						PIT	1990	44%
VAT	30/9/1991	10%				PIT	1991	43%
			CIT	1/3/1992	48%			
VAT	7/4/1993	14%						
			CIT	1/3/1994	40%			
			CIT	1/3/1995	35%	PIT	1995	45%
			CIT	1/3/2000	30%	PIT	2000	42%
						PIT	2002	40%
			CIT	1/3/2006	29%			
			CIT	1/3/2009	28%			
						PIT	2015	41%
						PIT	2016	45%
VAT	1/4/2018	15%						

Information collected by the author sourced from different policy documents.

The Franzsen Commission endorsed greater emphasis on indirect taxes in South Africa (Van Niekerk, 1969), and this expanded the tax revenue, which is part of fiscal consolidation.

Effectively, the Sales Tax Act 103 of the 1978 was adopted and on 3 July 1978, the retail general sales tax (GST)⁸ was introduced at a rate of 4%, respectively, (Swart, 1978). Under the general sales tax, table 3.1, shows that there have been 6 fiscal consolidation episodes achieved through tax increases of the VAT in South Africa at a rate of 5%, 6%, 7%, 10%, 12%, and 13% between the years 1982 and 1989. This reflected a 9% increase in 9 years as well as intense fiscal consolidation in the period. Nevertheless, from 1982 to 1989 there were trepidations related to the GST implementation, as there was the possibility of tax evasion when businesses use their credit sales (BR, 1990). It was also noted that PIT and GST are eventually borne by the individuals. This becomes a burden to the individual when considering other tax types. Given these dynamics, the Margo Commission was established in the year 1986, to assess the tax structure. The outcome of the Margo Commission was the publication of the white paper in 1988 which had a proposed replacing the general sales tax with VAT. On 30 September 1991, the VAT was formally introduced with the VAT Act, 1991 as a legislation framework (Margo, 1987).

Table 3.1, shows that as far as fiscal consolidation is concerned, the VAT increased from 10% to 14% in 1993 reflecting Fiscal consolidation episodes. This injected an additional R5.080 billion tax revenue in South Africa. The rationale for the tax increase was to “close the gap between the proposed expenditure level and an acceptable budget deficit” (BR, 2019). Moreover, the increase in VAT was with the evaluation and agreement of the IMF, and South Africa The Finance Minister and the co-chairmen of the Transitional Executive Council (TEC) recommended a reduction in the deficit by 2% points GDP over two years. Other measures postponement of bracket adjustments under the personal income tax, wage restraint, and cuts in defense spending. All this reflected the fundamental principles of fiscal consolidation according to (BR, 2019), the definition approach was adopted in South Africa.

In 1994, the Katz Commission was appointed to investigate the efficiency and effectiveness of the tax system and structure in South Africa. Moreover, the Katz Commission was to investigate the tax rates, tax bases, income brackets, and tax thresholds The Katz Commission recommended the establishment of South African Revenue Services (SARS) in 1994 (Katz and Shapiro, 1994). As far as the threshold the Katz Commission also recommended the rise in the marginal rate of the higher bracket of the personal income tax from 43% to 45%. The rise in the threshold of the PIT reflected fiscal consolidation in 1995, as indicated in Table 3.1 in 1995.

⁸The introduction of the GST by the government was to broaden the tax base, thereby including persons who had never been taxed on income before.

SARS came under a legislative framework with the adoption of the South African Revenue Service Act No. 34 of 1997 (Solomon and Boltar, 1997). In 1996 tax incentives (which were not a fiscal consolidation stance) were adopted in an effort to stimulate new investment in competitive and labor-absorbing projects.

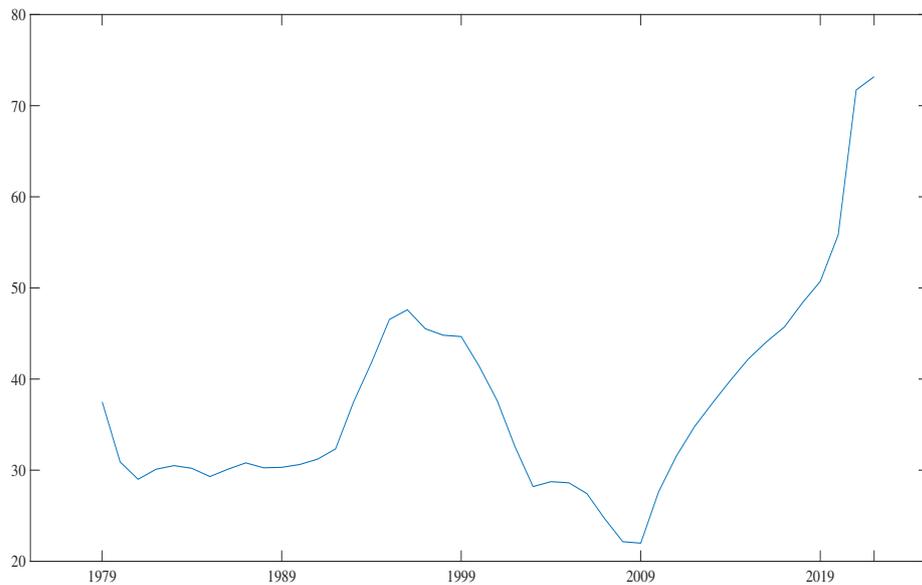
Given that SARS as an institution that administrates tax in South Africa was well established, fiscal authorities saw it fit that the country focused on expanding the tax base as well as the tax system to be in line with international tax laws. In this regard, in 2001, the tax system was changed to a residence-based. This meant that all taxpayers residing in South Africa are taxed at the country's tax rates irrespective of where income comes from and its source (BR, 2001). Before 2001, the South African tax system was source-based, where income is taxed in the country of origin (BR, 2001). In 2003 this was, aimed at assisting taxpayers who had transgressed the South African exchange control regulations by transferring funds offshore without proper authorisation. All these reforms were meant not only to enhance revenue collection but also to ensure that the PIT system was not discriminatory and conforms to international standards (BR, 2012).

In an effort to reduce the budget deficit and stabilize debt, fiscal authorities implemented fiscal consolidation in 2015 by increasing the upper bracket marginal rate of personal income tax by 1% to 41% from 40%, which has been constant for 13 years since 2002 (BR, 2015). The proposed change in personal income tax was expected to rise to R9.4 billion in 2015/16. In the national budget for 2018, one of the most notable announcements was an increase in the VAT rate from 14% to 15%, effective 01 April 2018. This was the first VAT increase over 24 years, and the rise was expected to raise approximately R22.9 billion (BR, 2018b).

3.2.5 Trends of fiscal variables and fiscal consolidation

Fiscal authorities in South Africa ensure long-term, vigorous public finance by appropriating expenditures and stable debt. The trend of government debt is critical, as it is an indicator of the macroeconomic well-being of the economy, economic growth prospects, policy risks, and the sustainability of public finances. Figure 3.2 shows the government debt share of the GDP from 1979 to 2022.

Figure 3.2: Government debt share to GDP



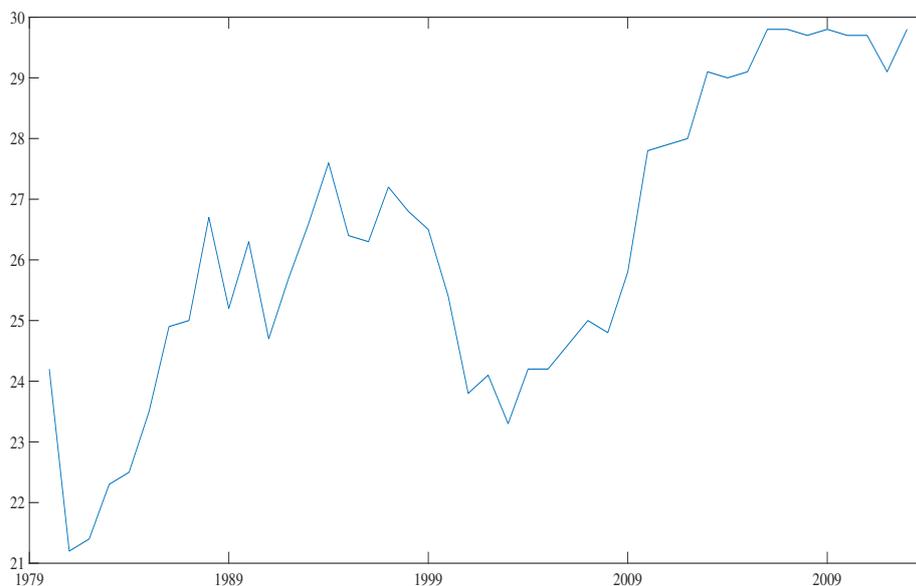
Sourced : [NT \(2022\)](#).

The domestic government debt share to GDP was 30.9% in 1980. In the new regime in South Africa over five years from 1994 to 1998, domestic government debt to GDP was at an average rate of 47.72%. This high level of government debt during that period was triggered by a lack of policy implementation and coordination under the RDP framework. Fiscal consolidation was not adopted in 1994 to reduce the level of government debt. The fiscal policy that was adopted was expenditure-based. Nevertheless, following the adoption of GEAR in 1996, domestic government debt to GDP had been on a downward trend for 12 years since 1997, and the lowest point was in 2008 at the rate of 26.50% ([NT, 2022](#)). In 2015, the domestic government debt share to GDP was at a rate of 49.30%, which was the highest since the new regime and the highest in the last 21 years since 1994 ([NT, 2022](#)).

South Africa is a member of the SADC and signed a protocol on finance and investment, which stipulates that all member countries should have a rate of government debt share to GDP equal to or below 60% as a member of the SADC ([SADC, 2006](#)). In 2017, fiscal authorities in South Africa outlined in the budget review that one of the essential goals of fiscal policy was to stabilize public debt by reducing the budget deficit, which is fundamental to fiscal consolidation ([BR, 2017](#)). In 2019, domestic government debt shared GDP at a rate of 62.20% ([NT, 2022](#)).

Government expenditure is critical for authorities in South Africa, and all priorities of the fiscal year are related to both social and economic issues for all citizens given the fiscal space. Figure 3.3 shows Government expenditure share of GDP between 1980 and 2022.

Figure 3.3: Government expenditure share to GDP

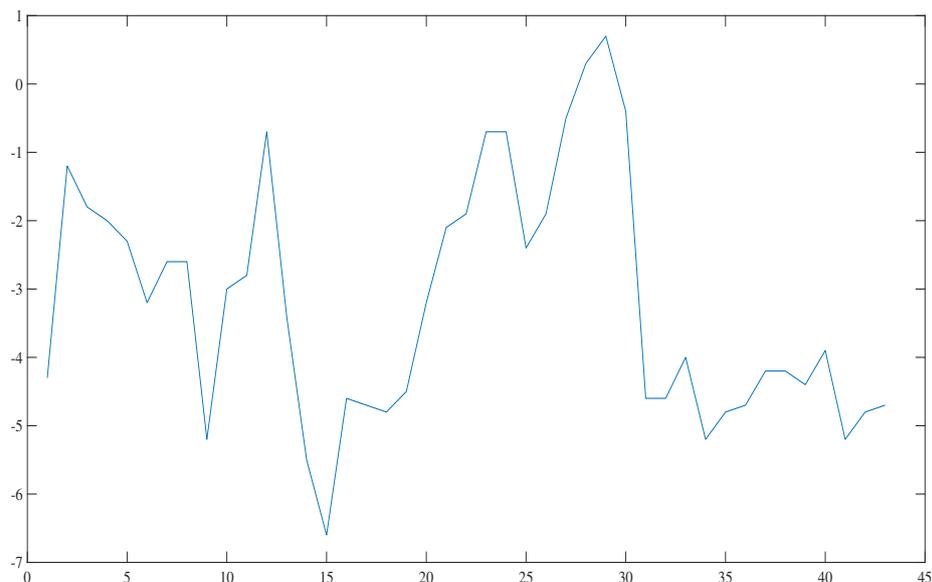


Sourced : [NT \(2022\)](#).

In 42 years, up to 2022, government expenditure on GDP was at its lowest at 21.20% in 1980 [NT \(2022\)](#). This was the result of the spillover of the global recession and political uncertainty due to the uprisings in Soweto in 1976 ([Adelzadeh and Padayachee, 1994](#)). There was no fiscal consolidation, as there was a need for fiscal authorities to provide goods and services and put the economy in a stable economic state. Thus, high levels of expenditures are required. After the 1980s, government expenditures on GDP showed an upward trend. This was up until government expenditure on GDP was at a rate of 27.60% in 1992, which was the highest in 12 years from 1980 [NT \(2022\)](#). One of the key attributes of the increase in government expenditure on GDP was the application of fiscal consolidation through tax, particularly VAT, which was key in the period. In 1997 after the adoption of the GEAR, there was an increase in government expenditure on GDP hence GEAR was a government expenditure-based policy. Moreover, the establishment of SARS increased revenue collection through a tax that triggered an increase in government expenditure, leading to an overall increase in government expenditures to GDP.

Government expenditure on GDP started a downward trend in 1999 for four years, until it hit its lowest at a rate of 23.30% in 2002 [NT \(2022\)](#). This was due to the key reform of the PFMA as well as the structure of the three plans of government expenditure. Government expenditure on GDP was at its all-time high, at a rate of 29.80% in 2018 [TCOSA \(2020\)](#). Figure 3.4, shows the government deficit from 1979 to 2022.

Figure 3.4: Government deficit share to GDP



Sourced : [NT \(2022\)](#).

Figure 3.4 shows that the second-largest government deficit in the old regime in South Africa was at a rate of 5.2% in 1987, which improved to 0.7% in 1990, while it drastically deteriorated to 6.6% in 1993 [NT \(2022\)](#). Other key factors that resulted in a further increase in the government deficit from 1987 to 1993 were the recession and severe drought experienced during the period. The improvement in the government deficit in 1990 was a result of the IMF's recommendation to maintain fiscal discipline as part of the preconditions for granting loans to the South African government. As such, there was an intention to reduce government expenditure, which formed part of fiscal consolidation. However, these were concentrated rather severely on curtailing capital spending ([Barker, 1997](#)). The government deficit in 1996 was at the rate of 4.8%, and improved further to 0.7% in 2002. In 2007, the government recorded a surplus, and there was a positive budget balance share to the GDP of 0.7% [NT \(2022\)](#). This was attributed to the

fact that, between 2005 and 2006, economic growth significantly increased, which was attributed to favorable trade developments. In 2009, the government deficit had a negative rate of 4.6%, which is close to the negative rate of 4.8% observed in 1996. This was mostly triggered by the 2008 global financial crisis, which put pressure on fiscal balance. Moreover, the goal of financial crises limited monetary policy to stimulate the economy, which stretched the government deficit. In 2012, the government deficit was at a rate of 5.2% owing to the knock-on effects of the 2008 financial crisis. In 2019, the government deficit was 6.2% [NT \(2022\)](#).

Tax is the key aspect of fiscal consolidation, and it is critical to note that tax in South Africa is used to meet overall spending needs. In 1980 personal income tax, corporate tax, as well as VAT contribution, was 35.21%, 38.35%, and 26.43% respectively among the three tax categories [NT \(2022\)](#). It was only the personal income that showed characteristics of fiscal consolidation with an increase of 15% in the maximum marginal rate from 45% in 1970 to 60% in the year 1971, as presented in [Table 3.2](#).

Table 3.2: Tax Rates and Characteristics of Fiscal consolidation in South Africa

Tax	Year	Maximum Marginal Rate	Minimum Marginal Rate	Bracket
PIT	1961	50%	14	19
PIT	1970	45%	14	19
PIT	1971	60%	14	19
PIT	1979	55%	14	19
PIT	1980	50%	14	19
PIT	1987	45%	14	19
PIT	1990	44%	15	14
PIT	1991	43%	17	9
PIT	1995	45%	17	10
PIT	1998	45%	19	6
PIT	2000	42%	18	6
PIT	2002	40%	18	6
PIT	2015	41%		
PIT	2016	45%		

Information collected by the author sourced from different policy documents. PIT reflects the upper-income tax rate bracket

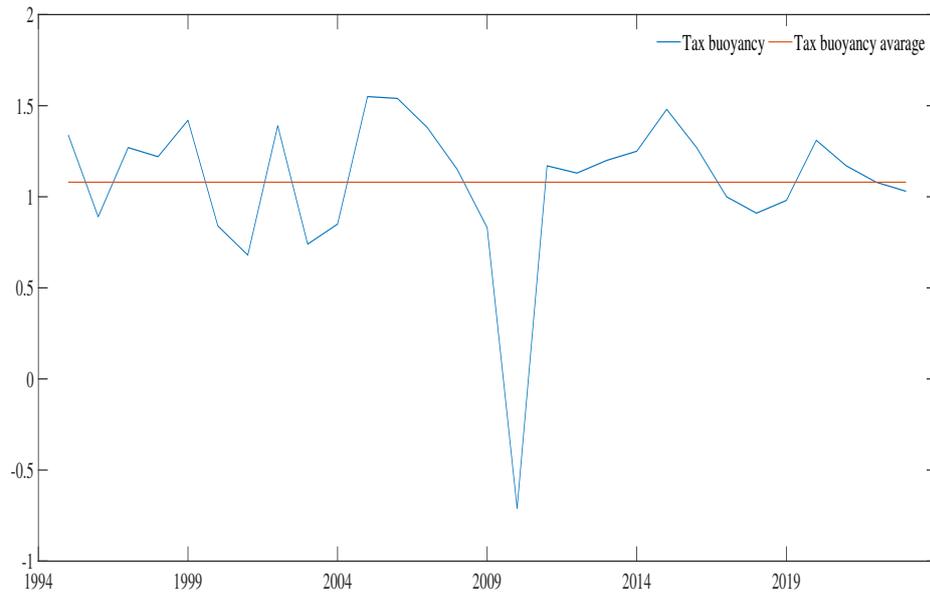
In 1980, the total amount collected for the three tax categories was 6 306.4 million NT (2022). Over 14 years, there was a lot of development of fiscal consolidation coming from the VAT. In the year 1994 personal income tax, corporate tax, as well as VAT contribution, were 52.16%, 13.87%, and 33.97% respectively among the the three tax categories NT (2022). The total amount of tax collected in the three tax categories was R86 222.5 billion, up by 1367.22% from the values in 1980 NT (2022). Personal income tax remained the highest contributor among the three tax categories in the 14 years from 1980 to 1994. There was no fiscal consolidation that was adopted at the time of tax instruments for fiscal policy. However, at a policy level, fiscal authorities announced fiscal consolidation through DRP as it outlines the reduction in the deficit (Adelzadeh and Padayachee, 1994).

The corporate income tax decreased by 18% from 40% in 1980 to 28% in 2009, all to encourage

business activities in South Africa. The corporate income tax became the second contributor to total revenue among the three tax categories when fiscal consolidation was applied with the increase of the corporate income tax rate from 42% which was adopted in the year 1982 to 50% in 1984 [TCOSA \(2020\)](#). This was the only time corporate income tax reflected fiscal consolidation; hence, the increase in its rate in 1984. Corporate income tax turned out to be the second contributor of tax to total revenue among the three tax categories in 1982 and 2008, overtaking VAT until 2020. The lowest rate of contribution of corporate income tax among the three tax categories was 35.68% in 2006 and 1980, with a rate of 35.21% in the old South African regime [TCOSA \(2020\)](#). The highest contribution of corporate income tax to total revenue among the three tax categories was in 1994, at a rate of 53.31% [TCOSA \(2020\)](#). In all cases of high corporate income tax contributions, fiscal consolidation was not implemented.

The VAT has been the last of the three categories of tax over the years in terms of average contribution to the total revenue for the three tax categories. The highest contribution of the VAT was 36.18% in 1988 during the old South African regime, while it was at the rate of 35.06% in the new regime in 2005 [TCOSA \(2020\)](#). In 1978, VAT was 4%, and it has been constantly increasing over time, reflecting fiscal consolidation as it reached 15% in 2018. In 2020, there were 48.37%, 20.089%, and 31.54% for personal income tax, company tax, and VAT, respectively, contributing to total revenue among the three tax categories [TCOSA \(2020\)](#). The total amount of tax collected among the three tax categories was R1 142 956.4 trillion. Figure 3.5 shows the tax buoyancy which reflects a Relationship between total tax revenue collection and economic growth. The tax buoyancy measure includes the effects of policy changes on revenue. As far as the interpretation, the value that is greater than 1 of the tax buoyancies means that government revenue is growing faster than the economy and below one means government revenue is growing below the rate of GDP growth.

Figure 3.5: Tax revenue buoyancy



Sourced : [NT \(2022\)](#).

The tax revenue buoyancy was greater than 1 in 1994 (1.34). This reflects new individuals coming to the economy and getting employment, the government getting income tax, and new businesses paying corporate income tax (BR, 2020). As such, the value of the tax revenue buoyancy is attributed less to fiscal consolidation at that time. Between the years 1996 and 1998 the tax revenue buoyancy was greater than 1 with the value of 1.27 as well as 1.42 in the respective years in range (BR, 2020). The tax revenue buoyancy was below 1 in the year 1995 with a value of 0.89. On the other hand, in the period between the years 1999 and 2003, the value of tax revenue buoyancy was below 1, with values of 0.84 as well as 0.85, respectively, (BR, 2020). This reflected the slipover effect of the fiscal consolidation that was achieved through the increase in the personal income tax in the year 1995. The tax revenue buoyancy was greater than 1 between the years 2004 and 2007, with a value of 1.55 as well as 1.15 (BR, 2020). It was below 1 year with a value of 0.83 and -0.71 in the year 2008 as well as 2009 respectively, which was mostly due to the financial crisis of 2008. There was a challenge to navigate the path between fiscal consolidation and economic recovery.

The value of the tax revenue buoyancy was greater than 1 between the years 2010 and 2015, reflecting that tax revenue grew faster than the economy. This reflects the slipover effect of

an increase in economic activities in 2010 that was channelled as an increase in tax revenue through personal income tax, corporate income tax, and VAT collection. Given that this was not triggered by the actual increase in the tax rates of the three tax categories of interest, the tax revenue buoyancy value at the time may not have been attributed to fiscal consolidation. Moreover, according to fiscal authorities in South Africa at the time, “*fiscal consolidation has been hampered by lower-than-expected economic growth and revenue collection*” (MTBPS, 2014). From 2017 to 2018, the tax revenue buoyancy was below the value of 1 as it was recorded at a value of 0.96 as well as 0.98 in the years (BR, 2020). The lower tax revenue buoyancy of 0.96 shows a shift in dividends withholding tax revenue. However, the budget review noted that some taxpayers avoided paying the higher rate introduced in the 2017 budget (BR, 2017). VAT and personal income tax collections fell short during this period. The value of the tax revenue buoyancy was greater than 1 between the years 2019 and 2020, and this reflects less time of fiscal consolidation and as such, tax revenue did not grow more than economic growth.

3.2.6 IMF and fiscal consolidation in South Africa

International institutions, such as the IMF, have a critical role in shaping the direction of policies related to fiscal consolidation. This is because such an institution provides government debt and monitors government debt, which is a critical economic variable for fiscal consolidation. In 2000, the IMF began measuring the CAPB to track the fiscal consolidation stance that could be implemented in South Africa. Moreover, the CAPB is the index used to determine if there are any discretionary fiscal intentions from fiscal authorities that are directed towards reducing government debt and government deficit. In 2009, the IMF moved away from fiscal consolidation, as its recommended expansionary fiscal year. This was recommended for most emerging economies, such as South Africa, because the country was experiencing weak economic growth at the time. In 2010, the IMF outlined that it agreed with the medium-term fiscal consolidation plan, as fiscal authorities in South Africa outlined the need to reduce the government deficit by 2.5% share of GDP.

In 2014, the IMF stated that there is a need to adopt sizable fiscal consolidation in both government expenditure cuts and tax increases (AIRSR, 2014; MTBPS, 2014). Fiscal authorities in South Africa also outlined to the IMF that fiscal consolidation in the country occurs through a reduction in the expenditure ceiling. This was thought to be the best instrument, as fiscal consolidation is politically and socially challenging when achieved through government expendi-

ture cuts (AIRSR, 2014). As such, fiscal authorities were going to ensure that they restrained expenditure growth and key social programs.

In 2016, the IMF recommended implementing growth-friendly fiscal consolidation measures (AIRSR, 2016). The IMF outlined that specifically targeted government expenditure cuts are critical for implementation and communication in this regard. The IMF proposed that fiscal authorities in South Africa relook the wage bill for a possible cut, as outlined in 2014, and avoid government expenditure cuts across the board (AIRSR, 2016). This was based on the rationale that there may be a potential risk of slow economic growth if fiscal consolidation was implemented across all government expenditure commitments. Moreover, the IMF outlined that fiscal consolidation of sizable or large spending projects, such as National Health Insurance, needed to be considered (AIRSR, 2016). There was an indication that the country needed to move away from the reduction of expenditure ceiling as one of the instruments of fiscal consolidation (AIRSR, 2016).

Despite the recommendation of the IMF in 2016, fiscal authorities in South Africa needed to move away from the expenditure ceiling, and fiscal consolidation measures through the reduction in the expenditure ceiling of R26 billion was pronounced by South Africa's fiscal authorities in 2017 (AIRSR, 2017). On the other hand, South Africa's fiscal authorities commented to the IMF that there was fiscal consolidation through government expenditure cuts in the government wage bill, current spending, education funds, health services, and municipal functions in rural areas (AIRSR, 2017). There was also an indication that there was additional revenue of R13 billion (AIRSR, 2017). However, no specific rate increased, which would have constituted a fiscal consolidation stance.

In 2020, South Africa had a high rate of government debt, which was forecasted by the IMF to rise. Given this development, the IMF encouraged fiscal authorities in South Africa to focus on maintaining medium-term debt sustainability through growth-friendly and expenditure-based fiscal consolidation. However, the IMF acknowledged the challenge of the narrow fiscal space in South Africa. The IMF further pointed out the need for reductions in the public wage bill, improvements in tax administration, and compliance in the effort to support fiscal consolidation (IMF, 2020).

3.3 Conclusion of chapter

This chapter provides an in-depth analysis of the fiscal consolidation policies and their implementation in South Africa. The objective was to examine the specific measures and approaches taken by the South African government to achieve fiscal consolidation and to address the challenges related to public finance. The chapter begins with an overview of fiscal consolidation in South Africa, emphasizing the importance of stabilizing the country's fiscal position and ensuring long-term fiscal sustainability. The government recognized the need for consolidation measures to address rising government debt levels and the associated risks to economic stability. The CAPB has been identified as a key indicator for assessing fiscal consolidation efforts in South Africa. The CAPB provides a measure of structural budget balance, considering cyclical fluctuations in revenue and expenditure. This allows policymakers to gauge the underlying fiscal position and progress in achieving fiscal consolidation.

The narrative approach to fiscal consolidation in South Africa was discussed, highlighting the importance of a comprehensive and multifaceted strategy. The government has implemented a range of measures, including expenditure and tax reforms, to enhance revenue generation, improve expenditure efficiency, and address structural issues in public finance. This chapter surveys the discussion of policy and fiscal stances from the tax and government expenditure that South Africa has taken in the effort to implement fiscal consolidation. At the policy level, fiscal consolidation objectives were noted in Growth Employment and Redistribution (GEAR) in 1996, which outlines the reduction in the deficit. The Medium-Term Expenditure Framework (MTEF) and Medium-Term Budget Policy Statement (MTBPS) are strategic fiscal policy frameworks that call for the effective planning of government revenue and expenditure. The adoption of the Protocol on Finance and Investment (PFI) in 2006 called for a limit of 60% government debt share to GDP, which is the fundamental aspect of fiscal consolidation in South Africa. Fiscal consolidation is evident in the proposed Fiscal Responsibility Bill (FRB) which, in 2018, outlined the need to have fiscal limits on government expenditure to reduce government debt as well as a deficit.

Government expenditure reforms play a crucial role in fiscal consolidation efforts. This chapter explored various initiatives undertaken by the South African government to control expenditure growth, enhance public sector efficiency, and reduce wasteful spending. These reforms aimed to

improve the quality of public services while achieving the fiscal consolidation objectives. Tax reforms are another key component of South Africa's fiscal consolidation strategy. The chapter discusses the government's efforts to reform the tax system, broaden the tax base, and enhance tax compliance. These measures aim to generate additional revenue streams and create a more sustainable revenue structure to support fiscal consolidation.

An analysis of trends in fiscal variables provides insights into the progress of fiscal consolidation in South Africa. This chapter examines indicators such as government debt, budget deficit, and revenue-to-GDP ratio, shedding light on the effectiveness of the implemented policies and their impact on fiscal outcomes. The IMF's role in supporting fiscal consolidation in South Africa is also discussed. The IMF provided technical assistance, policy advice, and financial support to assist the South African government in fiscal consolidation efforts. The chapter highlights the collaborative relationship between South Africa and the IMF in addressing fiscal challenges.

In conclusion, this chapter reviewed policies and approaches to fiscal consolidation in South Africa. The government's efforts to achieve fiscal sustainability through expenditure reforms, tax reforms, and other measures were analysed. The chapter also highlights the importance of monitoring fiscal indicators and the role of international institutions, such as the IMF. The findings of this chapter contribute to a better understanding of the fiscal consolidation landscape in South Africa and provide a basis for further analysis in subsequent chapters.

Chapter 4

Literature review of empirical studies

4.1 Introduction

This chapter is dedicated to a literature review of empirical studies related to fiscal consolidation, and is divided into four sections. The first section discusses the elasticity of the CAPB and its relationship with fiscal consolidation. The second section focuses on the CAPB threshold linked to fiscal consolidation episodes. section covers the literature on fiscal consolidation and domestic government debt status. Finally, the fourth section provides a literature review of the government debt threshold, economic growth, and fiscal consolidation.

4.2 Objective one: Literature review on the elasticity of CAPB and fiscal consolidation

Research studies aiming to address the knowledge gap regarding the elasticity function of CAPB, which can attributed to fiscal consolidation, have been conducted by various scholars, including [Giorno et al. \(1995\)](#), [Van den Noord \(2000\)](#), [Giorno et al. \(1995\)](#), [Bouthevillain et al. \(2001\)](#), [Braconier et al. \(2004\)](#) and [Girouard and André \(2006\)](#) among others. [Giorno et al. \(1995\)](#), were among the first to outline the OECD methodology of CAPB elasticity, using annual data from 1978 to 1992. They proposed that the elasticity of the CAPB be explained by TR tax revenue function of $\epsilon_r = \sum_{j=1}^4 \text{TR} \left(\frac{\hat{y}}{Y} \right)$ disaggregated into four components namely, corporate tax, personal income tax, indirect tax and security contribution as well as G government expen-

ditures of $\epsilon_g = G \left(\frac{\hat{y}}{Y} \right)$, adjusted proportionately to ration $\frac{\hat{y}}{Y}$ which is potential output to actual output with respective responsiveness elasticity ϵ_r and ϵ_g respectively. Using the ordinary least squares (OLS) it was found that the elasticity of corporate tax is 2.55%, personal income tax 1.14%, indirect tax 1%, security contribution of 0.74%, and government expenditure of 0.35%. They aimed to bridge the gap in understanding fiscal consolidation elasticities by disaggregating tax revenue into four components: corporate tax, personal income tax, indirect tax, and security contributions. This approach provides a more nuanced understanding of how different types of taxes influence changes in CAPB, enabling policymakers to target specific tax policies for desired fiscal outcomes. However, it is important to note that [Giorno et al. \(1995\)](#) did not account for the interrelatedness of fiscal variables, where changes in one component can have spillover effects on others¹. This oversight in disaggregating variables may lead to incomplete or misleading conclusions regarding their overall impact on CAPB.

An examination of the size and role of automatic fiscal stabilizers was explored by [Van den Noord \(2000\)](#) using CAPB with annual data from 1990 to 1998. The CABP was updated with the elasticities of revenue and expenditure components included in the OECD method, as outlined in [Giorno et al. \(1995\)](#). Moreover, the other key contribution by the author was the fact the tr tax reform $\epsilon_r = \sum_{j=1}^4 TR \left(\frac{\hat{y}}{Y} \right)^{tr}$ and government expenditure gr reform $\epsilon_r = G \left(\frac{\hat{y}}{Y} \right)^{gr}$ in the estimation of elasticity concerning output². Where, y is GDP \hat{y} is potential GDP G government expenditure TR aggregate tax revenue. It was found that the average elasticity for the corporate tax was 1.3%, personal income tax 10.0%, indirect tax 0.9%, social security 0.8% and current expenditure -0.3 and the aggregated CAPB reflects as a positive elasticity of 0.49%. If [Van den Noord \(2000\)](#) recognized heterogeneity across sectors of tax in response to fiscal policy this could have improved the accuracy of estimations. Different tax sectors may respond differently to fiscal stimuli because of varying economic structures and policy environments, providing more insight³.

An alternative CAPB measure approach was examined by [Bouthevillain et al. \(2001\)](#) using data from 1960 to 2000. Their main contribution was based on the analysis of elasticity using the tax-based approach which is contrary to the traditional approach of using regression vari-

¹Disaggregating fiscal variables often involves making assumptions or simplifications regarding the relationships between different components. These assumptions may not accurately reflect the complexities of real-world fiscal systems, leading to biased estimates or misinterpretation of the results.

²They are then aggregated using the share of each in total revenue as weights, to derive the elasticity of the total revenue level (in monetary amount) for output.

³Accounting for the dynamic effects of fiscal policy measures can provide a more accurate assessment of their impact on CAPB. This includes considering lagged effects, feedback loops, and non-linear relationships between fiscal variables and economic output.

ables for output. Therefore, the elasticity of tax revenue is given by $\epsilon_r = \sum_{j=1}^4 \text{TR} \left(\frac{\text{TB}}{Y} \right)$ and government expenditure is given by $\epsilon_g = G \left(\frac{\text{TB}}{Y} \right)$. It was found that the time-invariant elasticity of CAPB on the government revenue side had four catalogues: direct taxes on households had 1.4%, direct taxes on companies 0.7%, indirect taxes 1%, and social security contributions 1%. This represents how responsive fiscal authorities are in an effort to use government revenue to implement fiscal consolidation. By averaging government expenditure and tax revenue with GDP, was about to capture the overall effort to find the effect of fiscal consolidation. This averaging helped provide a comprehensive view of how fiscal policy measures interacted with the overall economy, indicating fiscal authorities' collective response to economic conditions. On the other hand, while [Giorno et al. \(1995\)](#) and [Van den Noord \(2000\)](#) also contributed valuable insights into fiscal policy and CAPB elasticity, [Bouthevillain et al. \(2001\)](#)'s approach offered an alternative perspective, emphasizing the importance of considering tax revenue in the context of fiscal consolidation efforts⁴.

[Braconier et al. \(2004\)](#), investigated the innovative method of CAPB in Sweden using data from 1970 to 2002. These authors used a an approach similar to that in [Bouthevillain et al. \(2001\)](#). However, the authors used additional variables for tax categories and primary revenues, which are proportional to GDP and capital gains taxes and proportional to (net) capital gains. This addresses the gap and limitation in understanding the implications of capital-gains taxes proportional to (net) capital gains on fiscal consolidation. Capital gains taxes play a crucial role in government revenue, especially in economies with substantial capital markets. Incorporating these taxes into the analysis enables a more comprehensive understanding of fiscal policy dynamics and their impact on budgetary outcomes. Their function in tax elasticity is given by changing to $\epsilon_r = \sum_{j=1}^6 \text{TR} \left(\frac{\text{TB}}{Y} \right)$ giving an elasticity different from that in [Bouthevillain et al. \(2001\)](#). Where TB is the tax base approach different to $\frac{\hat{y}}{Y}$ potential GDP and output gap. It was found that the CAPB four tax and output gap was different, with the CAPB lower than the traditional approach over time. However, a more comprehensive analysis could have been found with the consideration of the elasticity of various components of government expenditure, as well as their interactions with tax revenue, which could provide a more holistic understanding of fiscal policy dynamics. The elasticity of the CAPB was found with adjustment deviations between actual and potential GDP, which was found to be 53.2%; adjustment deviations between actual and equilibrium unemployment, which was found to be -48.2%; and adjustment

⁴While this approach provided valuable insights, it had limitations in capturing the responsiveness of fiscal authorities to economic conditions, particularly in terms of revenue and expenditure adjustments.

deviations between actual and normal (trend) tax bases as ratios to GDP, which was found to be 49.1%.

A re-estimate and re-specification of elasticities was undertaken by [Girouard and André \(2006\)](#) through an investigation of CAPB in OECD countries using annual data between 1980 and 2003. Their main contribution is the income tax elasticity calculation for the tax base, which is given by $\epsilon_{tax\ per\ work}$, $w = (\sum_{i=1}^n \gamma_i MA_i) / (\sum_{i=1}^n \gamma_i AV_i)$. Where γ_i denotes weights of the different income distribution or wage brackets, i reflects the individual country's wage bill proxied by the average wage in the manufacturing sector. By contrast, MA_i denotes the marginal income tax rate, and AV_i indicates the average income tax rate. This methodology was supreme as it accounted for tax reforms, sensitivity to different tax bases, and income distribution⁵. However, the method is static, leading to limitations in the analysis of the responsiveness of tax revenue over time. It was found that the overall adoption of elasticities did not significantly modify CAPB in OECD countries. The authors use generalized least square estimators (GLS) and seemingly unrelated regression procedures (SURE) to estimate the tax revenue and government expenditure elasticities with respect to the output gap. It was found that, in the CAPB, there is an average sensitivity of -0.10 %. [Giorno et al. \(1995\)](#), [Van den Noord \(2000\)](#), [Bouthevillain et al. \(2001\)](#), [Braconier et al. \(2004\)](#) and [Girouard and André \(2006\)](#) highlight different methodologies and findings regarding the elasticity of the CAPB and the responsiveness of fiscal authorities in using government revenue for fiscal consolidation. They point out that the different components of tax revenue and government expenditure have varying elasticities with respect to output. These studies emphasize the significance of considering how fiscal variables respond to changes in output, the implications for fiscal policies, and efforts to consolidate budgets.

In contrast to the functional approach utilized by [Giorno et al. \(1995\)](#), [Van den Noord \(2000\)](#), [Bouthevillain et al. \(2001\)](#), [Braconier et al. \(2004\)](#) and [Girouard and André \(2006\)](#) other scholars such [Fedelino et al. \(2009\)](#), [Afonso \(2010\)](#), [Afonso and Jalles \(2014\)](#), and [Princen et al. \(2013\)](#) among others have employed constant elasticity, definition approach, data measurement, and parameters to ascertain the elasticity attributed to fiscal consolidation in their respective studies. [Fedelino et al. \(2009\)](#), examined the computation and methodology employed by the IMF, drawing on data from OECD countries. Their research aimed to bridge the gap in quantifying fiscal episodes by adopting the methodology utilized in IMF studies, which primarily focused on the constant elasticity of revenue concerning the output gap and assumed zero elasticity of

⁵The computations were updated by using 2003 tax law information and income distributions of 1999 to 2001.

spending, as seen in the works of [Giorno et al. \(1995\)](#), [Van den Noord \(2000\)](#), [Bouthevillain et al. \(2001\)](#), and [Girouard and André \(2006\)](#). Using constant elasticity in the CAPB, it was found that fiscal consolidation can successfully reduce government debt and impact economic growth. The constant elasticity models are relatively simple and easy to implement. Moreover, it is intuitive, allowing for a clear understanding of changes in fiscal variables. However, there are also disadvantages as constant elasticity models assume a linear relationship between fiscal variables and economic outcomes, which may not accurately capture the complex dynamics of real-world fiscal policies and their effects.⁶

The gap concerning the limited understanding of evidence regarding expansionary fiscal policy was tackled by [Afonso \(2010\)](#). In their analysis of expansionary fiscal consolidations in Europe, [Afonso \(2010\)](#) utilized data from 1970 to 2005 and employed a fixed effects model (FEM). In contrast to the functional and elasticity approaches utilized by [Giorno et al. \(1995\)](#), [Van den Noord \(2000\)](#), [Bouthevillain et al. \(2001\)](#), [Braconier et al. \(2004\)](#) and [Girouard and André \(2006\)](#). [Afonso \(2010\)](#) employed a narrative approach to identify fiscal consolidation. They use government documents that detail government expenditure cuts, increased taxes, and various fiscal consolidation measures. Government documents often provide a historical context and rationale for fiscal consolidation measures, helping researchers to understand the broader economic and political environment surrounding these policies. However, government documents may not always provide comprehensive or accurate information on fiscal consolidation efforts, leading to gaps or inaccuracies in the analysis.⁷ Nevertheless, results similar to those of [Fedelino et al. \(2009\)](#) were found, as they included evidence of expansionary fiscal consolidations. However, fiscal consolidation through tax increases eventually has an unfavorable effect on private consumption.

In an effort to address the gap in the identification of fiscal consolidation episodes more accurately [Afonso and Jalles \(2014\)](#), departed from the constant approach and narrative approach utilized by [Fedelino et al. \(2009\)](#) and [Afonso \(2010\)](#). [Afonso and Jalles \(2014\)](#), studied the elastic-

⁶Constant elasticity models may lack flexibility in capturing nonlinear relationships or sudden changes in fiscal policy regimes, potentially leading to biased estimates or inaccurate predictions. On the other hand, constant elasticity models may oversimplify the interactions between fiscal variables and economic outcomes, overlooking important nuances and contributing factors that could affect policy effectiveness.

⁷The narrative approach provides qualitative insights into the nature and context of fiscal consolidation measures, offering a more nuanced understanding beyond quantitative data alone. However, the interpretation of government documents and narrative accounts can be subjective, potentially leading to biases or inconsistencies in identifying fiscal consolidation measures.

ities for OECD countries with four different definitions ⁸ of fiscal consolidation episodes. These definitions range from changes in the CAPB of 1%, 1.5%, 2%, and 3%. Nevertheless, there was a lack of detailed explanation or elaboration on the thresholds used for defining fiscal consolidation episodes can indeed be considered a limitation. Without clear justification or context for why specific thresholds (1%, 1.5%, 2%, and 3% of the change in the CAPB) were chosen, it becomes challenging for readers to understand the rationale behind these thresholds. However, [Afonso and Jalles \(2014\)](#) showed that lower government expenditures increase private consumption. Furthermore, private investment reveals a non-Keynesian response and social transfers have a negative impact on private investment. They did not calculate elasticity; however, they followed the literature on elasticity, which could be attributed to the fiscal consolidation episodes.

The gap of constant elasticity was investigated by [Princen et al. \(2013\)](#), in the examination of discretionary tax measures (DTM) pattern and the impact on tax elasticities in OECD countries using annual The data were collected from 2001 to 2012. They used the time-varying tax revenue tr elastic given by $\epsilon_{r,i,t} = \sum_{j=1}^4 \text{TR} \left(\frac{\hat{y}}{\hat{Y}} \right)_{i,t}$ as defined by [\(Van den Noord, 2000\)](#) with the differences that the parameters were time-varying. Their main contribution was using DTM in the computation of the CAPB based on time-varying elasticities. The shortfall of this methodology is that it ignores government expenditure dynamics. The average elasticity of CAPB was -0.1% between 2003 and 2013. One of the main contributions of the study was the incorporation of DTM in the computation of the CAPB based on time-varying elasticities. This addresses a gap in the literature in which previous studies have focused solely on traditional tax measures without considering the discretionary nature of certain tax policies. Using time-varying parameters in their analysis, which differs from previous studies that assumed constant parameters over time ⁹.

[Fedelino et al. \(2009\)](#), [Afonso \(2010\)](#), and [Princen et al. \(2013\)](#) bridged the gap in quantifying fiscal episodes by adopting the methodology utilized in IMF studies, primarily focusing on the constant elasticity of revenue concerning the output gap. To address these gaps, the constant-elasticity approach provides evidence that fiscal consolidation can successfully reduce

⁸Fiscal consolidation episodes (FE1) — a measure used by [Giavazzi and Pagano \(1995\)](#): the cumulative change in the primary cyclically adjusted budget balance is at least 5, 4, 3 percentage points of GDP in 4, 3 or 2 years respectively, or 3 percentage points in one year. Fiscal consolidation episodes (FE2) — a measure used by [Alesina and Ardagna \(1998\)](#)—the change in the primary cyclically adjusted budget balance is at least two percentage points of GDP in one year or at least 1.5 percentage points on average in the last two years. Fiscal consolidation episodes (FE3) — a measure based on [Afonso \(2010\)](#): A fiscal episode occurs when either the change in the primary CAPB is at least one and a half times the standard deviation (from the full panel sample) in one year, or when the change in the primary cyclical

⁹By allowing parameters to vary over time, the study accounted for potential changes in the relationship between tax revenue and economic variables, addressing a limitation of earlier research that may have oversimplified the dynamics of tax elasticities.

government debt and impact economic growth. By employing this approach, researchers have gained insight into the effectiveness of fiscal consolidation measures and their influence on economic variables. Conversely, using a narrative approach to identify fiscal consolidation episodes offers qualitative insight into the nature and context of these measures. These studies also address the gap in the limited understanding of evidence regarding expansionary fiscal policies by employing a qualitative approach alongside quantitative analysis. Their findings highlight the complexities of expansionary fiscal consolidation, revealing evidence of both positive and negative effects on economic variables. Finally, these studies address the gap in accurately identifying fiscal consolidation episodes by providing multiple definitions and thresholds. This shed light on the varying impacts of fiscal consolidation measures depending on the thresholds used, contributing to a deeper understanding of their effectiveness.

An investigation of the cyclical adjusting balance in OECD countries using a new approach of semi-elasticity was undertaken by [Mourre et al. \(2014\)](#) using data from 1990 to 2013. One of the main contributions in the calculation of elasticity is to further disaggregate the elasticity tax revenue component of social security contributions, which differs from the studies of [Fedelino et al. \(2009\)](#), [Afonso \(2010\)](#), [Princen et al. \(2013\)](#), and [Afonso and Jalles \(2014\)](#). Moreover, they express elasticity as different from the output gap $(y - \hat{y})$ contrary to $\frac{\hat{y}}{Y}$ potential output to the actual output. Their function of semi-elasticity TR tax revenue is given by $\epsilon_r = \sum_{j=1}^4 \frac{TR_j}{Y} (y - \hat{y})$ disaggregated into four components: corporate tax, personal income tax, indirect tax, and security contributions, which include employee and employer contributions. On the other hand, there was an inclusion of the semi-elasticity of G government expenditures of $\epsilon_g = \frac{G}{Y} (y - \hat{y})$ with government expenditure adjusted to the actual output, and the output gap to get the semi-elasticity ϵ_r and ϵ_g respectively. Using the generalized least squares estimators, it was found that the semi-elasticity for revenue was -0.03%, in contrast to the positive value of 0.42% using the traditional approach for the sensitive approach. Government expenditures were found to have a semi-elasticity of -0.55%, whereas the traditional approach reflected a semi-elasticity of -0.06%.

Several studies, such as [Price et al. \(2014\)](#), [Mourre et al. \(2019\)](#), [Braz et al. \(2019\)](#) and [Afonso and Leal \(2022\)](#), focus on investigating tax and expenditure elasticities, conventional approach to CAPB, introducing new methodologies, or applying existing methodologies to new contexts and explored factors influencing fiscal semi-elasticities. [Price et al. \(2014\)](#), made several contributions by filling the gap in understanding tax and expenditure elasticities in the context of EU budget surveillance. This was achieved through their investigation of the new tax and expendi-

ture elasticities. Moreover, they use the CAPB defined by $CAPB_t = ((R_t - G_t)_t) - \epsilon_t * GAP_t$, where R_t and G_t stand for nominal government revenue and expenditure, respectively, and Y_t^* is the nominal GDP. The output gap is the distance between actual and potential GDP Y_t^* in percentage points of potential output $(Y_t - Y_t^*)/Y_t^*$. Several refinements and methodological improvements were made relative to the [Girouard and André \(2006\)](#) study. The revisions to the individual elasticities were relative to [Girouard and André \(2006\)](#) view, which is significant in many cases but does not follow a clear pattern across countries, except for the elasticities of corporate income tax revenue, which were revised in most cases. According to the authors, methodological change used a broader definition of the representative family that had the effect of reducing elasticities on average, because families with two children tend to have higher thresholds, which reduces the average rate of tax relative to the marginal. Changes in the income weighting system (extending the analysis to higher-income earners) have also had the effect of reducing income tax elasticities, on average, insofar as higher-income earners face a lower tax elasticity, and these are given greater weight¹⁰.

[Breuer \(2019\)](#), investigated the expansionary austerity and reverse causality with critical analysis to critique the conventional approach of CAPB in OECD using the data of [Alesina and Perotti \(1995\)](#). The authors used the [Giorno et al. \(1995\)](#) methodology to define the CAPB. A regression model was used with the economic variables of CAPB, GDP, and government expenditure, among others. The authors noted that the cyclical adjustment strategy used in the literature has erroneous assumptions that produce flawed results that support expansionary austerity. Specifically, the CAPB strategy employed in this study fails to correct for cyclical effects in the expenditure-GDP ratio, so that the estimates of the results of expansionary fiscal consolidation are affected by reverse causality, i.e., increasing GDP causally decreases expenditure-GDP ratios, rather than vice versa. They found that CAPB, which reflects fiscal consolidation, results in a 0.067% decrease in GDP¹¹.

¹⁰The main gap addressed in [Price et al. \(2014\)](#) is the need for a better understanding of [Girouard and André \(2006\)](#), which provides valuable insights, but there are still refinements and improvements in the methodology and estimation of these elasticities. [Price et al. \(2014\)](#) aimed to fill this gap by conducting a comprehensive investigation into new tax and expenditure elasticities, focusing on their implications for the cyclically adjusted primary balance (CAPB), a key indicator used in fiscal policy and surveillance. They made methodological refinements such as using a broader definition of the representative family and adjusting the income weighting system to provide more accurate estimates of elasticities.

¹¹The study provides a critical analysis of the conventional approach to CAPB, pointing out erroneous assumptions that lead to flawed results in support of expansionary austerity. By highlighting the failure of the literature's cyclical adjustment strategy to correct for cyclical effects in the expenditure-GDP ratio, the authors identify a key gap in the existing methodologies.

4.3 Objective two: Literature review on the threshold of the CAPB that can be attributed to fiscal consolidation episodes

Studies, by [Giorno et al. \(1995\)](#), [Van den Noord \(2000\)](#), [Bouthevillain et al. \(2001\)](#), [Braconier et al. \(2004\)](#), and [Girouard and André \(2006\)](#), among others, were limited with systematic analysis of the outcomes of fiscal consolidation efforts, particularly in terms of their impact on government debt and economic growth. Therefore, [McDermott and Wescott \(1996\)](#), [Duperrut \(1998\)](#), [Heylen and Everaert \(2000\)](#), [Gupta et al. \(2005\)](#), [Afonso et al. \(2006\)](#), and [Ardagna et al. \(2007\)](#), among others, addressed these gaps in the empirical evidence on the effectiveness of fiscal consolidation measures and the factors that contribute to their success or failure. Econometric models and empirical data were utilized to examine the effects of fiscal consolidation episodes on government debt levels and economic activity. They focus on identifying episodes of fiscal consolidation based on specific criteria, such as thresholds for increases in GDP or reductions in government debt share to GDP. [McDermott and Wescott \(1996\)](#), investigated the impact of fiscal consolidation from 1970 to 1995 in OECD countries. They use economic data ranging from government expenditure, government wages, subsidies, and social security. The authors deemed fiscal consolidation as a fiscal adjustment that results in a threshold of a 1.5% increase in GDP over two years and a reduction in government debt share to GDP advocated by [Alesina and Perotti \(1995\)](#). There were 74 episodes based on revenue increases and 34 episodes based on expenditure cuts. The authors used the Probit Model, and found that if all other factors are held constant, the government expenditure cuts of government wage, subsidies, and social security result in a 3.22%, 0.60%, 0.26%, and 0.28% chance to trigger a fall in government debt share to GDP. These results suggest that government expenditure cut-based fiscal consolidation is more likely to be successful in reducing government debt than tax-based fiscal consolidation. Moreover, the authors find that there is a greater chance of successful fiscal consolidation when external macroeconomic conditions are accommodated with lower interest rates.

[Alesina and Ardagna \(1998\)](#), aimed to address the gap in understanding the effectiveness and consequences of fiscal consolidation policies in OECD countries during the period from 1960 to 1994. Specifically, they sought to investigate whether fiscal consolidation efforts, defined as reductions in government deficits, were successful in reducing debt levels and stimulating eco-

economic growth. In an effort to find fiscal consolidation episodes, the authors successfully used the CAPB threshold, which was defined by a 2 % or 1.05 % increase in the share of GDP for two years. Fiscal consolidation was deemed successful if the primary deficit had a threshold of 2% below the GDP in the year of tight policy. They used the economic variables of unemployment, wages, welfare payments, asset prices, CAPB, government debt, and tax. Using these thresholds, the authors found 51 fiscal consolidation episodes, 19 of which were deemed successful, while 23 had an expansionary effect on economic activities in OECD economies characterized by low unemployment. There were 9 of the fiscal consolidation episodes that did not have a significant impact. The authors conclude that there is evidence of success and the expansionary effect of fiscal consolidation. As such, they note that economic growth and government debt reduction are more likely to increase when government expenditure cuts are implemented rather than tax increases¹².

The research of Duperrut (1998) endeavor to bridge a significant lacuna in empirical inquiry concerning the factors contributing to efficacious fiscal adjustments, particularly within the unique backdrop of South Africa. Prior scholarly discourse offers scant insights into the nuanced conditions conducive to successful fiscal consolidation efforts, rendering this investigation indispensable for a comprehensive understanding of the fiscal dynamics prevailing in the region. Duperrut (1998), investigated successful fiscal adjustments in South Africa from 1973 to 1997. Fiscal adjustments were defined as a one-year improvement in the primary balance of the general government of more than 1.5% of GDP, and a two-year improvement in the primary balance of the general government of more than 2.5% of GDP with no reversals. The definition of the success of fiscal consolidation episodes was found with the identification of a deduction of at least 3% of the debt-GDP ratio by the second year after the last year of fiscal contraction or a reduction of at least 5% of the debt-GDP ratio by the third year after the last year of fiscal contraction. It was found that two episodes successfully represented 22.22% success. If the fiscal adjustment is reasonable, there is a negative impact on GDP between 1.5 % and 2

Heylen and Everaert (2000), investigated fiscal adjustment success and failure in OECD countries and European countries, respectively, addressing the lack of comprehensive analysis on the determinants and outcomes of fiscal consolidation efforts across a diverse set of countries.

¹²Alesina and Ardagna (1998) fill this gap by providing empirical evidence on the outcomes of fiscal consolidation episodes across OECD countries. They examined a range of economic variables to assess the success or failure of these episodes, considering both the short-term effects on economic activity and long-term effects on debt reduction and economic growth. This study contributes to the understanding of fiscal policy effectiveness and provides insights into the relative impact of different types of fiscal consolidation measures, such as government expenditure cuts versus tax increases.

They focused on fiscal adjustment in transition economies, filling the gap in understanding the fiscal policies' effectiveness in post-Soviet Union and Eastern European countries during their transition to market economies between 1970 and 1995. They considered the economic variables of cyclically adjusted transfers, dummy variables of CAPB, cyclically adjusted social security contributions, government wage bills, cyclically adjusted direct taxes on households, and cyclically adjusted direct taxes on business. The authors defined the success of the fiscal adjustment when the CAPB threshold improved by 2.5% or when there was an improvement of 2% for at least two consecutive years. There were 39 fiscal consolidation cases. The authors used the OLS model and found a 4.55% decrease in government debt share to GDP in the representation of fiscal consolidation programs in OECD countries. It was found that fiscal adjustment implemented through social security contributions increased government debt, while fiscal adjustments undertaken through the increase in taxes on business contributed to the reduction of government debt.

Zaghini (2001) addressed the gap in understanding the effectiveness of fiscal policy measures, particularly regarding their impact on government debt levels and short-run economic growth. By examining a wide range of economic variables, the study aimed to provide a comprehensive assessment of the consequences of fiscal consolidation efforts. Moreover, they investigate fiscal adjustments and economic performance in 14 European countries from 1970 to 1998. The economic variables used were the government debt share, consumption, tax, investment, unemployment, government expenditure, current account, CAPB inflation, interest rate, and exchange rate. The author identified the fiscal consolidation episode and CAPB increase with a threshold of 1.6% or 1.4%. The alternative is a 0.8% increase in the CAPB over two years. Between 1970 and 1998, the author found 100 fiscal consolidation episodes, of which 52 were characterized by a more expansionary fiscal contraction effect, while 48 were loose policy interventions. Using the VAR model, it was found that if all factors were held constant, government debt would increase by 3.7% with no fiscal consolidation intervention. Nevertheless, holding all other factors constant, fiscal consolidation results in a 0.1% decrease in government debt and 2.81% increase in economic growth. This result suggests an improvement in government debt and short-run economic performance. The author found that government expenditure cuts were also more favorable than tax increases¹³.

¹³Zaghini (2001) study contributes to the literature by providing empirical evidence on the effectiveness of fiscal consolidation efforts in European countries, offering insights into the comparative effects of different fiscal policy measures, and highlighting the importance of policy choices in achieving fiscal sustainability and economic stability.

Purfield (2003), investigated fiscal adjustment from 1992 to 2002 in 24 countries from the Soviet Union (FSU) and Eastern Europe (CEE). The author looked at large fiscal adjustments, and successful fiscal episodes were selected if there was a threshold of a 2% fall in government debt share to GDP in one year. The economic variables used were government tax, government expenditure, primary balance, real GDP growth rate, inflation, and current account balance. There were 33 fiscal adjustments with 27 fiscal consolidations based on government expenditure cuts. The author used VAR as well as the probit model and found that if all other factors are held constant, a 1% decrease in government expenditure cuts resulted in a 2.3% increase in real GDP growth. On the other hand, a 1% increase in government tax results in a 2.1% increase in real GDP growth. Therefore, it was concluded that the decline in government debt share to GDP relied on government expenditure cuts rather than government taxes. At the transition level, the author found that government expenditure cuts were a 2% share of GDP between 1992 and 2000, while real GDP increased from 0.3% to 2% on average in these countries¹⁴

Gupta et al. (2005), was initiated to understand the impact of fiscal consolidation efforts on economic growth in emerging economies, filling a gap in empirical research on the effectiveness of fiscal policy in these contexts. Gupta et al. (2005) highlighted limitations in using the cyclically adjusted primary balance (CAPB) as the sole criterion for identifying fiscal consolidation episodes, emphasizing the need to consider additional factors such as initial government debt levels, exchange rate volatility, inflation, and unemployment rate for a more comprehensive assessment. Fiscal consolidation has been found to have a positive impact on economic growth. However, the authors pointed out that the CAPB cannot identify discretionary fiscal policies. Therefore, it was proposed that factors such as initial government debt share to GDP, exchange rate volatility, inflation, and the unemployment rate need to be considered to ensure reliable exogenous fiscal consolidation, especially in emerging economies¹⁵.

Afonso et al. (2006), examined government expenditure-based fiscal consolidations in 10 central and 15 eastern European countries from 1991 to 2003. The authors used the economic variables of budget balance share to GDP, government revenues, government expenditures, GDP,

¹⁴It provided empirical evidence on the factors influencing fiscal adjustment success, highlighting the importance of the composition of fiscal adjustments (i.e., expenditure cuts vs. tax increases) and their implications for government debt and economic growth. Identified the role of government expenditure cuts in reducing government debt and stimulating economic growth in transition economies, shedding light on the effectiveness of fiscal consolidation strategies in unique economic contexts.

¹⁵Contribute to the literature by providing insights into the effectiveness of fiscal consolidation efforts in emerging economies and proposing methodological enhancements for identifying and assessing fiscal consolidation episodes. They highlight the importance of considering a broader set of factors beyond CAPB for a comprehensive understanding of fiscal policy effectiveness in diverse economic contexts.

and the dummy variable for fiscal consolidation success. Fiscal consolidation was identified if government debt fell by a threshold of 2%, which is more than the dummy variable. The authors found 114 and 20 successful fiscal consolidation episodes in central and eastern European countries, respectively. The Logit model was utilised and it provided evidence that government expenditure-based fiscal consolidation results in a 4.2% and 2.0% probability that countries in central and eastern European respectively may achieve a fall in government debt. The study offers a statistical framework for assessing the likelihood of achieving a fall in government debt through government expenditure-based fiscal consolidations. [Afonso et al. \(2006\)](#) focus on Central and Eastern European countries undergoing transition from planned to market economies, offering valuable insights into the challenges and opportunities associated with fiscal consolidation in these unique economic contexts.

[Baldacci et al. \(2006\)](#), aimed to assess the efficacy of fiscal consolidation measures in a sample of 25 emerging market economies spanning the period from 1980 to 2001. Through the utilization of an array of economic indicators and the application of the probit model, the researchers endeavored to discern the determinants underpinning fiscal sustainability and evaluate the effectiveness of diverse fiscal policy interventions in attaining consolidation objectives. This research addressed a conspicuous lacuna in empirical inquiry by specifically scrutinizing fiscal consolidation dynamics within the ambit of emerging market economies. This focus was instrumental in providing insights into the nuanced contours of fiscal consolidation strategies within the diverse economic milieus. By examining a spectrum of factors including political stability, initial economic conditions, and the composition of fiscal adjustment measures, [Baldacci et al. \(2006\)](#) sought to elucidate the multifaceted determinants of fiscal sustainability. This endeavor was pivotal for advancing a nuanced understanding of the drivers shaping fiscal outcomes in emerging market contexts. Leveraging an exhaustive array of economic metrics, including government debt ratios, economic growth indicators, and political stability indices, [Baldacci et al. \(2006\)](#) furnished an empirical substantiation of the factors engendering success in fiscal consolidation endeavors within emerging economies. This empirical rigor lent credence to their findings and underpinned the robustness of their analytical framework. They define fiscal consolidation as a successful episode in which the primary balance exceeds the sustainability threshold for at least one or two years. The second definition was an increase in the primary balance of 0.5% GDP. The authors used the probit model and found that if all other factors were constant, a 1% increase in the second definition of fiscal episode resulted in a 0.25% lower government debt. Government expenditure-based fiscal consolidation results in a 0.073% higher likelihood

of fiscal sustainability, but negative effects are found in tax-based fiscal consolidation. The authors also found that political will resulted in the effective implementation of fiscal consolidation.

[Ardagna et al. \(2007\)](#), investigated fiscal adjustment dynamics across 17 OECD countries, examining their impact on government debt share to GDP and economic growth during the period spanning from 1975 to 2002. A rigorous empirical framework was employed, drawing on economic data encompassing government debt ratios, real GDP per capita, CAPB, and overall economic growth rates, to elucidate the determinants and consequences of fiscal adjustment endeavors. This was an effort to address a notable gap in the literature by providing a comprehensive analysis of the fiscal adjustment processes within OECD countries. By scrutinizing the interplay between fiscal policy measures and their subsequent impacts on government debt levels and economic growth, this study aims to enrich our understanding of fiscal dynamics in advanced economies. The delineation of specific success criteria for fiscal adjustment episodes, predicated on improvements in the CAPB and reductions in government debt ratios, represents a notable contribution. This analytical framework facilitated a nuanced evaluation of the efficacy of fiscal policy interventions in achieving desired fiscal outcomes [Ardagna et al. \(2007\)](#) utilization of the Logit model underscored the empirical rigor underpinning the analysis, enabling the identification of significant determinants shaping fiscal adjustment outcomes. By quantifying the probability of government debt reduction vis-à-vis variations in government expenditure and tax policies, this study provides empirical substantiation for its findings, thus enhancing the credibility of its conclusions. This study's findings regarding the differential impacts of government expenditure cuts and tax increases on government debt dynamics have significant policy implications. The discernment of a higher likelihood of reducing government debt shares associated with substantial cuts in government spending underscores the efficacy of expenditure-based fiscal consolidation strategies.

The study of [Ardagna et al. \(2007\)](#), [Alesina and Ardagna \(1998\)](#), [Duperrut \(1998\)](#), [Heylen and Everaert \(2000\)](#), [Zaghini \(2001\)](#), [Purfield \(2003\)](#), [Gupta et al. \(2005\)](#), [Afonso et al. \(2006\)](#), [Baldacci et al. \(2006\)](#), and [Ardagna et al. \(2007\)](#) among others. These findings provide empirical evidence of the effectiveness of fiscal consolidation measures, particularly in OECD countries and emerging market economies. They sought to understand whether fiscal consolidation efforts, typically characterized by reductions in government deficits, effectively reduced debt levels and stimulated economic growth. Their research aims to identify the factors contributing to the success or failure of fiscal consolidation efforts. This includes examining the impact of different

types of fiscal policy measures, such as government expenditure cuts versus tax increases, and their implications for government debt and economic activity. Moreover, they conduct empirical analyses using econometric models and real-world data to assess the outcomes of fiscal consolidation episodes. This involved examining a wide range of economic variables to understand the dynamics of fiscal adjustment and its impact on government debt and economic growth. By identifying the relative effectiveness of different fiscal policy measures, such as expenditure cuts versus tax increases, the studies offer insights into policy choices that may be most conducive to achieving fiscal sustainability objectives. Some highlighted methodological limitations in identifying fiscal consolidation episodes and proposed enhancements to improve the accuracy of the assessments. Overall, fiscal consolidation efforts, particularly those involving significant cuts in government expenditure, are more likely to be successful in reducing government debt levels and stimulating economic growth. Government expenditure-based fiscal consolidations were generally found to have a positive impact on fiscal sustainability, while tax-based consolidations often had negative effects. Political will and external macroeconomic conditions, such as interest rates and exchange rate volatility, were identified as important factors influencing the success of fiscal consolidation efforts. Similar to [McDermott and Wescott \(1996\)](#), [Zaghini \(2001\)](#), [Gupta et al. \(2005\)](#), [Afonso et al. \(2006\)](#), fiscal adjustment through government expenditure cuts leads to higher GDP growth rates than a tax increase.

Studies that have provided a critical examination of the gap in the literature by examining the interplay between fiscal consolidation efforts and asset prices are that of [Morris and Schuknecht \(2007\)](#), [Blanchard \(1990\)](#), [Alesina and Perotti \(1995\)](#), [Gupta et al. \(2005\)](#), [Alesina and Ardagna \(2010\)](#), and [McDermott and Wescott \(1996\)](#) among others. Moreover, they focus on large changes in fiscal policy and their implications for economic performance and fiscal sustainability. By examining a wide range of fiscal policy episodes, this study offers insights into the determinants of successful fiscal consolidation. These studies provide a comparative analysis of tax- and spending-based fiscal consolidation strategies, offering valuable insights into the differential impacts of these policy instruments on fiscal outcomes and economic growth. [Morris and Schuknecht \(2007\)](#), examined the structural balances and asset prices in 16 OECD countries from quarter one of 1982 to quarter one of 2006. They used the economic data of CAPB, equity price index, asset price, tax, structural budget balance as a share of GDP, residential property price index, and direct and indirect tax. They adopted the VAR model, and fiscal consolidation episodes were selected when the CAPB increased by a threshold of 1.25% of the GDP for two years. It was found that a 1% increase in the cyclically adjusted balance resulted in a 0.6%

increase in the structural budget balance as a share of GDP. Moreover, they find that everything held constant, a 1% increase in asset prices affects the cyclically adjusted balance by 0.47%. This result provided strong evidence that cyclically adjusted balance had significant shortcomings in its influence coming from cyclically adjusted balance. This results in a biased estimate of the impact of fiscal consolidation on fiscal position. Therefore, contrary to [Blanchard \(1990\)](#), [Alesina and Perotti \(1995\)](#) and [Gupta et al. \(2005\)](#), the authors propose that both short and long asset prices must be accounted for in the CAPB. [Alesina and Ardagna \(2010\)](#), investigated large changes in fiscal policy, especially taxes versus spending in the context of fiscal consolidation in OECD countries from 1970 to 2007. The definition of a fiscal consolidation episode referred to by the authors is that it is a period of fiscal adjustment (stimulus) in a year in which the CAPB improves (deteriorates) by the threshold of 1.5% of GDP, similar to that of [McDermott and Wescott \(1996\)](#). Using this threshold of 1.5%, they found 107 periods of fiscal adjustment, which represented 15.1% of the observations, and 91 periods of fiscal stimuli, which were 12.9% of the observations in a sample. Expansionary fiscal adjustments were defined as when the average growth rate of GDP was different from the G7 average (weighted by GDP weights) after the first period of fiscal consolidation. It was found that a period of 26 years of expansionary periods during fiscal adjustments was 3.7% of the observations of the entire OECD sample, and 20 years of expansionary periods during fiscal stimuli, which is 2.8% of the observations of the entire OECD sample. The fiscal adjustment was defined to be successful if there was a cumulative reduction of the debt-to-GDP ratio of 4.5% for the three years following the implementation of fiscal consolidation. Seventeen successful fiscal adjustments were found in the OECD sample. It was also found that fiscal adjustments based on spending cuts and no-tax increases are more likely to reduce deficits and debt over GDP ratios than those based on tax increases.

The scholars that have examined global financial crisis, drawing insights from historical experiences, intricate relationship between fiscal policy decisions and movements in the context of fiscal consolidation this include the work of [Barrios et al. \(2010\)](#), [Tagkalakis \(2011\)](#), [Perotti \(2012\)](#), [Aizenman et al. \(2012\)](#), [Tagkalakis \(2011\)](#) and [Perotti \(2012\)](#) among others. [Barrios et al. \(2010\)](#), filled a critical gap in the literature by examining the effectiveness of fiscal consolidation efforts in the aftermath of the global financial crisis from 1970 to 2008 in EU and non-EU OECD. The authors used economic variables of cyclically adjusted expenditure, government debt, post-financial crisis, downturn, recovery, expansion, and fiscal governance during the financial crisis. The fiscal consolidation episode definition is adopted from [Alesina and Perotti \(1995\)](#) and [Alesina and Perotti \(1997\)](#). The data reflected 235 fiscal consolidation episodes, the

Probit model was used, and it was found that there was a 30.3% and 24.4% chance government debt would be lower than usual during the financial crisis and post-financial crisis in the presence of fiscal consolidation respectively. Such results indicate that countries need to have an effective model to implement fiscal consolidation in times of fiscal distress to increase their chances of success. On the other hand, it was found that there was an 11.2%, 9.3%, and 21.0% chance that government debt would be lower than usual if fiscal consolidation were implemented in the downturn, recovery, and boom phases, respectively, ¹⁶.[Tagkalakis \(2011\)](#), investigation addressed a notable gap in the literature by examining how fiscal policy decisions interact with movements in financial markets from 1970 to 2010 in 17 OECD countries. The author used economic data on CAPB share to GDP, interest payments share to GDP, aggregate asset prices, government debt share to GDP, and government expenditure. Using the VAR model, it was found that holding all other factors constant, a 1% increase in asset prices results in 0.056% government expenditure. The lag effect of asset prices results in a 0.089% decrease in government expenditures. Furthermore, a 1% increase in asset prices and residential property prices results in a 0.020% and 0.030% increase in government revenue, respectively, while the lag effect results in a 0.006% fall and 0.005% increase, respectively. This result is subject to CAPB being inelastic to asset price changes. Moreover, an asset price increase was found to be triggered by sustained revenue and primary balance adjustment. They further found that the government tax fall is triggered by higher residential, commercial property, and equity price volatility ¹⁷. [Perotti \(2012\)](#), investigated austerity. The author focused on the framework of fiscal adjustment and noted that cyclically adjusted balance had two possible limitations that arose: cyclical adjustments and asset price influence, which the author refers to as imperfect cyclical adjustment problems. The second possible limitation that occurs as a result of the positively correlated changes in economic growth is the countercyclical response problem¹⁸. It was noted out that there is a necessity of adopting alternative approaches, such as the narrative approach proposed by [Romer and Romer \(2010\)](#) and [Devries et al. \(2011a\)](#) , to overcome the limitations associated with the CAPB framework.

¹⁶The study's results emphasize the importance of adopting proactive fiscal measures to address fiscal imbalances and enhance fiscal sustainability, particularly during periods of economic uncertainty. These findings provide valuable guidance for policymakers seeking to design effective fiscal consolidation strategies to navigate post-crisis recovery and ensure long-term fiscal stability.

¹⁷The study highlights the effects of asset price changes on government revenue, expenditure, and primary balance, offers valuable insights for policymakers seeking to navigate the complex interplay between fiscal policy and financial markets, and provides valuable guidance for policymakers seeking to enhance the effectiveness of fiscal policy in response to financial market movements. By identifying the triggers of government revenue adjustments in response to asset price volatilities, this study offers insights for designing proactive fiscal policies to promote economic stability and financial market resilience.

¹⁸[Perotti \(2012\)](#) offered a critical evaluation of the CAPB framework, highlighting its susceptibility to imperfect cyclical adjustment problems and countercyclical response issues. By pinpointing these inherent constraints, the study contributed to a deeper understanding of the challenges associated with traditional fiscal adjustment metrics.

Barrios et al. (2010), Tagkalakis (2011), Perotti (2012), Aizenman et al. (2012), Tagkalakis (2011) and Perotti (2012) studies contributed to the literature on fiscal consolidation by examining its effectiveness and identifying key factors that influence its success or failure. They collectively highlight several gaps in the existing research and offer insights into addressing these gaps through empirical analysis and methodological advancements. However, these studies provide valuable empirical evidence on the effectiveness of fiscal consolidation measures across different countries and time periods. They offer insights into the impact of fiscal consolidation on government debt levels, economic growth, asset prices, and financial market movement. Among these studies, there were limitations in traditional metrics, such as the CAPB, emphasizing the need for alternative approaches to fiscal policy analysis. Scholars have pointed out that fiscal consolidation on asset prices, financial markets, and economic growth is underscored, suggesting the necessity for comprehensive assessments considering these factors. The importance of incorporating nuanced economic variables and considering diverse economic contexts to provide more accurate assessments of fiscal policy effectiveness is recognized. Alternative methodologies have been proposed, such as narrative approaches, to overcome the limitations of traditional fiscal adjustment frameworks such as the CAPB. They contribute to bridging the gap between theoretical frameworks and empirical evidence, providing policymakers with valuable insights into the design and implementation of effective fiscal consolidation strategies. These studies collectively contributed to advancing our understanding of fiscal consolidation by addressing key gaps in existing research, offering empirical evidence on its effectiveness, and proposing alternative methodologies to enhance fiscal policy analysis. Through rigorous empirical analysis and methodological innovations, they provide valuable insights for policymakers and researchers grappling with the challenges of fiscal policy formulation and evaluation in diverse economic.

Various aspects of fiscal consolidation and government debt dynamics across different countries have been investigated by Aizenman et al. (2012), Amo-Yartey et al. (2012), and Heylen et al. (2013). Amo-Yartey et al. (2012) investigates tax multipliers and the impact of changes in tax rates, particularly value-added tax (VAT), on fiscal outcomes in industrialized nations. Aizenman et al. (2012) focuses on the challenges of fiscal consolidation in diverse economies, assessing the effectiveness of different policy instruments and their impact on government debt reduction. Heylen et al. (2013) examines government debt dynamics in OECD countries, analyzing the role of public sector efficiency in fiscal consolidation efforts and exploring the relationship between fiscal adjustment measures, tax policies, and government debt reduction. These studies

provide valuable insights into the complexities of fiscal policy and the factors influencing fiscal outcomes on both domestic and international scales. [Aizenman et al. \(2012\)](#), addresses a crucial aspect of fiscal policy by examining the tax multipliers associated with fiscal consolidation efforts across 14 industrialized countries over the period from 1980 to 2009. This research endeavor contributes to the existing literature by focusing on the nuanced effects of tax policies, particularly value-added tax (VAT) adjustments, on economic outcomes during consolidation periods. They used the economic variables of the tax base, GDP per capita, tax revenues, the tax rate to GDP, and value-added tax (VAT) in the SVAR model. They find that a VAT rate of 32 increases the influence of fiscal consolidation and 10 reductions. Tax rate increases were found to always be contradictory in terms of output. Similar to [Perotti \(2012\)](#), the authors found that the narrative approach was suitable for finding exogenous fiscal shocks, as advocated by [Romer and Romer \(2010\)](#). However, in contrast to [Romer and Romer \(2010\)](#) and [Devries et al. \(2011a\)](#) they focused on the fiscal shocks that resulted from the change in VAT and the policy variable under the direct control of the policymaker¹⁹.

[Amo-Yartey et al. \(2012\)](#) study addresses a significant gap in the literature concerning the efficacy of fiscal consolidation measures in reducing government debt levels across a wide spectrum of countries and economic circumstances. To bridge this gap, [Amo-Yartey et al. \(2012\)](#) adopt a comprehensive approach encompassing 155 countries spanning different economic classifications and geographical regions. By employing a logit model, this study rigorously assesses the impact of fiscal variables such as the cyclically adjusted primary balance (CAPB), real GDP growth, government debt-to-GDP ratio, and taxation on government debt reduction. This methodological choice enables a thorough investigation of the intricate relationship between fiscal policies and debt dynamics. Fiscal success was found when there was a 15% reduction in the government debt share to GDP over five years. Fiscal consolidation was defined as a 1% improvement in CAPB in year one or for two consecutive years, and successful if the government debt fell by 5% after five years. They found 206 episodes, 107 similar to [Alesina and Ardagna \(2010\)](#) and 51 episodes of government debt share to GDP reduction, fiscal adjustment, and successful fiscal adjustments. Fiscal consolidation increases the likelihood of government debt sharing to GDP reduction by 0.58%. They also observe that fiscal consolidation achieved through government expenditure cuts is more successful than tax-based consolidations²⁰.

¹⁹In contrast to previous studies advocating for narrative approaches, [Aizenman et al. \(2012\)](#)'s research diverges by focusing specifically on fiscal shocks resulting from VAT adjustments, thereby offering a unique perspective on the direct influence of policymaker-controlled variables on economic outcomes.

²⁰[Amo-Yartey et al. \(2012\)](#) study makes a significant scholarly contribution by offering a thorough analysis of how fiscal consolidation impacts government debt reduction across a diverse array of countries. Through

Heylen et al. (2013), delves into the realm of fiscal consolidation across 21 OECD countries spanning nearly four decades, aiming to shed light on its impact on government debt dynamics. Departing from conventional classifications of fiscal outcomes as either successes or failures, Heylen et al. (2013) outlined the complexity underlying changes in government debt levels. Using the 21 OECD countries from 1981 to 2018 and the CAPB. They built up the scope of Heylen and Everaert (2000) and argued that changes in the government debt share to GDP between the range of 10% and 25% cannot be limited to either ‘success’ cases or ‘failures,’ as there was a need to explain such outcomes. They find that the change in government debt share to GDP varies between -25% and 35%. The authors used economic variables such as government debt share, GDP, GDP, and tax. The OLS model was utilized on the new hypothesis role of public sector efficiency and found that being equal to a 1% increase in government efficiency increases the expansionary fiscal adjustment variable by 2.55%. They contribute to the literature by analyzing the evolution of the ratio of public debt to GDP during as well as two years after fiscal adjustment. They found 132 fiscal episodes with empirical evidence that showed that all remained equal if there was a 1% increase in fiscal adjustment and tax, and government debt share to GDP fell by 1.06% and 4.84%, respectively. The authors noted that successful fiscal consolidation also occurs in countries where there is product market deregulation since there is competition, which results in a significant increase in demand as high-quality products are produced leading to an increase in economic growth²¹.

Yang et al. (2015), investigated macroeconomic effects of fiscal adjustment using two approaches; the narrative, and CAPB from 20 OECD countries between 1970 and 2009. They use the economic variables of CAPB, real economic growth, unemployment, tax, inflation, and interest rates. In response to the estimation challenges of CAPB, they consider asset prices, as pointed out by Romer and Romer (2010) and Devries et al. (2011a). The authors account for asset price movement and remove its cyclical effect on government revenue. Moreover, contrary to the literature, they use the standard deviation in the fiscal consolidation definition to account for country-specific heterogeneity. They defined fiscal adjustment episodes as CAPB increases by 0.33 points in the mean and standard deviation for 2 and 3 years or more. There were 66

meticulous empirical examination and a nuanced definition of fiscal success, this study illuminates the relative effectiveness of different consolidation strategies and provides essential guidance for policymakers to navigate fiscal challenges on a global scale.

²¹Heylen et al. (2013) enriches our understanding of fiscal consolidation by emphasizing the nuanced nature of changes in government debt, highlighting the importance of public sector efficiency, and shedding light on the interaction between fiscal policy and market deregulation in achieving successful consolidation outcomes.

fiscal episodes, 11 of which lasted for one year, and the overall period of the 66 fiscal episodes comprised 19 years, where most of the countries had implemented fiscal consolidation for nine years. The adopted panel logit model revealed that expansionary fiscal adjustments resulted in a 28.9% likelihood of a decrease in economic growth. However, the lagged effect of such changes results in a 15% increase in the impact on economic growth. They conclude that there is no clear evidence of the effects of fiscal consolidation. [Jalles \(2017\)](#), investigated how fiscal adjustments changed the income distribution in 27 emerging market economies between 1980 and 2014 including South Africa. Fiscal consolidation was identified using the CAPB in a definition of three scholars' papers ([Alesina and Ardagna, 1998](#)), who consider a CAPB threshold of 2% or 1.05% increase in the share of GDP for 2 years successful. ([Giavazzi and Pagano, 1995](#)), proposed the cumulative changes in the CAPB that are at least 5, 4, and 3 percentage points of GDP, respectively, for four, three, or two years. ([Afonso and Jalles, 2013](#)), who defines the occurrence of a fiscal episode when the change in the CAPB is at least one-and-a-half times the standard deviation. The number of fiscal contractions ranges from 52 in the approach proposed by ([Giavazzi and Pagano, 1995](#)), to 42 in both the approach from ([Alesina and Ardagna, 1998](#)) and ([Afonso and Jalles, 2013](#)). In South Africa, using the approach of ([Giavazzi and Pagano, 1995](#)), fiscal consolidation episodes were found to be expansionary from 2009 to 2011; using the ([Alesina and Ardagna, 1998](#)) approach from 2009 to 2010, fiscal consolidation was successful; and using the ([Afonso and Jalles, 2013](#)) approach, fiscal consolidation was expansionary from 2008 to 2009 and there were contractions occurred in 2010. They find that fiscal consolidations tend to lead to an increase in income inequality and reduce the redistributive role of fiscal policy. Spending-based consolidations are more detrimental to income distribution than tax-based ones, and fiscal retrenchment during bad times raises inequality²².

[Escolano et al. \(2018\)](#), investigated the maximum size of fiscal adjustments from 1965 to 2014 in 83 countries. They note that debt sustainability hinges on the stability of the debt-to-GDP ratio. Therefore, a country with fiscal adjustment needs is one whose debt-to-GDP ratio is on a rising path and, consequently, is facing a positive primary gap. It was found that CAPB improved primary balance by 5%. The fiscal adjustment was found to be larger and greater than the initial

²²These studies contribute to the understanding of the macroeconomic effects of fiscal adjustment and its implications for income distribution. It is noted that fiscal adjustment using both narrative and cyclically adjusted primary balance (CAPB) approaches across OECD countries addresses challenges in CAPB estimation by considering asset price movements and country-specific heterogeneity. Moreover, there is the possibility of ambiguity regarding the impact of fiscal consolidation on economic growth. On the other hand, emerging market economies, including South Africa, examine how fiscal adjustments affect income distribution. Definitions of fiscal consolidation highlight differences in outcomes based on spending- or tax-based consolidation and their timing relative to economic conditions. Fiscal consolidation often exacerbates income inequality, with spending-based consolidation having a more pronounced effect than tax-based consolidation, especially during economic downturns.

deficit when the adjustment efforts were sustained. [David and Leigh \(2018\)](#), investigated a new action-based data set of fiscal consolidation in Latin America and the Caribbean (LAC) between 1989 and 2016. The author [Romer and Romer \(2010\)](#) identified fiscal actions using a narrative approach. The rationale was to find discretionary changes in taxes and government spending, primarily motivated by a desire to reduce the budget deficit and long-term fiscal health, and not by a response to prospective economic conditions. The author examined contemporary policy documents, including budgets, central bank reports, and the IMF and OECD reports. Based on this approach, 76 fiscal policy adjustments were found in the 14 LAC economies. Fiscal consolidation consists of 0.9% of GDP with a tax increase of 1.2% of GDP, offset by a spending increase of 0.3% of GDP. [Glavaški and Beker-Pucar \(2020\)](#), investigated episodes of fiscal consolidation in the period from 1990 to 2015 in 28 EU economies. The economic variables used were cyclically adjusted primary budget balance, economic openness, inflation, gross fixed capital formation, and the GDP growth rate. The Pooled Mean Group (PMG) estimator, which uses the panel extension of the single-equation autoregressive distributed lag (ARDL) model (PMG-ARD), was used. It was found that the CAPB has a positive impact on the economic growth of Western Balkan countries in the long run. The coefficient was positive and statistically significant at the 1% level. If the share of the cyclically adjusted primary budget balance in GDP increases by 1%, the real economic growth in Western Balkan countries would grow by 0.26%. This implies that fiscal consolidation has a positive impact on economic growth in this region. They noted that there was a 70% chance of implemented fiscal consolidations, particularly in emerging EU economies, having a positive impact on economic growth, which is anticipated to result in a decrease in government debt in the long run²³.

The significant contribution and gap addressed in the study by [de Rugy and Salmon \(2020\)](#) lie in its comprehensive analysis of the effectiveness of fiscal consolidation efforts in reducing debt-to-GDP ratios and their impact on economic performance. Therefore, [de Rugy and Salmon \(2020\)](#) investigated fiscal consolidation, which resulted in the successful reduction of debt-to-GDP ratios and economic performance in 26 countries between 1995 and 2018. The analysis focused on large fiscal consolidations in which the fiscal deficit as a share of GDP improved by at least 1.5% over two years and did not decrease in either of those two years. It was found that 135 fiscal consolidation episodes met this two-year criterion and divided each episode into successful and

²³While the findings of these studies suggest that fiscal consolidation, as indicated by improvements in the CAPB, can have positive effects on economic growth and debt reduction, there are counterarguments to consider. Some scholars argue that the size and composition of fiscal adjustments may have differential effects on economic outcomes, with certain types of consolidation measures, such as austerity measures or excessive tax increases, potentially leading to adverse economic consequences such as lower growth and increased income inequality.

unsuccessful consolidations. A successful consolidation was defined as one in which the debt-to-GDP ratio declined by at least 5 percentage points three years after the adjustment took place, or by at least 3% two years after the adjustment. There were 62 successful and 73 unsuccessful consolidations. They found that there were 45 expenditure-based fiscal consolidation (EB) episodes, and more than half were successful, while there were 67 tax-based fiscal consolidation (TB) episodes, in which less than four in 10 were successful. They concluded that expenditure-based adjustments tend to cause small contractions, which are not significantly different from zero, whereas tax-based adjustments cause deep and long-lasting recessions. In addition, periods of fiscal consolidation that lasted more than two years tended to be twice as successful as those that lasted two years or less. Finally, the size of fiscal consolidation was a key determining factor in the success of fiscal adjustments.

[Xiang et al. \(2021\)](#), investigated fiscal consolidation episodes in 13 Latin America and the Caribbean (LAC) countries from 1989 to 2016. The traditional method of identifying fiscal consolidation episodes uses the CAPB. They considered the economic variables factor productivity, CAPB, tax, government expenditure, private consumption, and total trade. They find 51 fiscal consolidation episodes in 13 LAC countries. Using a Panel Multiple Regression Model, it was found that, on average, these fiscal consolidation episodes have a statistically significant negative impact on their host countries' Total Factor Productivity (TFP). Moreover, they noted that in fiscal consolidation policies, this model finds that expenditure cuts are a better policy option than tax increases, which is in line with popular opinions in this field of research. [Afonso et al. \(2022a\)](#), investigated the non-Keynesian effects of fiscal austerity with new evidence from 1970 to 2018. They considered 37 advanced economies and 137 developing economies, and used an approach similar to that of [Jalles \(2017\)](#), using different definitions from ([Alesina and Ardagna, 1998](#)), ([Giavazzi and Pagano, 1995](#)), and ([Afonso and Jalles, 2013](#)). Using these different approaches, it was found that there are 122, 169, and 171 episodes, respectively. It was found that increases in government final consumption expenditure had a positive (Keynesian) effect on real per capita private consumption. In contrast, tax increases had a positive effect on private consumption in the presence of fiscal consolidation. They note that fiscal contractions create a crowding-in effect on private investments. [Afonso et al. \(2022b\)](#), investigated whether or not to consolidate data from 1980 to 2018. They used the WEO-based CAPB, which is world economic outlook data based on the IMF and Hamilton-based CAPB data. With the application of the approach of [Afonso et al. \(2022a\)](#) in the identification of fiscal consolidation episodes, they found that South Africa experienced fiscal consolidation episodes in 2000, 2009, and 2017 using the

WEO-based CAPB. Hamilton-based CAPB fiscal consolidation episodes occurred in 2000, 2009, and 2018. Across all countries, it was found that using the WEO-based CAPB, there were 488 years of fiscal consolidation episodes, while with Hamilton-based CAPB, there were 586 years of fiscal consolidation episodes. They noted that a fiscal consolidation program implied an improvement in the degree of public financial sustainability in advanced and developing economies.

Table 4.1: Summary of fiscal consolidation episodes

Author	Definition	EB	TB	TE	TS	% S
Alesina and Perotti (1995)	Threshold of 1.5% CAPB	59	60	119	66	55.46%
Alesina and Perotti (1997)	Changes in the CAPB that are at least 5%	125	98	223	43	19.28%
McDermott and Wescott (1996)	Threshold of 1.5% CAPB	34	74	108	43	39.81%
Alesina and Ardagna (1998)	Threshold of 2% CAPB	23	28	51	19	37.25%
Zaghini (2001)	Threshold of 1.6% or 1.4% of CAPB	52	48	100	52	52.00%
Afonso et al. (2006)	Threshold of 2% CAPB			72	20	27.78%
Alesina and Ardagna (2010)	Threshold of 1.5% CAPB			107	91	85.05%
Barrios et al. (2010)	Threshold of 1.5% CAPB			235	71	30.21%
Amo-Yartey et al. (2012)	1% improvement in CAPB			107	51	47.66%
Alesina and Ardagna (2013)	Debt to GDP ratio fall for 2 year	17	35	107	25	23.36%
Yang et al. (2015)	Narrative approach			66	19	28.79%
de Rugy and Salmon (2020)	Debt-to GDP ratio declines by at least 5 percentage points	45	67	112	66	58.93%
Afonso et al. (2022a)	Threshold of 1.5% CAPB		171			

Note: EB reflects the expenditure base fiscal consolidation, TB tax-based fiscal consolidation, TE total expenditure-based, TS total fiscal consolidation success and % Total fiscal consolidation success as a percentage.

4.4 Objective three: Literature review of fiscal consolidation and domestic government debt

The studies of [Blanchard \(1990\)](#), [Duperrut \(1998\)](#) and [Swanepoel and Schoeman \(2003\)](#), explores the implications of fiscal adjustment measures on economic performance and government debt dynamics, consider nuanced factors such as government debt sustainability, and sheds light on the specific factors influencing the outcomes of fiscal adjustment episodes. The study of [Blanchard \(1990\)](#) addresses a lacuna in the extant literature regarding the nuanced implications of fiscal adjustment measures on economic performance and government debt dynamics. [Blanchard \(1990\)](#), investigated fiscal adjustment measures. The author used a threshold of a 1.5% increase in the CAPB to identify fiscal consolidation episodes, economic variables of government debt, and asset prices. It was found that low and sustainable government debt provided room for fiscal consolidation to be implemented successfully, while tax-based fiscal consolidation had a detrimental effect on economic growth and government debt. However, when the economy was in deep recession, economic growth was evident even when fiscal consolidation was implemented based on tax increases. This provided evidence that in economies where there was desirability in the state authorities, the increased tax at such a time gave the impression that the government would undertake substantial tax cuts in the future. The eventuality of these positive expectations resulted in an increase in business confidence, leading to an increase in investments and private consumption, even in the short term. The authors call this economic phenomenon an ‘expansionary contraction fiscal austerity. At the measurement level, the authors proposed the use of the CAPB, which gave discretionary changes and excluded economic movement when the focus was on larger changes²⁴.

The gap in literature concerning the efficacy of fiscal consolidation efforts in reducing the debt-to-GDP ratio and the underlying factors influencing their success or failure was investigated by [Duperrut \(1998\)](#). Furthermore, it addresses the dearth of understanding regarding the differential impacts of tax-based versus expenditure-based fiscal measures on overall economic performance from 1973 to 1997. Successful fiscal consolidation episodes were identified when there was

²⁴Interestingly, the research also uncovers an intriguing phenomenon termed ‘expansionary contraction fiscal austerity,’ wherein economic growth is observed even during periods of fiscal consolidation implemented through tax increases, particularly in economies where positive expectations about future tax cuts prevail. Overall, the study underscores the importance of considering nuanced factors such as government debt sustainability and the composition of fiscal adjustment measures to understand their economic implications. In addition, the proposal to use the CAPB as a measurement level offers a valuable methodological contribution to the field by providing a framework for assessing discretionary fiscal changes while filtering out economic fluctuations.

a 3% reduction in the debt-GDP ratio by the second year after the last year of fiscal contraction or when there was a reduction of at least 5% of the debt-GDP ratio by the third year after the last year of fiscal contraction. Nine annual fiscal consolidation episodes were observed during this period. Only 22% of the fiscal consolidation episodes successfully reduced the debt-GDP ratio. On the taxation side, fiscal consolidation was unsuccessful, and, in general, the adjustment expenditure side was also successful. However, the disaggregated components of fiscal consolidation reflect that adjustments record spending cuts in all categories of expenditure, contrary to unsuccessful contractions. Successful adjustments appear to rely on temporary tax increases and permanent spending cuts. On the other hand, it was found that fiscal adjustments of 1.5% and 2% of GDP had a negative impact on aggregate demand²⁵. Furthermore, [Duperrut \(1998\)](#) note the nuanced relationship between fiscal consolidation measures and aggregate demand, revealing potential implications for overall economic activity. This insight adds to our knowledge of the macroeconomic consequences of fiscal policy adjustments and informs policymakers about the trade-offs involved in pursuing debt reduction goals.

[Swanepoel and Schoeman \(2003\)](#), investigated the counter-cyclical fiscal policy in South Africa from 1972 to 2000. The cyclical components of budget balance (ratio to trend output), government debt, and deficit were among the economic variables used. They used high debt and lower debt in an ordinary least squares model and the cyclical component of budget balance as a proxy for fiscal consolidation. It was found that fiscal consolidation implemented at a high level of government debt resulted in a 0.4% decrease in government debt. However, fiscal consolidation implemented at lower levels of government debt would result in a 0.82% increase in government debt²⁶. The studies conducted by [Blanchard \(1990\)](#), [Duperrut \(1998\)](#), and [Swanepoel and Schoeman \(2003\)](#) shed light on the intricate dynamics of fiscal adjustment measures and their implications on economic performance and government debt dynamics. [Blanchard \(1990\)](#)'s study reveals the phenomenon of 'expansionary contraction fiscal austerity,' highlighting that tax-based fiscal consolidation can lead to economic growth, particularly in times of recession, due to positive expectations about future tax cuts. [Duperrut \(1998\)](#)'s research underscores the im-

²⁵This study contributes significantly to bridging existing knowledge gaps by offering empirical insights into the success rates and determinants of fiscal consolidation efforts in South Africa. This study sheds light on the specific factors that influence the success or failure of fiscal consolidation. By analyzing the differential impacts of tax-based and expenditure-based fiscal measures, the research highlights the importance of adopting a balanced approach involving both revenue enhancements and expenditure cuts. This finding contributes to a deeper understanding of the optimal strategies for achieving fiscal consolidation objectives while minimizing the adverse effects on economic performance.

²⁶This study calculates the extent to which fiscal policy stabilizes output fluctuations in South Africa and estimates the cyclically adjusted budget balance of the consolidated general government as an alternative fiscal indicator that can contribute to more effective fiscal policy and fiscal analysis.

portance of balanced fiscal measures, showing that successful fiscal consolidation often involves temporary tax increases and permanent spending cuts. Furthermore, [Swanepoel and Schoeman \(2003\)](#)'s investigation into counter-cyclical fiscal policy in South Africa emphasizes the role of government debt levels in determining the effectiveness of fiscal consolidation efforts.

The studies explore phenomena such as fiscal fatigue include that of [Ghosh et al. \(2013\)](#), the challenges of government debt reduction during fiscal consolidation [Eyraud and Weber \(2013\)](#), the sustainability and duration of fiscal consolidations [Lodge and Rodríguez-Vives \(2013\)](#), fiscal policy in specific countries like South Africa [Calitz et al. \(2014\)](#), the multiplier effects of fiscal austerity during crises [Müller \(2014\)](#), and the effectiveness of austerity measures in the Eurozone [Monastiriotis \(2014\)](#). These studies contribute to filling the gaps in understanding the various aspects of fiscal policy dynamics and consolidation efforts. These findings provide insights into the factors influencing the success or failure of fiscal adjustments. [Ghosh et al. \(2013\)](#) significant contribution was on identification and exploration of the phenomenon of fiscal fatigue, shedding light on the intricate relationship between debt accumulation, fiscal adjustment measures, and market responses. By delineating the stages of fiscal fatigue, this study offers valuable insights into the challenges and limitations policymakers face in managing public finances, particularly during periods of heightened fiscal stress. This was found through an investigation of fiscal fatigue in 23 advanced economies from 1970 to 2007. The economic variables used were gross public debt, primary fiscal balance as shares of GDP, tax, government expenditure, and the output gap, among others. The stochastic and fixed effects models were applied to the fiscal reaction function. Debt and primary balance move in three stages. Moreover, they argued that this was because increases in debt were regarded as inconsequential at lower levels, and the primary balance did not react to growth in debt in the first phase when debt was low. Second, once rising debt reaches a point where markets respond and prices are at a higher risk of default, sovereign states would embark on a fiscal consolidation process aimed at bringing the debt-to-GDP ratio back into balance. Fiscal weariness occurred in the third phase of fiscal adjustment when debt rose to a certain level despite the adjustment. The sovereign may have stopped adjusting, causing the debt-to-GDP ratio to rise further²⁷.

²⁷The study focused on analyzing the fiscal reaction function to uncover patterns in the behavior of debt and primary balance relative to GDP. The findings reveal a three-stage pattern in the relationship between debt and primary balance. In the initial phase, characterized by low levels of debt, increases in debt were largely disregarded, and there was little reaction in the primary balance. However, as debt levels escalated to a point where market reactions and default risks heightened, governments initiated fiscal consolidation measures to restore the balance to the debt-to-GDP ratio.

The research by [Eyraud and Weber \(2013\)](#) makes a significant contribution to the body of knowledge surrounding government debt reduction and fiscal consolidation. By utilizing a vector autoregressive (VAR) model and analyzing extensive data spanning over four decades, this study offers valuable insights into the complex dynamics of fiscal policy and its impact on debt-to-GDP ratios. The findings shed light on the immediate and delayed effects of fiscal tightening, revealing that, while a 1% fiscal tightening initially leads to an increase in the debt-to-GDP ratio, it takes approximately six quarters for the ratio to begin declining. This nuanced understanding of the temporal dynamics of fiscal consolidation contributes to a deeper understanding of the challenges and implications of managing government debt. Furthermore, by examining the response of various economic variables to fiscal shocks such as government expenditure cuts and tax increases, this study provides policymakers and economists with valuable information to inform more effective fiscal policy decisions. Overall, the study significantly enhances our understanding of the mechanisms underlying government debt reduction efforts and offers valuable insights for policymakers and researchers alike.

[Lodge and Rodríguez-Vives \(2013\)](#) delves into the duration and sustainability of austerity measures, shedding light on the factors that influence the persistence of fiscal consolidation efforts. By employing the VC model and analyzing economic variables, such as the cyclically adjusted primary budget balance (CAPB), public debt, deficits, growth rate, output gap, and private sector credit growth, this study aims to understand the determinants of prolonged fiscal consolidation. The findings reveal that the duration of fiscal consolidation is influenced by several factors, including initial levels of public debt and fiscal deficits. High initial levels of public debt and large fiscal deficits are associated with prolonged austerity measures, suggesting that addressing these factors is crucial for sustaining fiscal consolidation efforts. Furthermore, this study highlights the role of the political cycle in shaping the duration of consolidation, emphasizing the importance of considering political dynamics in understanding the longevity of fiscal adjustment measures. Additionally, factors such as higher initial private sector savings, a stronger external balance, competitive positioning, and stable financial conditions are identified as conducive to sustaining longer-lasting consolidations.

[Calitz et al. \(2014\)](#) primarily investigates the patterns and implications of fiscal policy in South Africa from 1961 to 2010. Specifically, this study seeks to address the gap in understanding the dynamics of government debt accumulation and the effects of fiscal decisions on debt sustainability over a specified timeframe. By examining the trends in government debt levels and analyzing

the impact of discretionary fiscal measures on the debt-to-GDP ratio, the study aims to provide valuable insights into the factors driving changes in public debt and the associated risks to fiscal sustainability in South Africa. Utilizing the vector autoregressive (VAR) model and examining economic indicators such as economic growth, the debt-to-GDP ratio, and the primary balance as a ratio of GDP, among others, this research aims to understand the patterns and implications of fiscal policy decisions in the country. The findings reveal two distinct episodes of significant increases in government debt in South Africa, occurring between 1974 and 1978 and between 1985 and 1995, and a period of substantial decrease in debt between 1995 and 2008. Moreover, the dynamic impulse response analysis of the VAR model highlights the impact of discretionary fiscal decisions made from 2007 to 2010, indicating a serious threat to fiscal sustainability. These discretionary decisions have led to large budget deficits and rapid increases in the public debt burden, underscoring the importance of prudent fiscal management in ensuring long-term fiscal stability and sustainability in South Africa.

[Müller \(2014\)](#) addresses the gap in understanding the effectiveness of fiscal austerity measures during periods of economic crisis. Specifically, this study focuses on examining the fiscal multiplier effect in times of financial turmoil between 1990 and 2013. By employing a vector autoregression (VAR) model and incorporating key economic variables, such as tax revenues, debt-to-GDP ratio, cyclically adjusted primary balance (CAPB), GDP, and government spending, this study aims to shed light on the dynamics of fiscal policy and its impact on economic activity during crises. The significant finding of this study is the identification of fiscal consolidation as potentially self-defeating during financial downturns due to the presence of large fiscal multipliers. Additionally, this study highlights the mitigating role of public debt in dampening the magnitude of fiscal multipliers, thereby influencing the effectiveness of fiscal austerity measures in crisis situations.

[Monastiriotis \(2014\)](#) addresses the critical question of whether austerity measures effectively contribute to debt sustainability, particularly in the context of the Eurozone debt crisis. By examining the conditional link between fiscal austerity and debt sustainability, this study evaluates the impact of austerity policies implemented in response to the crisis. Utilizing descriptive statistics and government documents outlining fiscal consolidation measures in the Eurozone, this study assessed the outcomes of these policies. A significant finding of this study is the identification of an unprecedented recession resulting from fiscal consolidation efforts in the Eurozone. Despite fiscal consolidation programs achieving their intended goals under fiscal pres-

sure, the study reveals that they led to short-lived adverse growth effects. This highlights the complex interplay between austerity measures, economic performance, and debt sustainability, emphasizing the need for a nuanced approach to fiscal policy during times of crises.

The studies presented cover various aspects of fiscal policy and its impact on economic variables such as government debt, GDP growth, and fiscal sustainability. [Gechert and Rannenberg \(2015\)](#) focus on the sovereign debt crisis and fiscal consolidation in Greece, highlighting the potential outcomes of not adopting fiscal consolidation during economic downturns. [Baharumshah et al. \(2016\)](#) examine the public revenue-expenditure nexus in South Africa, emphasizing the importance of both expenditure cuts and tax increases in reducing government debt. [Gechert et al. \(2016\)](#) investigate fiscal multipliers and regime dependence, suggesting that fiscal consolidation should primarily occur during economic recovery and be tax-based. [Chen \(2016\)](#) explore fiscal sustainability in the US, challenging the effectiveness of expenditure cuts in reducing government debt and proposing increased expenditure to address debt issues. [Jordà and Taylor \(2016\)](#) analyze the effects of austerity measures on macroeconomic aggregates, finding that austerity tends to hinder economic growth, particularly in depressed economies. [Burger et al. \(2016\)](#) examine fiscal sustainability in South Africa, identifying the need for current expenditure cuts to reduce the public debt share of GDP. [Baharumshah et al. \(2017\)](#) investigate fiscal sustainability in emerging market economies, suggesting that increased government revenue through efficient tax policies is crucial for lowering debt levels. [Auerbach and Gorodnichenko \(2017\)](#) assess the impact of fiscal stimulus, finding that government spending shocks can positively affect economies in recession and contribute to reducing the public debt-to-GDP ratio. [Gechert and Rannenberg \(2015\)](#), investigated the sovereign debt crisis and fiscal consolidation in Greece using data from 1990 to 2014 using a vector autoregressive (VAR) model. This includes the economic variables of public investment, taxes, public consumption, and output. It was found that during 2009, in a downturn of the economy, if fiscal consolidation did not adopt the Greek economy, it would have entered a prolonged period of stagnation²⁸, rather than a depression²⁹. The authors noted that fiscal consolidation would have strongly assisted in reducing output contraction compared with the actual path of GDP. This could have been achieved if fiscal consolidation had been implemented as the economy recovered.

²⁸Stagnation is a prolonged period of little or no growth in an economy. Real economic growth of less than 2% annually is considered stagnant and is highlighted by periods of high unemployment and involuntary part-time employment.

²⁹The economic depression is a period of sustained, long-term downturn in economic activity in one or more economies.

The studies by [Baharumshah et al. \(2016\)](#) and [Gechert et al. \(2016\)](#) address several gaps in the existing literature on fiscal policy and its impact on government debt reduction. Lack of understanding of the interplay between government revenue and expenditure: Prior research has often focused on either government revenue or expenditure in isolation, overlooking the dynamic relationship between them. [Baharumshah et al. \(2016\)](#) filled this gap by examining the public revenue-expenditure nexus, revealing the existence of fiscal synchronisation and bi-directional causality between revenues and expenditures. in South Africa between 1960 and 2013. The economic variables used in the threshold autoregression (TAR) and Granger causality tests were government expenditure and government revenue, among others. It was found that fiscal synchronization ³⁰ reflecting the existence of bidirectional causality between revenues and expenditures. The results suggest that fiscal consolidation undertaken using both government expenditure cuts and tax increases may have been effective in reducing government debt. The authors recommended that fiscal authorities try to maintain or even improve the control of their fiscal policy instruments to sustain the prudent fall in government debt. Inadequate analysis of fiscal multipliers and regime dependence: Existing studies did not provide a comprehensive analysis of the effectiveness of fiscal policies across different economic regimes, particularly regarding fiscal consolidation efforts. [Gechert et al. \(2016\)](#) addressed this gap by conducting a meta-analysis of empirical studies, identifying fiscal multipliers and regime dependence to understand the differential impacts of government expenditure and taxation on economic activity during various economic conditions. [Gechert et al. \(2016\)](#) conducted a meta-analysis of empirical studies spanning two decades to examine the fiscal multipliers and regime dependence. Using fiscal multipliers and regime dependence, 98 empirical studies were published between 1992 and 2013 with 1800 observations. They used a meta-regression model in which the economic variables considered were government expenditure, household transfers, taxation, public consumption, investment, debt, and GDP. government expenditure was 0.6 to 0.8 during a downturn. Moreover, spending multipliers significantly exceeded tax multipliers by approximately 0.3 in normal times, and even more so in recession regimes. The authors concluded that fiscal consolidation should occur during economic recovery and should be primarily tax-based.

[Chen \(2016\)](#) and [Jordà and Taylor \(2016\)](#) contribute to our understanding of fiscal sustainability and the effects of austerity measures on macroeconomic aggregates. [Chen \(2016\)](#), investigated fiscal sustainability in relation to government expenditures and revenues using the data of quar-

³⁰Fiscal synchronisation is based on the argument that the government decisions about spending and revenues are made simultaneously

ter 2 of 1960 to quarter 3 of 2010. The economic variables used were government revenue, expenditure, deficits, and economic growth. The Vector Error Correction (VEC) model and long-run Granger causality were used. When government debt is high, there is evidence for the spend-and-tax hypothesis. The spend-and-tax hypothesis refers to real expenditure that generates revenue and growth per capita. These results suggest that a government expenditure cut is ineffective in reducing government debt because such fiscal consolidation is not recommended. However, the authors propose that fiscal authorities need to increase expenditures to reduce government debt and budget deficits. The authors further noted that a change in the debt ceiling may change the evolution of tax policy or public spending³¹. [Jordà and Taylor \(2016\)](#) Analysis of the effects of austerity: [Jordà and Taylor \(2016\)](#) addressed the controversy surrounding fiscal austerity measures following the Global Financial Crisis. They developed a unified framework to reconcile the disparate estimates of multipliers and identify causal effects using new propensity score-based methods for time-series data. Their findings underscore the negative effects of austerity on growth, particularly in depressed economies. Using this novel approach, they showed that austerity is always a drag on growth, especially in depressed economies: 1% of GDP fiscal consolidation translates into a loss of 3.5% of real GDP over five years when implemented in a slump, rather than just 1.8% in a boom. This result suggests that fiscal consolidation measures during economic slumps result in a much larger loss of real GDP than those implemented during periods of economic expansion, providing valuable insights for policymakers to grapple with fiscal policy decisions in the aftermath of a financial crisis. They identified causal effects using new propensity-score-based methods for time-series data.

[Burger et al. \(2016\)](#), [Baharumshah et al. \(2017\)](#) and [Auerbach and Gorodnichenko \(2017\)](#) significantly enhances our comprehension of fiscal sustainability and its implications for government debt management. [Burger et al. \(2016\)](#) delved into fiscal sustainability within South Africa, particularly focusing on the relationship between fiscal consolidation strategies and the stability of the government debt-to-GDP ratio. Through sophisticated modeling techniques, Burger highlighted the necessity of fiscal consolidation, emphasizing the importance of curbing current expenditures to mitigate the burden of public debt on the economy. They use data from 1976 to 2012. They defined fiscal consolidation episodes with a reaction function to determine whether the government acted to keep its debt share to GDP ratio stable over a period of time. They used economic variables such as government bonds, nominal and real economic growth rates,

³¹Contrary to conventional wisdom, [Chen \(2016\)](#) found that government expenditure cuts were not effective in reducing government debt. Instead, they propose increasing expenditures as a strategy to reduce government debt and budget deficits, highlighting the importance of fiscal policies in managing debt levels.

inflation, primary balance, public debt, and the primary balance required to ensure a stable debt-share GDP ratio (tract the act of fiscal authorities or fiscal consolidation). Using the Markov-switching (MS) model, it was found that regime 1's mean was 27.4%, with a transition probability of 0.925%. Regime 2 had a mean value of 67%, with a transition probability of 0.075%. Given this regime, the authors outlined that the fiscal consolidation policy or the counter-cyclical policy of the government must cut current expenditure needs to reduce the public debt share GDP ratio. In [Baharumshah et al. \(2017\)](#) the examination extended to an emerging market economy, shedding light on the threshold effects of public debt on economic activity. By employing advanced analytical tools, [Baharumshah et al. \(2017\)](#) demonstrated that once public debt surpasses a critical threshold level, it adversely affects economic growth. This underscores the urgency of prudent debt management policies to avert potential downturns in economic performance. [Baharumshah et al. \(2017\)](#) used data from 1980 to 2014. The Markov-switching model was used, along with the economic variables of growth rate, government primary expenditure, public debt, and government revenue. It was found that when public debt exceeded a certain threshold level above 55% of GDP, it was negatively correlated with economic activity. The transition probability was 90.63% in the stable regime and 78.32% in the unstable regime. In both the states, public debt was found to have a contraction effect on the economy. They also noted that the policy implications were that ongoing expenditure or revenue increases through an efficient tax policy (government service tax) are necessary for the government to achieve lower debt levels. [Auerbach and Gorodnichenko \(2017\)](#) focused on the impact of fiscal stimulus measures on government debt dynamics. Through rigorous analysis using econometric models, [Auerbach and Gorodnichenko \(2017\)](#) uncovered the dual effects of fiscal policy interventions on debt sustainability. While fiscal consolidation efforts led to a notable decline in government debt, economic booms resulting from fiscal stimulus initiatives also contributed to reducing the public debt-to-GDP ratio. These findings underscore the intricate relationship between fiscal policy decisions and their ramifications for long-term debt management strategies. The data from 1970 to 2015 in the Vector Auto-Regressive (VAR) model were used with the economic variables of debt GDP ratio, real GDP, short-term interest rate, and government spending, among others. Fiscal consolidation of the government expenditure cut resulted in a 2.80% decrease in government debt. Moreover, this boom has resulted in a 3.70% decrease in government debt. As such, the authors conclude that government spending shocks can have an important positive effect on economies in recessions and can lead to a reduction in the public debt-to-GDP ratio, thereby increasing fiscal sustainability.

There scholars that have contributed significant in providing insights into various aspects of fiscal policy and its impact on debt sustainability. [Brady and Magazzino \(2017\)](#) identified two states of Italian public debt, guiding policymakers in managing debt effectively. [Agnello et al. \(2017\)](#) showed synchronized fiscal measures can align business cycles across countries. [Heimberger \(2017\)](#) highlighted the negative effects of austerity on Euro area growth. [Brady et al. \(2018\)](#) found stable fiscal rules mitigate risks in Sub-Saharan Africa. [Kataryniuk and Vallés \(2018\)](#) suggested government spending cuts stabilize debt, but tax-based consolidation has lasting economic impacts. These studies offer guidance to policymakers in addressing fiscal challenges. [Brady and Magazzino \(2017\)](#), investigated the sustainability of Italian public debt and deficit. They used Markov-switching dynamic regression models and economic variables of GDP, government expenditure, public debt, and deficit, among others. It was found that there were two distinct states with different means of 41.25 and 94.36 for public debt ratio. The first state was a moderate public debt and deficit state, whereas State 2 was a high public debt and deficit state. The results in both states are persistent: for public debt, the $1 \rightarrow 1$ and $2 \rightarrow 2$ probabilities are 0.97 and 0.97, respectively, while for deficit, the $1 \rightarrow 1$ and $2 \rightarrow 2$ probabilities are 0.98 and 0.93, respectively. ³².

[Agnello et al. \(2017\)](#), addresses the gap in understanding how fiscal consolidation and fiscal stimuli affect the synchronization of business cycles. Fiscal consolidation was determined using the narrative approach and the pooled ordinary least squares (OLS) estimator. Fiscal consolidation (stimulus) measures adopted by countries simultaneously (synchronized fiscal consolidation or stimulus programs) led to a closer co-movement of business cycles. The synchronized fiscal consolidation (stimulus) increased the correlation coefficient of the business cycle across countries by between 0.06 and 0.15 (0.08 and 0.21). This insight contributes to our understanding of the interconnectedness of fiscal policies and business cycle synchronization, highlighting the importance of coordinated fiscal actions in shaping economic dynamics across countries. [Heimberger \(2017\)](#), investigates whether fiscal consolidation contributed to the double-dip recession in the Euro area. The author used OLS as well as economic variables of real GDP growth, government debt, and potential output, among others. A 5.5% decrease in GDP was found when fiscal consolidation was adopted during a recession. The econometric evidence of the link between

³²[Brady and Magazzino \(2017\)](#) provided insights gained from this study that shed light on the dynamics of Italian public debt and deficit, highlighting two distinct states with different mean levels. By understanding these states and their persistence, policymakers can assess the sustainability of Italian public finance and design appropriate fiscal policies. To enhance the analysis, future research could consider incorporating additional economic variables or employing alternative modeling techniques to further explore the determinants and implications of public debt and deficit sustainability in Italy.

cumulative real GDP growth and fiscal consolidation measures pointed to a strong negative association, as the depth of the economic crisis from 2011 to 2013 in the euro area economies was closely related to the harshness of fiscal austerity.

[Brady et al. \(2018\)](#) contributes to the understanding of fiscal policy and debt sustainability in Sub-Saharan Africa (SSA). The study also addressed the lack of comprehensive analysis focusing on fiscal policy and debt sustainability in SSA but may not address specific country-level nuances or regional variations within the continent. The analysis relies on a few economic indicators such as public debt, total revenue, and government spending gap, potentially overlooking other relevant factors that could influence fiscal sustainability in SSA countries. Using data between 1980 and 2016 and the Markov-switching model, it was found that fiscal rules that were stable in Regime 2 had high government debt. This result suggests that fiscal rules can be successful in the event of a public debt build-up. [Kataryniuk and Vallés \(2018\)](#), investigated the fiscal consolidation after the great recession and the role of composition from 2009 to 2014. The vector autoregressive (VAR) model was used together with the economic variables of CAPB, government debt, tax, and GDP, among others. It was found that there was evidence of the expansionary fiscal contraction hypothesis, since there was support that fiscal consolidation undertaken with government expenditure cuts was more effective in stabilizing debt and avoiding economic downturns. Nevertheless, they noted that fiscal consolidation to tax increases has a more persistent real impact than fiscal consolidation of government expenditure cuts.

While [Akram and Rath \(2019\)](#) focus specifically on fiscal sustainability in India, [Afonso et al. \(2018\)](#) analyze fiscal developments and financial stress without focusing on a particular country or region. [Akram and Rath \(2019\)](#), investigated fiscal sustainability in India from quarter 1 of 1997 to quarter 3 of 2013. The economic variables used were the total public debt, expenditure, revenue, GDP, and investment. The Markov Switching-Vector Error Correction Model (MS-VECM) was used, and it was found that the optimum public debt as a percentage of GDP is 21% every quarter, and beyond this level, public debt hurts economic growth. Moreover, there is evidence of a stable and unstable regime with transition probabilities of 74% and 73%, respectively. These regimes were estimated to run for five and four years, respectively. [Afonso et al. \(2018\)](#), investigated the fiscal developments and financial stress using the threshold vector autoregressive (VAR) model. They used data from quarter 4 of 1980 to quarter 1 of 2014, with the economic variables of GDP, debt, and government expenditure, among others. Fiscal adjustments increase output growth. Moreover, they noted that this evidence was prominent

in higher financial stress regimes. However, 50% of the confidence bands did not overlap. The differences between the mean responses in the high and low regimes were significantly different at short-term horizons of up to 1 or 2 years. This result suggests that fiscal tightening has a positive effect on a state of higher financial stress.

[Papaioannou \(2019\)](#) contributed to understanding the effects of fiscal policy on output over the business cycle, revealing an asymmetric effect of fiscal consolidation on the output gap. However, [Bamba et al. \(2020\)](#) investigated the effects of fiscal consolidation on the composition of government spending and identified a significant reduction in government investment relative to consumption during fiscal consolidation, particularly in the high debt and low economic cycle phases. On the other hand, [Aldama and Creel \(2019\)](#) focused on fiscal policy in the USA States using a Markov-switching fiscal rule to identify periods of unsustainable and sustainable fiscal policies. Moreover, [Mhlaba and Phiri \(2019\)](#) explored the relationship between public debt and economic growth in South Africa and found a negative debt-growth relationship, particularly strengthening in the post-crisis period. Finally, [Ganyaupfu and Robinson \(2019\)](#) investigated the relationship between the fiscal primary balance and public debt in South Africa and found evidence supporting the country's fiscal sustainability stance. [Papaioannou \(2019\)](#), investigated the effects of fiscal policy on the output of the business cycle matter from quarter 1 of 1999 to quarter 4 in 2015. The economic variables used were the growth rate of output, public spending, the growth rate, and the output gap. The author's contribution was to determine the influence of public expenditure on output, given the state of the economy. The author used Markov Switching regression and found an asymmetric effect over the business cycle. When there is a large output gap, fiscal consolidation would increase the output gap by 0.017

The gap addressed in the study by [Aldama and Creel \(2019\)](#) was the understanding of the dynamics and effectiveness of fiscal policy in the United States, particularly concerning its impact on government debt sustainability. The study aimed to investigate the timing and effectiveness of fiscal consolidation measures in addressing unsustainable fiscal policies and stabilizing public debt over the long run. The study addressed these gaps by employing the Markov-switching fiscal rule to identify periods of unsustainable and sustainable fiscal policies in the United States from 1940 to 2016. By analyzing the impact of fiscal consolidation measures on government debt dynamics, the authors aimed to provide insights into the short-term and long-term implications of fiscal policy decisions on debt sustainability. It was found that there was an average of 12 years of fiscal consolidation postponement which did not preclude global fiscal sustainability.

Moreover, it was found that there was a period 6 lag before the impact of fiscal consolidation was observed. They also examined the timing and lag effects of fiscal consolidation on public debt stabilization. [Aldama and Creel \(2019\)](#), investigated the fiscal policy in the USA using data from 1940 to 2016. The economic variables used were the output gap, fiscal consolidation, gagged debt, and cyclical government debt. They used the Markov-switching fiscal rule to identify periods of unsustainable and sustainable fiscal policy. It was found that there was an average of 12 years of fiscal consolidation postponement which did not preclude global fiscal sustainability. Moreover, it was found that there was a period 6 lag before the impact of fiscal consolidation was observed. Second, during these periods, the government's reaction was sufficiently tight to stabilize public debt over the entire horizon. The authors concluded that, in the short run, a tight fiscal contraction policy could be sufficient to ensure long-term government debt sustainability.

[Mhlaba and Phiri \(2019\)](#) investigated the relationship between public debt and economic growth in South Africa, particularly focusing on the period from the third quarter of 2007 to the fourth quarter of 2016, which included the global financial crisis. The key themes investigated the long- and short-run effects of public debt on economic growth as well as how this relationship evolved during and after the crisis. This study addresses the gap in understanding the impact of public debt on economic growth in the South African context, particularly during times of economic turmoil. Through the application of the Autoregressive Distributed Lag (ARDL) model and sensitivity analyses using subsample datasets, this study aims to provide comprehensive insights into the implications of public debt on economic growth in South Africa. This study contributes to a better understanding of the dynamics between public debt and economic growth, offering valuable insights to policymakers and stakeholders concerned with managing public finances and promoting sustainable economic development in South Africa. The study conducted by [Ganyaupfu and Robinson \(2019\)](#) delved into the relationship between fiscal primary balance and public debt in South Africa from the first quarter of 1960 to the second quarter of 2016 by utilizing the Vector Error Correction (VEC) model. Through the development of a fiscal reaction function incorporating key economic variables, such as the primary balance-to-GDP ratio, debt-to-GDP ratio, government expenditure, and GDP, the authors analyzed the dynamics between fiscal policy and public debt. Their findings reveal a robust positive relationship between the primary balance and public debt, endorsing South Africa's fiscal sustainability stance. Consequently, the study advocates for consistent monitoring of fiscal austerity measures across spending priorities to uphold fiscal policy sustainability in the country.

Woldu (2020), Makoto et al. (2020), Van Rensburg et al. (2022), Olaoye and Olomola (2022), and Mtibaa et al. (2022), explore themes such as the effects of fiscal consolidation measures, the relationship between public debt and economic performance, and the role of fiscal rules and regimes in shaping long-term fiscal sustainability. Additionally, these studies examine the dynamic interactions between fiscal policies, debt levels, and economic outcomes over time, highlighting the importance of understanding the macroeconomic implications of fiscal decisions. Woldu (2020) investigated whether fiscal regimes matter for fiscal sustainability in South Africa using the data from quarter 1 of 1960 to quarter 4 of 2008. The economic variables used were the debt-GDP ratio, deficit, domestic debt ratio, foreign debt-GDP ratio, and GDP ratio. The threshold autoregressive (TAR) model was also used, and it was found that there was a 93% probability of transitioning to a stable regime and an 89% probability of moving from an unstable regime. Moreover, in the low- and high-deficit regimes, the coefficient of the debt-to-GDP ratio is positive, suggesting an increase in the debt-to-GDP ratio. The author recommends that to achieve long-term fiscal sustainability, the South African government undertake substantial fiscal consolidation measures to reduce the debt-to-GDP ratio to prudent levels. Fiscal consolidation through government expenditure cuts operational expenses and reduces subsidies. The tax on fiscal consolidation and consumption aims to achieve stable public finances and lower debt levels.

Makoto et al. (2020) investigated public debt composition, debt policy rules, and growth in selected SADC countries from quarter 1 of 1990 to quarter 4 of 2016. The economic variables used were output, capital, labor, external debt, domestic debt, and the debt reduction rule. The Markov-switching method was also used, and it was found that high external debt is related to domestic debt and has a positive effect on growth in Tanzania, a well-reforming country. However, it had a negative effect on Zimbabwe, a debt-distressed country. Moreover, fiscal consolidation is recommended to reduce public debts. Van Rensburg et al. (2022) investigated the fiscal multipliers in South Africa from 2000 to 2019. The author used the DSGE model and found that the fiscal multiplier declined from 1.5 in 2010 to 0 in 2019 as the debt levels became progressively more unsustainable, and large tax increases muted the aggregate demand effects of higher government expenditure. This result suggests that the costs of fiscal consolidation are less harmful to growth than generally perceived, as the multiplier is currently very small. Olaoye and Olomola (2022), analysed the asymmetry phenomenon in the public debt structure of SSA's five biggest economies including South Africa. The economic variables used were public debt, taxes, GDP, and investment. The Markov-Switching model was used and it was found that the

first regime of South Africa had 31.43% and 45.71% in the second regime with the expected duration of 13 and 10 years in the respective regimes. However, there was no mention of the use of fiscal consolidation in an effort to stabilize debt. The transitioning from state 1 \rightarrow 1 and 2 \rightarrow 2 probabilities were at least 0.92 and 0.93, respectively, in all five countries.

Mtibaa et al. (2022) investigated the expansionary austerity literature in Tunisia using annual data over the period 1970–2018 and a nonlinear autoregressive distributed lag (ARDL) model. The traditional CAPB approach was applied to define fiscal consolidation episodes. Fiscal adjustments in Tunisia may hurt the economy, both in the short and long run, through its contractionary effect on economic growth. Another important finding is unidirectional nonlinear Granger causality from fiscal consolidation to economic growth. The effects of fiscal consolidation in 24 OECD countries were investigated Georgantas et al. (2023) from 1990 to 2019. The fiscal adjustment used was contractionary, according to our baseline model. They found this during recessions in nations with large levels of debt, in closed economies, and when the money supply was constrained. Consequently, the decrease in public debt ratio is minimal. Adjustments based on spending during recessions when money is scarce or the debt-to-GDP ratio is higher than 80% are counterproductive. Initiated during expansions in low-debt nations, during times of loose monetary conditions, and in open economies, fiscal consolidations can be expansionary, resulting in a more pronounced decrease in the debt ratio.

Woldu (2020), Makoto et al. (2020), Van Rensburg et al. (2022), Olaoye and Olomola (2022), Mtibaa et al. (2022) among others. These studies have focused on the short- to medium-term effects of fiscal policies and debt management. Addressing the long-term implications of fiscal decisions and debt accumulation provides a comprehensive understanding of their effects on economic stability and growth. Dynamic Interactions: Analyzing the dynamic interactions between fiscal policies, debt levels, and economic performance over time would offer insights into how these relationships evolve and influence each other, especially in response to changing economic conditions and policy interventions. Heterogeneity Across Countries: While studies focus on specific countries or regions, broader comparative analyses across diverse economies with varying institutional frameworks and policy environments can help identify common patterns and factors that influence fiscal sustainability and debt dynamics. Policy Evaluation: Assessing the effectiveness of specific fiscal consolidation measures, such as expenditure cuts, tax reforms, and debt management strategies, would provide policymakers with valuable guidance on the most appropriate policy responses to address fiscal challenges. Investigating the linkages between fiscal policy, public debt, and financial markets could elucidate how fiscal decisions affect investor

perceptions, interest rates, and financial stability, thereby influencing economic outcomes.

4.5 Objective four: Literature review of government debt threshold, economic growth, and fiscal consolidation

The literature review on government debt thresholds, economic growth, and fiscal consolidation provides valuable insights into the relationship between government debt levels and economic performance [Pattillo et al. \(2002\)](#), [Cordella et al. \(2005\)](#), [Pattillo et al. \(2002\)](#), and [Reinhart and Rogoff \(2010\)](#). [Pattillo et al. \(2002\)](#), investigated external debt and growth in 93 developing economies. They used the economic variables of fiscal balance, investment external debt, and growth, among others, in the GMM system. They found that government debt of 35% to 40% has a negative impact on economic growth. Moreover, if the government debt is above this threshold, it starts to increase at an increasing rate. Scholars have been silent on matters related to fiscal consolidation at the threshold. Highly indebted poor countries (HIPC) were investigated by [Cordella et al. \(2005\)](#) from 1980 to 2005. The economic variables used were initial GDP per capita, population growth, terms of trade, investment, inflation, a dummy variable representing HIPC in some specifications, and external debt to GDP. They used the GMM model and found that countries with good policies similar to [Pattillo et al. \(2002\)](#) institutions are likely to experience adverse growth effects of external debt beyond 15% to 30% of GDP. This threshold seems lower in countries with poor policies and institutions. The marginal effect of debt on growth becomes irrelevant above 70% to 80%. These findings suggest that there is a negative marginal relationship between debt and growth at intermediate levels of debt, but not at very low debt levels, or below the “debt overhang” threshold, or at very high levels, above the “debt an irrelevant” threshold. [Reinhart and Rogoff \(2010\)](#)³³ examined 20 of the most advanced economies using gross external debt as a percentage of GDP and GDP from 1960 to 2009 on the GMM and found that in countries with thresholds of 90% government debt share of GDP, economic growth, on average, falls by 1%. On the contrary, if the threshold share of GDP is 60%, annual economic growth declines by an average of 2%. They also indicate that the question of why a government debt threshold of 90% has a negative impact on the economy is an important question that merits further research. However, they argue that this may be because of the added premium at a level above 90% of the government debt threshold. This can also encourage countries to commit to fully repaying their government debt and be forced to

³³The authors used the public debt to categorise low public debt (below 30% in the ratio of GDP), medium-low public debt (between 30% and 60%), medium-high public debt (between 60% and 90%), and high public debt (above 90%).

tighten fiscal policies to appear credible to investors, thereby reducing risk premiums³⁴. Policy implications arising from these findings suggest the importance of establishing clear government debt thresholds and implementing timely fiscal consolidation measures to prevent debt from reaching detrimental levels. Fiscal consolidation policies should be carefully designed to balance debt reduction with the need to support economic growth and social development. Moreover, policymakers should prioritize structural reforms to enhance fiscal sustainability and strengthen institutional capacity for debt management and fiscal governance.

[Kumar and Woo \(2010\)](#) used the system GMM applied in the panel data from 1990 to 2007. The economic variables used are investment and debt-to-GDP ratio, among others. The coefficient of the debt-to-GDP ratio ranges from -0.021% to -0.028%, indicating that a 10% increase in the initial debt-to-GDP ratio is associated with a decline in per capita GDP growth of approximately 0.2% to 0.3% per year. Similar to [Reinhart and Rogoff \(2010\)](#) at a threshold level, a threshold of 30% to 90% has a negative impact on economic growth. [Pattillo et al. \(2011\)](#), use the data of 93 developing countries from 1969 to 1998. Using time series trend analysis and descriptive statistics, it was found that the data suggest that the average impact of debt becomes negative when it is in the range of 35% to 40% of GDP. The authors provide a relatively more reasonable basis for policy guidance, as per the insights obtained from panel data analysis. Understanding government debt thresholds and their implications for fiscal consolidation is crucial for policymakers in designing effective fiscal policies. These studies shed light on the critical debt thresholds beyond which fiscal consolidation becomes imperative to avoid adverse effects on economic growth.

[Cecchetti et al. \(2011\)](#), investigated the real effects of debt in 18 OECD countries from 1980 to 2010. They considered economic variables, such as government debt, corporate debt, household debt, and economic growth. The authors used the threshold model and found that corporate debt exceeded 90% of GDP, 85% of government debt, and 56% of household debt, resulting in a detrimental effect on economic growth. However, they do not explain the threshold of government debt in the presence of fiscal consolidation. Therefore, the authors do not recommend implementing fiscal consolidation beyond this rate. However, a fiscal buffer was recommended to curb extraordinarily high levels of government debt. The impact of high public debt and eco-

³⁴Studies by [Pattillo et al. \(2002\)](#), [Cordella et al. \(2005\)](#), and [Reinhart and Rogoff \(2010\)](#) collectively address the relationship between external debt and economic growth, focusing on identifying threshold levels beyond which debt becomes detrimental to growth. However, a notable gap in these investigations is the limited exploration of fiscal consolidation measures to mitigate the adverse effects of high debt levels.

economic growth was investigated by [Minea and Parent \(2012\)](#) from 1990 to 2011. They used the economic variables of government debt and GDP, among others. The Panel Smooth Threshold Regression (PSTR) model was used in the data of [Reinhart and Rogoff \(2010\)](#) and it was found that post-WW2 economic growth dramatically declined in advanced economies once the debt-to-GDP ratio exceeded a 90% threshold. Using the current data, it was found that the threshold is around a debt-to-GDP ratio of 115% and 130%, above which debt growth is negative. [Kumar and Woo \(2010\)](#), [Reinhart and Rogoff \(2010\)](#), [Pattillo et al. \(2011\)](#), [Cecchetti et al. \(2011\)](#), and [Minea and Parent \(2012\)](#) provide evidence for the existence of threshold effects, showing that public debt levels above particular thresholds have detrimental effects on economic growth. This emphasizes the importance of controlling debt levels and putting fiscal policies in place to preserve stable and beneficial economic conditions³⁵.

[Reinhart et al. \(2012\)](#) investigated the external debt and growth from 1870 to 2010. to extend the work in [Reinhart and Rogoff \(2010\)](#). The authors used trend analysis and descriptive statistics. The economic variables that were used were public debt, external debt, and economic growth. Public debt overhang episodes have been evident in advanced economies since the early 1800s. Public debt-to-GDP levels exceeding the threshold of 90% for at least five years are found to have a significant detrimental effect on economic growth. [Presbitero \(2012\)](#), with the use of 104 developing countries' data on economic growth, debt to GDP ratio, trade openness, investment rate, and public indebtedness from the period 1990 to 2007 as well as the GMM. Empirical evidence shows adverse effects on economic growth when the government debt ratio reaches a threshold of 90%. Moreover, a 1% increase in government debt leads to a 0.008 % decrease in economic growth. At lower levels, government debt in industrialized countries has better economic growth than in developing economies. This is because industrialized countries productively manage government debt without paying costs in terms of disincentives to investment, capital flight, policy volatility, and crowding out. By contrast, in developing countries, poor economic management and institutions have a negative effect on the economy. [Drakes et al. \(2012\)](#) investigated threshold effects of sovereign debt on economic growth in 12 Caribbean Community (CARICOM) countries between 1980 and 2010. They used a panel threshold regression (PTR) model and found that a government debt share with a GDP threshold lower than 30% is associated with faster economic growth in CARICOM countries. They found that faster eco-

³⁵These studies show that high debt levels—government, corporate, or household—can harm economic growth beyond certain thresholds. [Cecchetti et al. \(2011\)](#) found negative effects when corporate debt exceeds 90% of GDP, government debt exceeds 85%, and household debt surpasses 56%. [Minea and Parent \(2012\)](#) identified a debt-to-GDP ratio threshold of 115%-130% for advanced economies. These findings add empirical evidence to the nonlinear link between debt and growth, thus emphasizing the need to manage debt for sustainability.

conomic growth was achieved because government debt was channeled through investment and trade openness projects. However, the positive effects of government debt on economic growth switch to negative when government debt exceeds the threshold of 56% in CARICOM countries. They also found that beyond the threshold of 56% of government debt, Guyana, Suriname, and Jamaica are some of the countries in CARICOM that have accumulated 519.70%, 322.43%, and 161.97% of real GDP growth since 1980. [Reinhart et al. \(2012\)](#), [Reinhart and Rogoff \(2010\)](#), [Presbitero \(2012\)](#), and [Drakes et al. \(2012\)](#) results support the hypothesis that the threshold effect between government debt and economic growth exists. When debt levels are maintained for an extended period of time, exceeding debt thresholds can have detrimental effects on growth. These studies also emphasize the significance of good institutional frameworks and efficient debt management to reduce the adverse effects of government debt on economic performance.

[Baum et al. \(2013\)](#), investigated the impact of government debt in 12 Euro-area countries using the data of initial income per capita, population growth rate, investment rates, and trade openness, from 1990 to 2010 on the dynamic threshold model (DTM). These results reflect the nonlinear impact of public debt on GDP growth. Moreover, it was found that, in the short run, government debt improves economic growth. However, as the government debt share in the growth of domestic products reaches 67% and 95%, it has detrimental effects on economic growth. The negative impact of interest increases when the public debt share to GDP exceeds the 70% threshold. [Legrenzi and Milas \(2013\)](#) used economic variables of the primary surplus to GDP and the ratio of debt to GDP among others in the effort to investigate fiscal reaction functions of the GIPS Based on State-Varying Thresholds. Using the logistic model, it was found that a GIPS adjusts budgetary in disequilibrium only in the higher debt regime, and the debt threshold for adjustment is estimated to be 69% for Greece, 49% for Ireland, 47% for Portugal, and 43% for Spain. These rates reflect the effective rate of government debt accumulation in the respective countries for the fiscal policy authority to consider fiscal consolidation in an effort to stabilize government debt. [Naraidoo and Raputsoane \(2015\)](#), investigate the debt sustainability and financial crises in South Africa using the time series data from 1865 to 2010. The author used the logistic smooth transition autoregressive (LSTAR) model, economic variables of debt-to-GDP ratio, threshold value, and the financial crisis index. It was effective in reducing government debt when it did not exceed the threshold value of 56%. However, fiscal consolidation occurs at a higher debt-to-GDP ratio and must be relaxed. [Baum et al. \(2013\)](#), [Legrenzi and Milas \(2013\)](#), and [Naraidoo and Raputsoane \(2015\)](#) underline how crucial debt ceilings and fiscal consolidation strategies are for controlling public debt. They contend that there are thresholds

for debt that harm economic growth.

Égert (2015) used the data of Reinhart et al. (2012) in the regime switch model using only two economic variables of annual real GDP growth and large government debt. Similar to Reinhart et al. (2012), government debt negatively affects economic growth. Moreover, the threshold of 90% reflects a negative impact on economic growth. However, Égert (2015) found evidence that government debt does not start to be detrimental to economic growth when it reaches only 90%, even at a lower threshold of 20% to 60%, provided evidence that it can curb economic growth. Égert (2015) points out that it is extremely difficult to find a negative and nonlinear nexus, arguing that results are very sensitive to the estimation framework. Benayed et al. (2015), investigated the threshold effect of public debt in 10 selected African countries from 1981 to 2010. The economic variables used are investment, public debt, and GDP. However, the authors are silent on the use of fiscal consolidation. Baglan and Yoldas (2016), investigated government debt and macroeconomic activity in advanced economies using the threshold model. The authors applied an equation similar to that of Égert (2015) including the economic variables of annual real GDP growth and large government debts. Thresholds of 18% and 58% are found to have a negative impact on annual real GDP growth. As such, the authors outline that a lower threshold needs to be critically considered because it is not always that a threshold of 90% discriminates economic growth, as advocated by Cecchetti et al. (2011) and Reinhart et al. (2012) among others.

Senadza et al. (2017), used a sample of 39 SSA countries over 24 years from 1990 to 2013 when examining the effect of external debt on economic growth with the use of the GMM model. The data variables used were the growth rates of output, exports, and labor force. The mean ratio of government debt share to GDP in SSA countries was 87.99%. The GMM results show that all other factors were kept constant, and government debt was statistically significant at an alpha of 5%, with a negative coefficient of 0.0515. This reflects that for a 1% increase in government debt, economic growth in SSA countries falls by 0.0515% in the long run ceteris paribus. It was then recommended that the governments of SSA countries use government debt for long-term investment. Moreover, there is a need to negotiate with creditors for more debt relief programs, maintain macroeconomic stability, and pursue export-led growth strategies and policies to solve the structural imbalances in SSA economies. Mensah et al. (2019) investigated whether a debt threshold of public debt had any effect on economic growth in Africa from 1970 to 2015 in 38 African countries. They used panel autoregressive distributed models and the

economic variables of public debt and economic growth. A public debt threshold of 20%–80% results in a decrease in economic growth. Based on the debt trajectory, this study established that increasing public debt beyond 50% to 80% adversely affected economic growth in Africa. This study is unique in that it seeks to add new evidence to the relationship between public debt and growth in Africa by considering the impact of the persistent growth of public debt on economic growth. [Hsing et al. \(2020\)](#) investigated the relationship between economic growth and government debt in 18 OECD countries from 1980 to 2008. They used economic data on the growth rate of real GDP, labor employment, capital, and the government debt-to-GDP ratio. Using the threshold model, it was found that the turning point of the government debt ratio was 45.26%, suggesting that an increase in the debt ratio beyond 45.26% caused the real GDP growth rate to decline. The evidence of 90% was advocated by [Reinhart and Rogoff \(2010\)](#).

[Bexheti et al. \(2020\)](#) investigated the impact of public debt on economic growth using data from the period of 2003 to 2016. The economic variables used were the real GDP growth and public debt. The 2SLS was used, and the square value of public debt was used to determine the threshold. The quadratic term for debt was also included in the model, reflecting the nonlinear relationship between debt and growth. The results reveal a maximum debt threshold of 50.87%. This result suggests that fiscal sustainability, as well as active debt management, is critical, because when debt rises above the threshold of 50.87% of GDP, economic growth deteriorates. [Mupunga and Ngundu \(2020\)](#), investigated public debt accumulation in SSA countries using data from 2000 to 2016. The other economic variables used were output, GDP, expenditure gaps, and public debt, applied in the fiscal reaction function. The GMM model was utilized, and it was found that SSA countries reacted to increases in the public debt-to-GDP ratio through fiscal consolidation. Fiscal consolidation is peroxide with a lagged economic variable of government debt. Fiscal consolidation in SSA countries has been found to be effective in reducing government debt. A government debt exceeding 90% was found to have a negative impact on GDP. This finding is consistent with the views of [Reinhart and Rogoff \(2010\)](#) and [Cecchetti et al. \(2011\)](#) that growth maximizes public debt levels, which shows that public debt levels over 90% of GDP become a drag on economic activity. [Ndoricimpa \(2020\)](#)³⁶ investigated the threshold effects of public debt on Africa's economic growth. The economic variables that were used were government debt and economic growth. The panel smooth transition regression approach [Hansen \(1996\)](#) and [Hansen \(2000\)](#) was used, and a threshold range of 62%–66% was found. The

³⁶Study applies a different estimation technique which allows for heterogeneity and a smooth change of regression coefficients from one regime to another.

panel smooth transition regression approach indicates that the debt threshold is 74.3%. This result indicates that the 60% outline by SADC is lower [SADC \(2006\)](#). The author outlined that no single debt threshold applies to all African countries; as such, a country-specific search is required.

The studies discussed contribute to the literature by investigating the nonlinear dynamics between public debt levels and economic growth, with a focus on identifying critical threshold levels beyond which public debt may impede economic performance. [Makhoba et al. \(2021a\)](#) concentrate on the Southern African Developing Communities (SADC) region, while [Clements et al. \(2003\)](#), [Caner et al. \(2010\)](#) and [Checherita-Westphal and Rother \(2012\)](#) examine various aspects of debt dynamics in broader global contexts. Through empirical analysis, these studies shed light on the nuanced relationship between debt accumulation and economic growth, thus enhancing our understanding of the conditions under which public debt is high. [Makhoba et al. \(2021a\)](#)³⁷ investigated the dynamic asymmetric relationship between public debt and economic growth in SADC development. They used a panel smooth transition regression (PSTR) and economic variables of public debt, economic growth (GDP), gross fixed capital formation, employment, and government expenditure among others in 13 SADC members from 2000 to 2018. They found that thresholds of 60.36% and above had a detrimental effect of 0.33% on economic growth. By contrast, a threshold lower than 60.36% increases economic growth by 0.35%. Fiscal consolidation is not recommended to stabilize public debt. However, the authors noted that fiscal policymakers ought to consider adopting well-coordinated debt policies that aim to strike a balance between sustainable public debt and economic growth. [Clements et al. \(2003\)](#) investigated external debt and economic growth from 1980 to 1998. They used the economic variables of GDP growth and government debt. The system GMM model was used, and it was found that the threshold of between 35% and 40% increased economic growth, and from 40% to 160% economic growth increased at a decreasing rate. However, a government debt threshold of 160–170% decreases economic growth.

The focal point of the study by [Caner et al. \(2010\)](#) was the exploration of the intricate relationship between government debt and economic growth, particularly focusing on identifying critical thresholds where this relationship shifts. [Caner et al. \(2010\)](#) used 77 countries from the period 1980 to 2008. The economic variables used were public debt-to-GDP ratio and economic

³⁷The study focuses on asymmetric and threshold analysis of public debt on economic growth in SADC using sophisticated panel smooth transition regression (STAR).

growth. A threshold regression model was used, and it was found that there was a threshold of 77% for the public debt-to-GDP ratio. A 1% increase in the debt-to-GDP ratio costs 0.017% of annual real growth. In emerging economies, a threshold of 64% for the debt-to-GDP ratio was found. If the economy is at the 64 % debt-to-GDP ratio threshold, a 1% increase in the debt-to-GDP ratio results in a 0.02% increase in economic growth. These findings highlight the importance of considering threshold effects when analyzing the impact of government debt on economic performance, particularly in different economic contexts such as emerging economies. [Checherita-Westphal and Rother \(2012\)](#), the authors delved into the intricate relationship between high government debt and economic growth across a spectrum of 12 European countries spanning the years 1970 to 2008. Employing a Fixed Effects (FE) model and a comprehensive set of economic variables, including GDP per capita, government debt, savings, and gross fixed capital formation, they unearthed a noteworthy finding. Their analysis revealed a nuanced, concave, nonlinear, and inverted U-shaped relationship between public debt ratios and economic growth rates. This signifies that, while moderate levels of government debt may have either a positive or neutral effect on growth, there exists a pivotal threshold at which the impact shifts. Specifically, a turning point was identified at 90% of the government debt-to-GDP ratio, beyond which government debt began to exert a negative influence on the long-term growth prospects. This discernment underscores the significance of prudently managing government debt levels to mitigate adverse repercussions on economic growth trajectories.

[Afonso and Jalles \(2013\)](#), focused on the debt-growth nexus in a sample of 155 developed and developing countries during the 1970-2008 period and confirmed the existence of nonlinearity and the relevance of the debt threshold. The empirical analysis shows a debt threshold equal to 59% of GDP for the Eurozone and a value higher than 79% for emerging countries. The authors also conclude that an increase of 10 % in public debt causes a 0.2 % decrease in economic growth for countries with debt above 90% and below 30% of the GDP. [Mencinger et al. \(2015\)](#) revisited the role of public debt in economic growth in OECD countries from 1995 to 2010. They used the economic variables of annual changes in GDP, per capita, and initial government debt as a share of GDP. The authors used GMM, similar to [Reinhart and Rogoff \(2010\)](#), and found that the government debt threshold in developed countries ranged from 90% to 94%, which had a negative effect on economic growth. However, from 44% to 45%, below this limit, public debt has positive effects on economic growth, whereas above this limit, it has a negative impact on economic growth. An inverse U-shaped relationship was observed. [Mupunga and Le Roux \(2015\)](#) estimated the optimal growth-maximising public debt on the threshold for Zimbabwe using the

data from 1980 to 2012. They considered the economic variables of the economic growth rate and debt as public debt, as outlined by [Égert \(2015\)](#). The threshold regression of [Hansen \(1996\)](#) and [Hansen \(2000\)](#) is utilized. It was found that thresholds of 45% and 50% resulted in an increase in economic growth. However, beyond this threshold, the economic growth began to fall. ³⁸.

[Megersa and Cassimon \(2015\)](#) investigated public debt, economic growth, and public sector management in developing countries. They used economic variables of initial per-capita GDP, investment, population, inflation, and public debt amongst others. The system-generalized method of moments (SYS-GMM) was utilized, and it was found that there was a significant negative relationship between public debt and growth at lower thresholds. However, economic growth increases at high thresholds. Nonlinearity shows an inverse U-shaped relationship between public debt and economic growth. [Megersa \(2015\)](#), investigated the Laffer curve and the debt-growth link in low-income 22 SSA economies from 1990 to 2011. The economic variables used were the GDP per capita growth, gross government debt, and investment. They were found to have an inverse U shape. This result indicates that an extreme point or threshold is found at 90% of government gross debt. However, 25.26% of the observations lie to the left of the extreme point, and the rest of the observations 74.74% lay to the right of the extreme point. [Swamy \(2015\)](#), investigated government debt and economic growth using the Panel threshold estimation on the data from 1990 to 2009. The economic variables used were government expenditure, trade openness, debt share of GDP, and GDP growth. It was found that the relationship between government debt and real GDP growth was weak for debt shares with GDP ratios below 90%. Moreover, they found that debt thresholds ranged from 84% to 114%. Moreover, an additional 10% debt-to-GDP ratio beyond the debt threshold costs 10–30 basis points of annual average real GDP growth. [Baaziz et al. \(2015\)](#), investigated if public debt mattered for economic growth in South Africa from the period of 1980 to 2014. The economic model used was a smooth transition regression (STR) with the economic variables of government expenditure, GDP, public debt, inflation, and employment, among others. It was found that public debt negatively affects growth when it approaches a threshold of 31.37% of debt to GDP. The recommendation is that this threshold be adopted by the fiscal authority as the public debt limit and control. Fiscal consolidation was not recommended as the policy for reducing public debt as it was not accounted for in the model. [Khanfir et al. \(2019\)](#), investigated the threshold effect of public

³⁸The policy implication of the analysis is the need to ensure that public debt management policies are in line with the growth-maximizing public debt threshold. This ensures sustained economic growth and employment rates, which are key tenets of sustainable economic development.

debt on economic growth in the North African countries between 2000 and 2018. The economic variables considered were the public debt ratio, the government expenditure gap, the exchange rate, and the real GDP gap. In the panel threshold regression (PTR), it was found that public debt lower than 42.8% of GDP was positively affected by economic growth. They recommended that the adoption of fiscal consolidation requires an appropriate mix of revenue and expenditure measures to ensure that adequate resources are devoted to supporting inclusive growth and reducing public debt.

[John-Sowe et al. \(2019\)](#), investigated public debt sustainability in the West African monetary zone from 2000 to 2018. Smooth transition regression (STR) was used, and the economic variables used were primary balance to GDP, lagged public debt to GDP ratio, and output gap, among others. Similar to [Megersa \(2015\)](#), the primary balance increases the debt ratio below a threshold debt-to-GDP ratio of 90%. Moreover, They recommend the continuation of fiscal consolidation efforts aimed at enhancing revenue and rationalizing unproductive expenditures in all member states. [Liu and Lyu \(2021\)](#) investigated the impact of public debt on economic growth from 1983 to 2013. The economic variables used were gross domestic product (GDP) growth and government debt. The threshold regression model was used, and it was found to be at a threshold of 130%. The dynamic effect of the threshold of government debt indicates that the relationship between the ratio of public debt to GDP and economic growth appears graphically as an inverted U shape. This finding is not contrary to the 90% outlined by [Égert \(2015\)](#), [Baglan and Yoldas \(2016\)](#) and [Ndoricimpa \(2020\)](#) among others. [Makhoba et al. \(2021b\)](#), investigated the asymmetric effects of public debt on economic growth in South Africa from 1980 to 2018. Smooth transition regression was used with the economic variables of public debt, GDP, employment, and investment, among others. It was found that if public debt rises by 1%, the economy expands by 0.17% during a low-debt regime, significant at the 1% significance level. On the contrary, if public debt falls, it would cause the economy to contract by 0.017%, which is statistically significant at the 1% level. Similar to [Liu and Lyu \(2021\)](#), the results suggest that there is an inverted U-shaped relationship, which implies a significant positive influence of public debt on economic growth during a low-debt regime and a negative influence during a high-debt regime. They were silent on the aspect of fiscal consolidation, which probes a gap to be investigated. [Buthelezi \(2023\)](#), investigating the effects of macroeconomic uncertainty on economic growth in the presence of fiscal consolidation in South Africa. Markov-switching dynamic regression (MSDR) and time-varying parameter vector autoregression (TVP-VAR) were performed using time series data from 1994 to 2022. Little attention has been given to the investigation of macroeconomic

uncertainty in different regimes of economic growth in South Africa. Three states were found for economic growth, with mean growth rates of negative 6.29% and positive 3.90% and 1.47%, respectively. Macroeconomic uncertainty was found to have negative impacts of 6.72%, 4.38%, and 3.08% in states 1 and 3, respectively. Fiscal consolidation provided an accommodative policy as it reduced the negative impact of macroeconomic uncertainty by 3.17%, 1.80%, and 0.92% in states 1 to 3, respectively. However, fiscal consolidation does not completely reduce macroeconomic uncertainty's negative impact.

The studies reviewed explore the intricate relationship between government debt thresholds, economic growth dynamics, and the role of fiscal consolidation across various countries and regions. These investigations significantly contribute to our understanding of fiscal policy implications and debt management strategies. This study sheds light on the asymmetric effects of public debt on economic growth in South Africa, revealing an inverted U-shaped relationship, where moderate levels of debt positively influence growth, but excessive debt levels have adverse effects. These findings underscore the importance of maintaining a balanced debt management approach to foster sustainable economic growth. On the other hand, studies identify threshold levels of public debt beyond which economic growth begins to decline. These studies emphasize the nonlinear nature of the debt-growth relationship and highlight the critical importance of debt sustainability. Others have delved into the impact of macroeconomic uncertainty on economic growth in South Africa, particularly in the context of fiscal consolidation. Their findings suggest that, while fiscal consolidation can mitigate the negative effects of uncertainty to some extent, it may not completely offset its impact, underscoring the complex interplay between fiscal policy, uncertainty, and economic performance. Collectively, these studies provide valuable insights into the dynamics of government debt thresholds, economic growth patterns, and efficacy of fiscal consolidation measures. By elucidating the nonlinear nature of these relationships and offering empirical evidence on their implications, they inform policymakers and practitioners in crafting effective debt management and fiscal policy strategies to promote sustainable economic development.

4.6 Conclusion of chapter

This chapter presents a comprehensive literature review of the empirical studies related to our research objectives. The objective of this review is to synthesize the existing body of knowledge and provide insights into the key findings and trends in the literature. The chapter begins

by introducing the importance of a literature review to establish the theoretical and empirical foundations of our study. The literature review served as a critical tool for understanding the current state of research and identifying the gaps that our study aimed to address. Objective one focused on examining the elasticity of the CAPB and its relationship with fiscal consolidation. The literature highlights mixed findings on the impact of fiscal consolidation on output (GDP). Some studies have suggested contractionary effects, indicating a decrease in economic growth, while others have found no significant impact or even expansionary effects in the long run. The results emphasized the complexity of the relationship, which depends on factors such as the composition and size of the consolidation measures as well as the prevailing economic conditions.

Objective two explored the threshold of the CAPB that can be attributed to fiscal consolidation episodes. The literature review revealed that various studies have investigated this threshold, with different findings. While the specific threshold varies across studies, ranging from 30% to 90% of GDP, there is a consensus that high levels of government debt can hinder economic growth. Debt levels above the identified threshold are associated with adverse growth effects, increased risk premiums, and the need for fiscal consolidation. Objective three focused on the relationship between fiscal consolidation and domestic government debt. The literature indicates that successful episodes of fiscal consolidation generally lead to a reduction in government debt levels as measured by the debt-to-GDP ratio. However, the magnitude and speed of debt reduction varied across studies and were influenced by the fiscal measures implemented. Expenditure-based consolidations were more successful than tax-based consolidations in achieving debt reduction and fiscal goals.

Objective Four studies examined the relationship between the government debt threshold, economic growth, and fiscal consolidation. The literature consistently supports the existence of a threshold beyond which government debt negatively affects economic growth. Countries with sound policies and institutions tend to experience adverse growth effects at lower debt levels compared to countries with weaker governance structures. The literature emphasizes the importance of fiscal discipline, effective debt management, and timely implementation of fiscal consolidation measures to ensure sustainable economic growth. In conclusion, the literature review provides valuable insights into the elasticity of CAPB, the threshold of the CAPB, the relationship between fiscal consolidation and domestic government debt, and the relationship between government debt threshold, economic growth, and fiscal consolidation. These findings underscore the complex nature of these relationships and highlight the significance of factors

such as fiscal measures, economic conditions, and institutional quality. By synthesizing existing empirical studies, this literature review laid the foundation for our research and provided a basis for further investigation in subsequent chapters.

Chapter 5

Methodology

5.1 Introduction

In any research study, the methodology adopted plays a crucial role in determining the validity and reliability of the findings. This chapter provides an in-depth discussion of the methodology adopted in this study to investigate these four objectives. The chapter begins by highlighting the theoretical framework adopted to guide this study. Theoretical frameworks are important, as they provide a structure for the study and help researchers develop a clear understanding of the research problem. In this study, the theoretical framework is discussed in detail to provide an understanding of how the research objectives were formulated and the key concepts investigated. Furthermore, this chapter discusses the various statistical techniques used to analyze the data. These techniques include descriptive statistics and diagnostics, correlation analysis, Hodrick-Prescott filter results, unit root tests, lag selection, instrument variables, and Durbin-Wu-Hausman tests. Each of these techniques is discussed in detail and their applications in the research context are highlighted. Additionally, this chapter provides justification for the models used in this study. Model justification is essential, as it helps establish the suitability of the model in addressing the research objectives. This chapter also discusses the importance of diagnostic tests in evaluating the models used.

5.2 Methodology

The empirical work of this study uses quantitative analysis because quantitative analysis numbers and models can be used to ensure effective measurement and comparison in an effort to determine the subject matter or economic question (Sims, 1980). Moreover, economic variables

Table 5.1: Economic variables utilises in this study empirical work

Time series secondary data	
<i>GD</i>	Domestic government debt
<i>G</i>	Government expenditure
<i>TGR</i>	Total government revenue
<i>M3</i>	M3 money supply
<i>GDP</i>	Gross domestic product per person
<i>rD</i>	Debt server ratio
Time series estimated variables	
<i>gdp-c</i>	Gdp cyclical component from hp filter
<i>gdp-p</i>	Gdp trend component from hp filter
<i>dtgr</i>	Government revenue times the output gap
<i>dg</i>	Government expenditure times the output gap
Estimationed	
<i>cnstnt_elstcy_tgr</i>	Time in-varying elasticity for total government revenue
<i>cnstnt_elstcy_g</i>	Time in-varying elasticity for government expenditure
<i>cnstnt_elstcy_CAPB_tgr</i>	Time in-varying CAPB for total government revenue
<i>cnstnt_elstcy_CAPB_g</i>	Time in-varying CAPB for government expenditure
<i>cnstnt_elstcy_CAPB</i>	Time in-varying CAPB for total government revenue
<i>tvp_elstcy_tgr</i>	Time-varying elasticity for total government revenue
<i>tvp_elstcy_g</i>	Time-varying elasticity for government expenditure
<i>tvp_elstcy_CAPB_tgr</i>	Time-varying CAPB for total government revenue
<i>tvp_elstcy_CAPB_g</i>	Time-varying CAPB for government expenditure
<i>tvp_elstcy_CAPB</i>	Time-varying CAPB

can be used to test, examine, and re-evaluate economic theory, as observed in (Barbosa, 2018; Carter and Kohn, 1994; Bouthevillain et al., 2001; Larch and Turrini, 2010), among others. This study used yearly time-series data from South Africa from 1979 to 2022. The economic variables are sourced from the South African Reserve Bank, Department of National Treasury, South African Revenue Service, World Bank World Development Indicators, and IMF.

Table 5.2 reflects the data and economic variable used in this study. The motive to use domestic government debt (*GD*) is a crucial indicator of fiscal health and sustainability. Analyzing its trends and dynamics allows for an assessment of the government's borrowing behavior and its im-

plications for economic stability and growth. Moreover, the variable is important for objectives two and four as the study seeks to investigate the impact of fiscal consolidation of government. By contrast, government expenditure (G) represents the total amount of money spent by the government on goods, services, and investments. Moreover, government expenditure plays a significant role in fiscal consolidation efforts. Fiscal consolidation refers to measures taken by governments to reduce budget deficits and stabilize or reduce debt levels relative to the GDP. Government expenditure is a key component of fiscal policy, and its management can have a profound impact on the success of consolidation efforts. The economic variable of the total government revenue (TGR) forms the basis for budgetary planning and determines the government's fiscal capacity. During fiscal consolidation, policymakers often assess revenue streams to identify potential sources of additional income or opportunities for revenue enhancement. M3 Money Supply ($M3$) represents the total supply of money in the economy, including currency in circulation, demand deposits, and other liquid assets. Understanding the dynamics of M3 money supply growth is essential for policymakers to assess the effectiveness of monetary policy measures aimed at supporting fiscal consolidation.

The Gross Domestic Product per person (GDP) is a crucial economic metric that evaluates the average economic output per capita within a nation. This variable is significant in estimating Objective Four, where the focus is on examining the impact of fiscal consolidation on economic growth. The theoretical framework of economic growth underscores GDP per person as a key macroeconomic indicator. The Debt Service Ratio (rD) reflects the ratio of debt payments to the government revenue. Fiscal consolidation aims to achieve debt sustainability by ensuring that debt levels remain manageable relative to government revenue and economic growth. Monitoring the Debt Service Ratio provides insight into the affordability of servicing existing debt commitments. High Debt Service Ratios may indicate a heavy debt burden, which could impede fiscal flexibility and limit the government's ability to finance essential public services or respond to economic shock. Moreover, the GDP clinical component gdp_c captures cyclical fluctuations or deviations from the long-term GDP trend. The HP filter separates GDP into its trend and cyclical components, where gdp_c represents the cyclical component. The cyclical component of GDP reflects short-term fluctuations in economic activity that cannot be explained by long-term trends. These fluctuations are often associated with business cycles characterized by periods of expansion and contraction in economic output. On the contrary, the GDP trend component gdp_p represents the long-term trend or underlying GDP growth path. The HP filter isolates the GDP trend component from short-term fluctuations, with gdp_p capturing this trend component.

The trend component of GDP reflects the underlying growth rate of the economy over time, abstracting from the temporary fluctuations caused by business cycles or other short-term shocks.

The *cnstnt_elstcy_tgr* is time in-varying elasticity for total government revenue, *cnstnt_elstcy_g* time in-varying elasticity for government expenditure, *cnstnt_elstcy_CAPB_tgr* is time in-varying CAPB for total government revenue, *cnstnt_elstcy_CAPB_g* is the time-varying CAPB for government expenditure and *cnstnt_elstcy_CAPB* is the time-varying CAPB for total government revenue. These variables offer a static variable to provide a snapshot of the economic conditions at a specific point in time or over a defined period. They offer valuable information about the current state of the economy, which is essential for understanding the baseline conditions and formulating policy interventions. The economic variables *tvp_elstcy_tgr* and *tvp_elstcy_g* reflect the time-varying elasticity of total government revenue as well as the time-varying elasticity of government expenditure, respectively. *tvp_elstcy_CAPB_tgr* is the time-varying CAPB for the total government revenue, *tvp_elstcy_CAPB_g* is the time-varying CAPB for government expenditure, and *tvp_elstcy_CAPB* is the time-varying CAPB. These variables are derived from statistical estimation techniques and represent cyclical components, trend components, and interactions with the output gaps. These estimated variables provide insights into the underlying economic trends and dynamics, allowing for a deeper understanding of the relationship between fiscal variables and economic performance. On the other hand, time-varying elasticities and cyclically adjusted primary balances (CAPB) exist for government revenue and expenditure. Time-varying elasticities and CAPBs allow for a more nuanced analysis of the effects of fiscal policies on government revenue, expenditure, and debt dynamics over time. These variables help identify the impact of fiscal consolidation measures and threshold effects on fiscal sustainability.

5.3 Theoretical framework

5.3.1 Theoretical framework for objective one

The theoretical framework of the CAPB is used for objective one¹. The CAPB is used to determine fiscal policy authorities' discretionary actions regarding government expenditure cuts and tax increases, which can be attributed to fiscal consolidation episodes. The OECD, European Commission (EUC), and IMF's rationale is that it is best to factor in the elasticity of government expenditure and tax to find the discretionary actions that can be attributed to fiscal consolidation

¹Investigate the difference between the CAPB with time-varying elasticity and time-invariant elasticity as proxy for fiscal consolidation.

episodes using the CAPB (Bouthevillain et al., 2001; Larch and Turrini, 2010; Girouard and André, 2006). This rationale is presented in Equations 5.1–5.3.

$$\Delta CAPB_{tgr} = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t}\right)^{\varepsilon_r} \quad (5.1)$$

$$\Delta CAPB_{-g} = G_t \left(\frac{y_t}{Y_t}\right)^{\varepsilon_g} \quad (5.2)$$

$$\Delta CAPB_t = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t}\right)^{\varepsilon_{tgr}} - G_t \left(\frac{y_t}{Y_t}\right)^{\varepsilon_g} \quad (5.3)$$

All parameters are defined in Chapters 2 and 2.3.4 to 2.3.5. Where $CAPB$ is the cyclically adjusted primary balance, y is the potential gross domestic product, Y is the gross domestic product, TGR_t is government revenue, G_t is government expenditure. The elasticity is given by ε_{tgr} and ε_g for both government revenue and expenditure, respectively, with the derivations shown in Equations 5.4 and 5.6 respectively.

$$\varepsilon_{tgr} = |TGR_t = \beta_0 + \beta_1 \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t}\right) + \mu_t \quad (5.4)$$

$$\varepsilon_{tgr} = \beta_1 = \text{constnt_elstcy_tgr} \quad (5.5)$$

$$\varepsilon_g = |G_t = \beta_0 + \beta_1 G_t \left(\frac{y_t}{Y_t}\right) + \mu_t \quad (5.6)$$

$$\varepsilon_{tgr} = \beta_1 = \text{constnt_elstcy_g} \quad (5.7)$$

One of the key drawbacks of the elasticity in Equations 5.1 to 5.3 is that they provide static or constant elasticity over time. This is argued to be a problem in Chapter 1, Section 1.3 as it may lead to biased identification of fiscal consolidation episodes. This study uses the framework reflected in Equations 5.1–5.6. This theoretical framework will result in CAPB findings characterized by constant static elasticities. Moreover, in this study, time-varying elasticities are investigated to find fiscal consolidation episodes using the CAPB, building from the theoretical framework in Equations 5.1 to 5.6. The time-varying elasticities of government revenue and expenditure are reflected in Equations 5.8 and 5.10 respectively.

$$\varepsilon_{tgr_t} = |TGR_t = \beta_0 + \beta_{1,t} \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t}\right) + \mu_t \quad (5.8)$$

$$\varepsilon_{tgr} = \beta_{1,t} = \text{constnt_elstcy_tgr} \quad (5.9)$$

$$\varepsilon_{g_t} = |G_t = \beta_0 + \beta_{1,t} G_t \left(\frac{y_t}{Y_t}\right) + \mu_t \quad (5.10)$$

$$\varepsilon_{tgr} = \beta_{1,t} = \text{constnt_elstcy_g} \quad (5.11)$$

The objective of this study is to transform time-invariant elasticities into time-varying elasticities. The time-varying elasticity is shown in Equations 5.4–5.6 and the time-varying elasticities are reflected in Equations 5.8–5.10. This transformation is reflected by $\varepsilon_{tgr} = \varepsilon_{gtr}$ and $\varepsilon_g = \varepsilon_{g_t}$, with the key distinction being the t time subscript reflecting the time-varying elasticity. The elasticities in the econometric context are denoted by β_1 in Equations 5.4 to 5.6 and are not time-varying, whereas those in Equations 5.8 to 5.10 are time-varying, as reflected by $\beta_1 = \beta_{1,t}$. When the elasticities from the Equations 5.8 to 5.10 are found this study will factor them into Equations 5.12 to 5.13 to see the variation in the CAPB reflected in 5.14.

$$\Delta CAPB_{tgr_t} = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_{gtr_t}} \quad (5.12)$$

$$\Delta CAPB_{g_t} = G_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_{g_t}} \quad (5.13)$$

$$\Delta CAPB_t = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_{r_t}} - G_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_{g_t}} \quad (5.14)$$

It is important to note that Equations 5.1–5.6 are different from Equations 5.8–5.14. The theoretical framework reflected in Equations 5.1 to 5.6 has time-invariant elasticity, whereas Equations 5.8 to 5.14 are the same framework, although it is used as a building block in this study to find time-varying elasticity.

The relevance of the IFM fiscal consolidation framework of constant CAPB in the discussion of time-varying elasticity CAPB lies in its foundational role. The constant CAPB serves as the baseline framework from which this study aims to extend and improve by transitioning to Time-Varying CAPB. The constant CAPB provides a well-established foundation for understanding fiscal consolidation efforts. It has been widely used in economic literature and policy analysis as a measure of fiscal sustainability and consolidation effectiveness. On the contrary, the constant CAPB offers a simple and interpretable metric for assessing fiscal policy effectiveness. Its straightforward calculation enables policymakers and researchers to understand and interpret it. Moreover, by starting with a constant CAPB, the study can conduct a comparative analysis between the traditional and proposed time-varying approaches. This comparison allows for a clear evaluation of the benefits and limitations of transitioning to a time varying framework. Finally, many policy discussions and decisions have been based on constant CAPB metrics. Therefore, understanding its limitations and potential improvements through the incorporation

of time-varying elasticity is crucial for enhancing the relevance and effectiveness of fiscal policy recommendations.

5.3.2 Theoretical framework for one, two and three

The government budget constraint is used for objectives one, two, and three of this study². The government budget contract states that the government can spend an amount equal to tax receipts or less (Barbosa, 2018). The government budget constraint in a closed economy is given by equation 5.15.

$$G_t + rD_t = TGR_t + GD_t + M3_t \quad (5.15)$$

The right-hand side of Equation 5.15 reflects the expenditure side, where G is government expenditure and rD is the government debt service payment. The left-hand side of Equation 5.15 reflects the revenue side of the government, where TGR is the government's total revenue, GD is the domestic government debt, and $M3$ is the money supply proxied by M3 money in the economy. One of the key objectives of fiscal consolidation is to reduce GD domestic government debt. In the government, the budget constraint theoretical framework GD uses domestic government debt as an economic variable. If domestic government debt is explained by the components of the government budget constraint, this is reflected in Equation 5.16.

$$GD_t = G_t + rD_t - TGR_t - M3_t \quad (5.16)$$

In this study, the government budget constraint presented in Equation 5.16 is used, and to factor in the aspect of fiscal consolidation, the CAPB (as a measure of fiscal consolidation) is imposed in Equation 5.16, which can be reflected in 5.17.

$$GD_t = G_t + rD_t - TGR_t - M3_t + CAPB_t \quad (5.17)$$

Then, this study integrates the government budget-constrained theoretical framework shown in Equation 5.17 with the time-varying CAPB elasticity framework shown in 5.16 to 5.16. The interaction of the two theoretical frameworks in present in Equations 5.17 to 5.20

$$GD_t = G_t + rD_t - TGR_t - M3_t + CAPB.tgr_t \quad (5.18)$$

²The objective is to investigate the difference between the CAPB with time-varying elasticity and time-invariant elasticity as a proxy for fiscal consolidation. The second objective is to investigate the threshold of CAPB that can be attributed to fiscal consolidation. Objective three is to investigate the impact of fiscal consolidation on different states of domestic government debt.

$$GD_t = G_t + rD_t - TGR_t - M3_t + CAPB_{-g_t} \quad (5.19)$$

$$GD_t = G_t + rD_t - TGR_t - M3_t + CAPB_t \quad (5.20)$$

This study will use an integrated theoretical framework to assist in investigating three questions: 1) What is the effect of fiscal consolidation underacted through $CAPB_{-g_t}$ government revenue or tax impact on domestic government debt; 2) What is the effect of fiscal consolidation underacted through $CAPB_{-g_t}$ government expenditure impact on domestic government debt; and 3) What is the effect of fiscal consolidation underacted through $CAPB_t$ both on government revenue or tax and government expenditure impact on domestic government debt? It is important to note that this study assesses the effect of fiscal consolidation measures using CAPB in the time-varying period depicted by $\beta_{5,t}$. In the econometric context, this is reflected in Equations 5.21 to 5.51.

$$GD_t = \beta_0 + \beta_1 G_t + \beta_2 r D_t - \beta_3 TGR_t - \beta_4 M3_t + \beta_{5,t} CAPB_{-g_t} \quad (5.21)$$

$$GD_t = \beta_0 + \beta_1 G_t + \beta_2 r D_t - \beta_3 TGR_t - \beta_4 M3_t + \beta_{5,t} CAPB_{-g_t} \quad (5.22)$$

$$GD_t = \beta_0 + \beta_1 G_t + \beta_2 r D_t - \beta_3 TGR_t - \beta_4 M3_t + \beta_{5,t} CAPB_t \quad (5.23)$$

The government budget constraint is a fundamental concept in economics that outlines the relationship between government expenditures, revenues, and debt. Investigating fiscal consolidation in the government involves understanding how theoretical frameworks can effectively analyze this process. Theoretical frameworks provide a structured approach to examine fiscal consolidation and its impact on government finances. On the other hand, the frameworks provide clear assumptions about the behavior of economic agents, the functioning of markets, and the role of the government. Therefore, there is a limitation in analyzing the effects of fiscal consolidation measures on government budgets. Moreover, it offers a rigorous analytical structure to assess the impact of fiscal policies on government finances. By specifying the relationships between variables such as government spending, taxation, and debt, these frameworks enable researchers to conduct systematic analyses of fiscal consolidation strategies. Finally, the framework incorporates dynamic models that can predict the long-term consequences of fiscal consolidation. By simulating various policy scenarios, researchers can evaluate the potential outcomes of different consolidation strategies on government budgets over time³.

³The insights gained from the theoretical framework can inform policymakers about the potential effects of fiscal consolidation measures on government finances. By understanding how changes in spending and taxation affect budget outcomes, policymakers can make informed decisions regarding fiscal sustainability. The theoretical frameworks provide hypotheses that can be tested using empirical data. By comparing model predictions

5.3.3 Theoretical of the framework for objective four

For the fourth objective⁴, the Solow growth model is adopted as the theoretical framework (Mankiw, 2014). The Solow growth model is expressed by Equation 5.24.

$$Y_t = F(K_t, L_t * E) = A (K_t)^\alpha (L_t)^{1-\alpha} \quad (5.24)$$

Where Y is economic growth, L is labour, K denotes capital, A indicates technological progress, and E is the efficiency of labour, which indicates public knowledge about production methods triggered by the improvement in technology denoted by A . The Solow growth model is a dynamic model and is denoted by subscript t in each variable of the model. The exponential subscript of $1 - \alpha$ in Equation 5.24 is the share of output paid to labour, and α is the share of output paid to capital. Solow growth provides attractive properties for analyzing economic growth. However, the Solow growth model was extended by including other economic variables of interest to investigate the impact of the domestic government debt threshold on economic growth. These economic variables of interest include *gd* domestic government debt and *tvp_elstcy_CAPB* the varying parameter elasticity of the cyclically adjusted primary balance, which is a proxy for fiscal consolidation. The extended Solow growth model is expressed in Equation 5.25.

$$Y_t = F(K_t, L_t * E) = A (K_t)^\alpha (L_t)^{1-\alpha} + GD + GD^2 + tvp_elstcy_CAPB \quad (5.25)$$

Where GD^2 is the square of the domestic government debt that assists in the derivation of the threshold. The empirical work of the study follows the work of Reinhart and Rogoff (2010) by using a dummy variable to track the threshold effect on economic growth. The extended Solow growth is given by Equation 5.34.

$$Y_t = F(K_t, L_t * E) = A (K_t)^\alpha (L_t)^{1-\alpha} + dummy_X + tvp_elstcy_CAPB \quad (5.26)$$

where *dummy_X* reflects the vector of the dummy variables for thresholds of 30%, 40%, 50%, 60%, and 70%. These economic variables are presented in Equations 5.27–5.33.

with real-world outcomes, researchers can assess the validity of different theoretical approaches and refine their understanding of the fiscal consolidation dynamics.

⁴Objective four is to investigate the threshold impact of domestic government debt on gross domestic product per person in the presence of fiscal consolidation?

$$dmmmy_dg_thr_30 = \begin{cases} 1 & \text{if the GD is } \leq 30 \\ 0 & \text{if otherwise} \end{cases} \quad (5.27)$$

$$dmmmy_dg_thr_50 = \begin{cases} 1 & \text{if the GD is } \leq 50 \\ 0 & \text{if otherwise} \end{cases} \quad (5.28)$$

$$dmmmy_dg_thr_70 = \begin{cases} 1 & \text{if the GD is } \leq 70 \\ 0 & \text{if otherwise} \end{cases} \quad (5.29)$$

$$dmmmy_dg_thr_30_40 = \begin{cases} 1 & \text{if the GD is } 30 \leq GD \leq 40 \\ 0 & \text{if otherwise} \end{cases} \quad (5.30)$$

$$dmmmy_dg_thr_40_50 = \begin{cases} 1 & \text{if the GD is } 40 \leq GD \leq 50 \\ 0 & \text{if otherwise} \end{cases} \quad (5.31)$$

$$dmmmy_dg_thr_50_60 = \begin{cases} 1 & \text{if the GD is } 50 \leq GD \leq 60 \\ 0 & \text{if otherwise} \end{cases} \quad (5.32)$$

$$dmmmy_dg_thr_60_70 = \begin{cases} 1 & \text{if the GD is } 60 \leq GD \leq 70 \\ 0 & \text{if otherwise} \end{cases} \quad (5.33)$$

The empirical work further derives the contribution of labor and capital to economic growth, as reflected in Equations 5.34 and 5.35 respectively.

$$\begin{aligned} \frac{\partial Y_t}{\partial L_t} &= \left(\frac{\partial}{\partial L_t} \right) Y_t \\ &= (K_t)^\alpha \left(\frac{\partial}{\partial L_t} \right) (L_t)^{1-\alpha} \\ &= \alpha (K_t)^{\alpha-1} (1-\alpha) (L_t)^{1-\alpha} (L_t)^{-1} \\ &= \frac{(1-\alpha)}{(L_t)} \left((K_t)^\alpha (L_t)^{1-\alpha} \right) \\ &= \frac{(1-\alpha)}{(L_t)} Y_t \\ &= (1-\alpha) \frac{Y_t}{(L_t)} \end{aligned} \quad (5.34)$$

$$\begin{aligned}
\frac{\partial Y_t}{\partial K_t} &= \left(\frac{\partial}{\partial K_t} \right) Y_t \\
&= \left(\frac{\partial}{\partial K_t} \right) (K_t)^\alpha (L_t)^{1-\alpha} \\
&= \alpha (K_t)^{\alpha-1} (L_t)^{1-\alpha} \\
&= \alpha (K_t)^\alpha (K_t)^{-1} (L_t)^{1-\alpha} \\
&= \frac{\alpha (K_t)^\alpha (L_t)^{1-\alpha}}{(K_t)} \\
&= \alpha \left(\frac{Y_t}{(K_t)} \right)
\end{aligned} \tag{5.35}$$

After the derivation, the contributions of labor and capital to economic growth in Equations 5.34 and 5.35 respectively. The two equations are then extended to the domestic government debt variables and fiscal consolidation variables and are reflected in Equations 5.36 and 5.37.

$$\frac{\partial Y_t}{\partial L_t} = (1 - \alpha) \frac{Y_t}{(L_t)} + GD + tvp_elstcy_CAPB \tag{5.36}$$

$$\frac{\partial Y_t}{\partial K_t} = \alpha \left(\frac{Y_t}{(K_t)} \right) + GD + tvp_elstcy_CAPB \tag{5.37}$$

The Solow growth model, a cornerstone of economic theory, as extend framework it provides a powerful framework for investigating the impact of fiscal consolidation on economic growth. One of the key advantages of this model is that it is designed to analyze long-term economic growth. Moreover, the Solow model incorporates dynamic adjustment mechanisms such as capital accumulation and technological progress. In this study, fiscal consolidation enables an analysis of how the economy responds to changes in fiscal policy over time. This allows for a nuanced understanding of the short- and long-term effects of fiscal consolidation on economic growth dynamics. ⁵.

5.4 Model specification

5.4.1 Models justification

The TVP-VAR was adopted in this study because it is effective in answering the question of this study, which relates to finding time-varying elasticities within the CAPB. The TVP-VAR

⁵The Solow growth model provides insights into the potential policy implications of fiscal consolidation efforts. By simulating different fiscal scenarios within the framework, researchers can assess the trade-offs between short-term and long-term stabilization goals. This helps policymakers make informed decisions regarding the timing and magnitude of fiscal consolidation measures.

study can be used to provide time-varying coefficients (Koop and Korobilis, 2018), reflecting the responsiveness of CAPB components that can be attributed to fiscal consolidation. TVP-VAR provides effective properties for investigating time-varying elasticities and discretionary government intervention. TVP-VAR is more suitable for rolling window regression because it provides a time-varying coefficient using the entire time series. Rolling window regression relies on splitting the data into different samples, which may result in an expectation shift. However, the coefficients are split into different samples, not showing how the data are responsive over time (Gechert et al., 2019). The TVP-VAR model was used as the building block of the VAR model. This is effective because the VAR model can also prove time-invariant elasticity, which will be effective for comparison. However, when applying the VAR model, we need to check whether there is no long-run relationship between the economic variables. If there is a long-run relationship, the VAR model may be biased, and the more effective model for economic variables that have a long-run relationship is the VEC model (Johansen, 1988). Therefore, this study's empirical work has three models.

The Markov-switching dynamic regression model was used because it provides an attractive fixture that is central to answering the question of the empirical work of this study. Some fixtures include time series that transitions over a set of finite states (Hamilton, 1989). This is important because this study investigates the different states of domestic government debt. Moreover, the Markov-switching dynamic regression model states are unobserved and the process can switch among states throughout the sample (Brady and Magazzino, 2017). The empirical work of this study is based on a sample from 1979 to 2022. The Markov-switching dynamic regression model provides the time of transition between states, and the duration in a particular state is random (Hamilton, 1989). This is very important to ascertain the duration of the statistics, and can inform policy. The transitions follow a Markov process and the estimate state-dependent and state-independent parameters (Hamilton, 1989; Brady and Magazzino, 2017)

The threshold autoregressive regime was effectively used to determine the threshold Hansen (2000). The properties of the threshold autoregressive regime model are attractive, as the empirical work of this study seeks to investigate whether there is a threshold of CAPB that can be attributed to fiscal consolidation. Moreover, the threshold autoregressive regime model allows for an effect beyond this threshold (Hansen, 2000; Ramos-Herrera and Sosvilla-Rivero, 2020). This means that the empirical work of this study should also ascertain the effect of fiscal consolidation episodes. The threshold autoregressive regime model can move from different economic

states. This provides attractive properties, as this study’s empirical work can find the threshold present with different states of domestic government debt. A threshold variable that is above or below a threshold value may have numerous thresholds, and one can either specify a known number or let the Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), and Hannan–Quinn Information Criterion (HQC) find that number for you (HQIC) (Ramos-Herrera and Sosvilla-Rivero, 2020; Rubio et al., 2004; Iqbal et al., 2017).

The two-stage least squares (2SLS) method is used because it is effective in solving endogeneity, which is a concern in the data used in the empirical work of this study. The 2SLS model is used as an alternative to the usual linear regression technique (ordinary least squares, OLS), which is used when the right-hand variables in the regression are correlated with the error term. 2SLS uses additional information to compute asymptotically unbiased coefficients (Wooldridge, 2010).

5.4.2 Model specification of TVP-VAR for objective one

The VAR presented in Equation 5.59 contains the estimation and questions that provide time-invariant coefficients. This study considers the framework of the time-varying parameter vector auto-regression model presented in Equation 5.38 with time-varying parameters.

$$y_t = \beta_{0,t} + \beta_{1t}X_{t-1} + \beta_{2t}X_{t-2} + \beta_{3t}X_{t-3} + \dots + \beta_{k,t}X_{t-k} + A^{-1} \sum_{e_t} t \quad (5.38)$$

In Equation 5.38, y_t and X_t denote the vectors of the observed endogenous variables with the $n * 1$ matrix. However, Equation 5.38 is different from Equation 5.59 because $\beta_0 = \beta_t$ which reflects the constant terms that are multiplied by a vector of time-varying coefficients, given by t denoting t over time with variables represented in an $n * 1$ matrix. By contrast, $\beta = \beta_t$ and $\beta_{1,t}$, $\beta_{2,t}$, $\beta_{3,t}$ and $\beta_{k,t}$ reflect the time-varying coefficients in $n * n$ matrix. $\sum_{e_t, t}$ defines heteroscedastic unobservable shocks with a variance-covariance matrix Ωt (Primiceri, 2005; Koop and Korobilis, 2010, 2018), as shown in Equation 5.39.

$$A_t \Omega t A_t' = \sum_t \sum_t' \quad (5.39)$$

The subscript A_t denotes the lower triangular matrix, as reflected in matrix 5.40.

$$A_t = \begin{bmatrix} 1 & 0 & \cdots & 0 \\ a_{2,1,t} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ a_{n,1,t} & \cdots & a_{n,k-1,t} & 1 \end{bmatrix} \quad (5.40)$$

In contrast, \sum_t is represented by the time-varying sum of unobservable shocks in the diagonal elements of $\sigma^2_t = (\sigma^2_{e_{t1,1}}, \sigma^2_{e_{t1,2}}, \sigma^2_{e_{t1,3}}, \dots, \sigma^2_{e_{tn,k}})$ [Primiceri \(2005\)](#); [Iiboshi et al. \(2019\)](#). These diagonal elements are presented in the matrix [5.41](#).

$$E(\varepsilon_t, \varepsilon_t') = \sum_{e_t} t = \begin{bmatrix} \sigma^2_{e_{t1,t}} & 0 & \cdots & 0 \\ 0 & \sigma^2_{e_{t2,t}} & \cdots & \vdots \\ \vdots & \vdots & \ddots & 0 \\ 0 & 0 & \cdots & \sigma^2_{e_{tn,k}} \end{bmatrix} \quad (5.41)$$

Therefore, this matrix can be obtained using Equation [5.42](#).

$$y_t = \beta_{0,t} + \beta_{1,t}X_{t-1} + \dots + \beta_{k,t}X_{t-k} + A_t^{-1} \sum_{e_t} t \quad (5.42)$$

$$V(\varepsilon_t) = I_n \quad (5.43)$$

Using the rationale and the assumption under Equation [5.39](#) as well as stacking in a vector β_t all the right-hand side coefficients, in Equation [5.43](#) can be represented as Equation [5.44](#).

$$y_t = \beta_t X'_t + \dots + \beta_{k,t} X_{t-k} + A_t^{-1} \sum_{e_t} t \quad (5.44)$$

$$X'_t = I_n \otimes (0, X'_{t-1}, X'_{t-2}, X'_{t-3}, \dots, X'_{t-k}) \quad (5.45)$$

where \otimes denotes the Kronecker product ([Iiboshi et al., 2019](#); [Primiceri, 2005](#)). The variance and covariance in the matrix for Equation [5.44](#) is a general practice in VAR composition. However, in the VAR framework, the variance-covariance matrix is time-invariant. Therefore, in the context of this study, it is crucial to adopt an estimation method that will provide a time-varying variance-covariance matrix to fulfill the investigation of this study. In this regard, A_t is time varying, which is essential in VAR. This study follows the modeling approach [Iiboshi et al. \(2019\)](#); [Koop and Korobilis \(2010, 2018\)](#) and [Primiceri \(2005\)](#) for the time-varying coefficient in a time-varying vector auto-regression model. This approach was adopted because scholars

have provided a framework for simultaneous equations. Such time-varying variations among the variables of interest were presented in the state-space model. The state-space model provides attractive fixtures as it handles interactions and connections between unobserved and observed variables or equations in a system (Iiboshi et al., 2019; Koop and Korobilis, 2010). The state-space model is used in the framework of TVP-VAR to determine the time-varying parameter in an autoregression system. The TVP-VAR model is represented in the state-space model, as reflected in Equations 5.46–5.49.

$$y_t = \beta_t X'_t + A_t^{-1} \sum_{e_t} t \quad (5.46)$$

$$\beta_t = \Phi \beta_{t-1} + v_t \quad (5.47)$$

$$a_t = a_{t-1} + \varsigma_t \quad (5.48)$$

$$h_t = h_{t-1} + \xi_t \quad (5.49)$$

Equations 5.46 show the TVP-VAR model, which can be represented in the state-space model, as reflected in Equations 5.47 to 5.49. The TVP-VAR model in Equation 5.46 reflects $y_t = X'_{t-1}$ indicating that the variables of interest are explained by its own lag function. In Equations 5.47 to 5.49, β_t , a_t and h_t evolution of time-varying parameters with the assumption that it follows a first-order random walk process, as proposed by scholars such as Koop and Korobilis (2010); Gechert et al. (2019); Koop and Korobilis (2018) and Primiceri (2005). The parameter β_t evolution sequence of the coefficients is time varying for all variables considered in this study. The insight is that β_t is time varying and is explained by the generative process of the first-order random walk process Φ which is phi. Factor a_t represents the evolution sequence of the structural information. The subscript h_t characterizes the evolution sequence of stochastic volatility. It is important to note that alterations or variance created in Equations 5.47 to 5.49 are unobservable components, which reflect different chrematistics to that of autoregressive conditional heteroskedasticity (ARCH)⁶ models (Primiceri, 2005; Iiboshi et al., 2019). In Equations 5.47 to 5.49, v_t , ς_t and ξ_t denote new error terms and $v_t \sim N(0, \Omega_\beta)$, $\varsigma_t \sim N(0, \Omega_a)$ and $\xi_t \sim N(0, \Omega_h)$ reflecting the assumption that different coefficients are not associated with each other and the error terms are not correlated but are explained by a jointly normal distribution, which, following the variance-covariance matrix 5.50, is also reflected by (Primiceri, 2005; Iiboshi et al., 2019).

⁶ARCH model is a statistical model for time series data that describes the variance of the current error term as a function of the actual sizes of the previous periods' error terms.

$$V = Var \begin{pmatrix} t \\ v_t \\ \varsigma_t \\ \xi_t \end{pmatrix} = \begin{bmatrix} I_n & 0 & 0 & 0 \\ 0 & \Omega_\beta & 0 & 0 \\ 0 & 0 & \Omega_a & 0 \\ 0 & 0 & 0 & \Omega_h \end{bmatrix} \quad (5.50)$$

Matrix 5.50 reflects the dimensional identity matrix Ω_β , Ω_a and Ω_h . The zero in V matrix 5.50 denotes the block matrix consisting of zero elements, which also indicates that the row elements of Ω_β , Ω_a and Ω_h are not associated or correlated with each other or defined by positive definite matrices⁷ (Primiceri, 2005; Iiboshi et al., 2019). In matrix 5.50 I_n denotes n -dimensional identity matrix.

5.4.3 VAR and VEC model specification

TVP-VAR⁸ is built from the framework of the structural vector autoregressive (SVAR) model, which is then reduced to the vector autoregressive model (VAR). Since the development of SVAR and VAR Sims (1980), models have been effectively used in macroeconomics and fiscal policy analysis. This model presents statistical properties for forecasting systems and the dynamic effect of random shocks on a system of variables. All economic variables of interest in these models are deemed to be endogenous and have lag functions (Sims, 1980). The SVAR model is expressed in Equation 5.51.

$$Ay_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_3 y_{t-3} + \dots + \beta_p y_{t-p} + Ce_t \quad (5.51)$$

Where the subscript A denotes the contemporaneous relationships between the endogenous variables with the $n * n$ matrix and p denotes the number of variables in the system. The subscripts y_t and y_{t-1} , y_{t-2} and y_{t-p} reflect the matrix $n * 1$ vector of endogenous variables. This means that each variable has an equation within the represented system. Thus, each variable is independent and can only be explained by its lag, holding all other factors constant (Kilian and Lütkepohl, 2017). Subscript β_0 is the intercept with a time-invariant coefficient. The subscripts

⁷In linear algebra, a symmetric $n * n$ in real matrix M is said to be positive definite if the scalar $z^T M z$ is strictly positive for every nonzero column vector z of n real numbers.

⁸This section explains the specification of the VAR and EVC models, which will assist in finding time-invariant elasticities. However, it is important to note that the VAR and EVC models are the building blocks for finding constant or time-invariant elasticities, as outlined in Equations 5.1–5.111. Moreover, these models can also be used in the TVP-VAR model. As such, we explain that VAR and VEC are related to TVP-VAR, but there is a time-invariant coefficient that will be calculated using the VAR and VEC models. The VAR is put in the state-space model through MCMC to find the time-varying coefficients. The SVAR model was not used in this study's empirical work, as explained in the content of the study. However, this is done in line with the overall TVP-VAR.

$\beta_1, \beta_2, \beta_3$ and β_p reflect the time-invariant coefficients explained by matrix $n * n$. where $t - p$ indicates the order of autoregression or several lags and the explanatory variables explain the independent variables in the respective equations. The error terms reflecting the structural shocks in the system are denoted by e_t of the vector that has uncorrelated or orthogonal structural disturbances with zero mean in a matrix $n * 1$ (Kilian and Lütkepohl, 2017). The orthogonality assumption of structural innovations at time step t is not correlated, as shown in Equations 5.52 and 5.2.

$$E(e_t) = 0 \quad (5.52)$$

$$E(e_t, e_t') = \sum_e = \begin{bmatrix} \sigma^2_{e_{t1}} & 0 & \cdots & 0 \\ 0 & \sigma^2_{e_{t2}} & \cdots & \vdots \\ \vdots & \vdots & \ddots & 0 \\ 0 & 0 & \cdots & \sigma^2_{e_{tn}} \end{bmatrix} \quad (5.53)$$

$$E(e_t, e_{t,\tau}') = 0, t \neq \tau \quad (5.54)$$

SVAR cannot be estimated directly; this is a remedy for the reduced-form SVAR, which produces a standard VAR model. Therefore, to obtain the standard VAR model, the matrix of the SVAR Equation 5.51 is multiplied by the inverse A^{-1} and then solved for X_t and Ce_t . The SVAR model, which is transformed through multiplication of the contemporaneous matrix A^{-1} across all perimeters, is expressed in Equation 5.55.

$$A^{-1}Ay_t = A^{-1}\beta_0 + A^{-1}\beta_1y_{t-1} + A^{-1}\beta_2y_{t-2} + A^{-1}\beta_3y_{t-3} + A^{-1}\beta_p y_{t-p} + A^{-1}Ce_t \quad (5.55)$$

If A is a lower triangular matrix 5.56 it can be disconnected by rows for independent subsequent sampling, which significantly reduces computational difficulty (Primiceri, 2005).

$$A = \begin{bmatrix} 1 & 0 & \cdots & 0 \\ a_{2,1} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ a_{n,1} & \cdots & a_{n,p-1} & 1 \end{bmatrix} \quad (5.56)$$

where the result of the multiplication of the parameters with the inverse; therefore, Equation

5.55 can be expressed as Equation 5.57.

$$A^{-1}Ay_t = F_0 + A^{-1}F_1y_{t-1} + A^{-1}F_2y_{t-2} + A^{-1}F_3y_{t-3} + A^{-1}F_p y_{t-p} + A^{-1} \sum_e t \quad (5.57)$$

$$\varepsilon_t \sim N(0, I_n) \quad (5.58)$$

Where $A^{-1}F_i = \beta_i$ for $i = 1 \dots p$ and \sum_e is the diagonal matrix of the denoting disturbance term. This study uses the rationale of [Primiceri \(2005\)](#) to describe $X_t = I_s \otimes (0, y'_{t-1}, y'_{t-2}, \dots, y'_{t-p})$ and $\beta = (F_0, F_1, F_2, F_3 \dots F_p)$, where \otimes denotes the Kronecker product. The reduced form VAR is reflected in Equation 5.59, where there is no direct instantaneous influence of variables in the model because such variables are predetermined at time t ([Primiceri, 2005](#)). Therefore, Equation 5.51 indicates that there is a contemporaneous relationship among the variables in the form of the structural VAR that does not hold in Equation 5.59.

$$y_t = \beta_0 + \beta X_t + A^{-1} \sum_e t \quad (5.59)$$

It is important to note that 5.59 provides a time-invariant coefficient of β without t . As such, as indicated in Section 5.4.10, the VAR model proved effective in estimating time-invariant elasticities, which this study seeks to investigate, as outlined in Sections 5.3 and 5.3.1. The VAR model reflected in Equation 5.59 is used to estimate elasticity, as shown in Equations 5.60–5.61.

$$\varepsilon_{tgr} = \beta_0 + \beta_1 \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (5.60)$$

$$\varepsilon_g = \beta_0 + \beta_1 G_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (5.61)$$

The time-invariant elasticities of Equations 5.60 to 5.61 are estimated and factored in the CAPB as a measure of fiscal consolidation episodes, as reflected in Equations 5.4.3 to 5.4.3.

$$\Delta CAPB_{tgr} = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_r} \quad \Delta CAPB_{.g} = G_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_g} \quad \Delta CAPB_t = \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_{tgr}} - G_t \left(\frac{y_t}{Y_t} \right)^{\varepsilon_g}$$

In using the VAR model to estimate time-invariant elasticity, there are econometric properties that need to be held. One of the econometric properties that needs to be held is that economic variables used to estimate elasticity need to have no long-run relationship ([Johansen, 1988](#)). If there is a long-run relationship between economic variables, the VEC model needs to be estimated to reduce biases in the coefficients or elasticities to be estimated. [Engle and Granger \(1987\)](#), developed the econometric model of [Sims \(1980\)](#), when they combined cointegration and error correction models, to establish the trace error correction model. [Engle and Granger \(1987\)](#),

pointed out that when the autoregressive distributed lag model has a long-run relationship and there is cointegration between variables, it establishes the error correction model. The VAR model system equation has an autoregressive distributed lag model such that the VEC model is a VAR model with cointegration constraints. Owing to the cointegration relationship in the VEC model, when there is a large range of short-term dynamic fluctuations, VEC expressions can restrict the long-term behavior of the endogenous variables and converge to their cointegration relation. Equation 5.59 reflects the VAR model, which is converted into the VECM reflected in Equation 5.62.

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \mu_t \quad (5.62)$$

The components of Equation 5.62 are reflected in Equation 5.63.

$$\Pi = \sum_{i=1}^{p-1} A_i - I, \Gamma_i = \sum_{J=i+1}^p A_j \quad (5.63)$$

If the variable of interest is represented by a vector y_t has cointegration relationship, then $\Pi y_{t-1} \sim I(0)$ in Equation 5.62 can then be given by Equation 5.64.

$$\Delta y_t = \alpha \beta' y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \mu_t \quad (5.64)$$

The error correction term is reflected by $\alpha \beta' y_{t-1} = ecm_{t-1}$, which also shows the long-term equilibrium Relationships between the variables of interest considered in this study Therefore, the term in Equation 5.64 can be rewritten as Equation 5.65.

$$\Delta y_t = \alpha ecm_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \mu_t \quad (5.65)$$

Equation 5.65 of the VEC is used to estimate Equations 5.60–5.61 when the variables have a long-run relationship. The estimation is factored into the CAPB as a measure of fiscal consolidation episodes, as reflected in Equations 5.4.3 to 5.4.3.

5.4.4 Recursive Short Run Approach

This study uses the recursive approach in the identification proposed by Sims (1980) using the ratio of the matrix A by Cholesky factorization. This approach follows the lower-triangular matrix variance-covariance matrix with positive main diagonal elements of a Cholesky decomposition. The rationale for imposing restrictions is that the first variable is mostly exogenous; therefore, variable ordering is critical. Changes in the organization of variables transform VAR equations, which results in changes in residuals and coefficients (Pfaff, 2008). Scholars such as Gechert et al. (2019); Iiboshi et al. (2019); Koop and Korobilis (2010, 2018, 2010) and Pfaff (2008) use recursive and non-recursive long-run approaches. These scholars make the argument that what they find is that the ordering has no significant impact on the coefficient. However, they acknowledge its change and the remedy adopted to best fit the model.

5.4.5 TVP-VAR parameter estimation approach

The TVP-VAR model adopted in this study was contracted using the state-space model. The study uses the Bayesian approach to assess the posterior distributions of coefficients of the variables that are considered in this study presented as unknown states β_t in Equation 5.47, A_t, sum_{e_t} and hyperparameter V . The Bayesian approach was adopted to account for the probability that there may be sensitive information that is unknown about the unknown parameters of interest in this study. Therefore, this study uses prior information and factors it in the model to obtain sensible posterior information about the parameters of interest (Primiceri, 2005). A more technical justification for the Bayesian approach adopted in this study is discussed in detail in Section 5.4.6. Similar to Gechert et al. (2019); Iiboshi et al. (2019); Koop and Korobilis (2010, 2018, 2010), this study selected training samples to find prior information using the ordinary least squares (OLS) algorithm. This information on coefficients is factored in the Monte Carlo Markov Chain (MCMC) in an effort to investigate time-varying parameters. In MCMC, the Gibbs sampling algorithm is used to fix the high dimensionality. A more technical justification for the MCMC approach adopted in this study is discussed in detail in Section 5.4.6.

5.4.6 Bayesian inference

We also use the Bayesian theorem to build the TVP-VAR estimated in the MCMC framework using space models. The Bayesian approach provides attractive fixtures for model estimation. This is because it permits the utilization of information that is believed or previously known to predict changes in events occurring (Primiceri, 2005). Unlike the classical approach, the

Bayesian approach provided in TVP-VAR allows the model to remedy the limitation of the maximum likelihood that it is related to nonlinearity and high dimensionality. The maximum likelihood permits for different thresholds may not be related to the estimate of interest. As such, the maximum likelihood may offer thresholds that are not fully representative of the real true value. The Bayesian approach uses prior information to remedy such limitations under the maximum likelihood (Primiceri, 2005; Koop and Korobilis, 2010).

Moreover, the Bayesian approach is effective for handling high dimensionality using Gibbs sampling in the MCMC framework. The Bayesian approach assists in the remedy of the nuisance parameters experienced in the maximum-likelihood approach. This limitation is because an increase in the moving-average result may reflect that the predicted value is close to one, while its true value is less than one (Primiceri, 2005). This problem is also referred to as the pile-up problem, in which the Bayesian approach is not limited because its posterior distribution is not reliant on the nuisance parameters (Primiceri, 2005; Pham and Sala, 2019).

5.4.7 Bayesian inference and the TVP-VAR

To obtain prior information on the TVP-VAR model adopted in this study, the study follows (Primiceri, 2005; Koop and Korobilis, 2010), the OLS algorithms shown in Equations 5.66 to 5.69.

$$\beta_0 \sim N\left(\widehat{\beta}_{OLS}, 4V\left(\widehat{\beta}_{OLS}\right)\right) \quad (5.66)$$

$$a_0 \sim N\left(\widehat{a}_{OLS}, 4V\left(\widehat{a}_{OLS}\right)\right) \quad (5.67)$$

$$h_0 \sim N\left(\left(\widehat{h}_{OLS}, 4I_n = V\left(\widehat{h}_{OLS}\right)\right)\right) = N\left(\widehat{h}_{OLS}, 4I_n\right) \sum_{\varepsilon_{0,0}} \varepsilon_0 = \varepsilon_0 \sim N\left(\widehat{\varepsilon}_{OLS}, 4V\left(\widehat{\varepsilon}_{OLS}\right)\right) \quad (5.68)$$

$$A_{0,0} = A_0 \sim N\left(\widehat{A}_{OLS}, 4V\left(\widehat{A}_{OLS}\right)\right) \quad (5.69)$$

Equations 5.66–5.69 reflect the mean prior distributions in the OLS algorithm $\widehat{\beta}_{OLS}$, \widehat{a}_{OLS} , $\widehat{\varepsilon}_{OLS}$ and \widehat{A}_{OLS} which are time-invariant initial values. The male prior distributions given by the OLS algorithm are four times the variance denoted by $V\left(\widehat{\beta}_{OLS}\right)$, $V\left(\widehat{a}_{OLS}\right)$, $V\left(\widehat{\varepsilon}_{OLS}\right)$ and $V\left(\widehat{A}_{OLS}\right)$ to integrate sufficient uncertainty Primiceri (2005); Iiboshi et al. (2019). The mean and variance of \widehat{h}_{OLS} are calibrated using the OLS estimator, and the VAR model is time invariant. We assume that identity matrix I_n is identical to $V\left(\widehat{h}_{OLS}\right)$ (Primiceri, 2005; Iiboshi et al., 2019). The inverse Wishart distribution is a probability distribution defined on real-valued

positive-definite matrices. Bayesian statistics are used as the conjugate prior for the covariance matrix of a multivariate normal distribution and is used to calibrate the unknown parameters of Ω_β , Ω_a and Ω_h matrix 5.66 which are characterized as independent from each other (Koop and Korobilis, 2010). The inverse Wishart distribution prior are reflected in Equations 5.70 to 5.72

$$\Omega_\beta^{-1} \sim IW \left(1 + \aleph_\beta, \left((k_\beta)^2 \cdot (1 + \aleph_\beta) \cdot V \left(\widehat{\beta}_{OLS} \right) \right)^{-1} \right) \quad (5.70)$$

$$\Omega_a^{-1} \sim IW \left(1 + \aleph_a, \left((k_a)^2 \cdot (1 + \aleph_a) \cdot V \left(\widehat{a}_{OLS} \right) \right)^{-1} \right) \quad (5.71)$$

$$\Omega_h^{-1} \sim IW \left(1 + \aleph_h, \left((k_h)^2 \cdot (1 + \aleph_h) \cdot V \left(\widehat{h}_{OLS} \right) \right)^{-1} \right) \quad (5.72)$$

In Equations 5.70 to 5.72 \aleph_β , \aleph_a and \aleph_h denote the dimensionality of β_t , a_t , and h_t . In the TVP-VAR $p - th$ order model with n output variables, the dimensionality of β_t , a_t and h_t is calibrated by n_β . Moreover, the values of 0.01, 0.1, and 0.01 are used to calibrate the parameters k_β , k_a and k_h following the citing of (Koop and Korobilis, 2010).

5.4.8 Markov Chain Monte Carlo Algorithm

This study adopted the Markov chain Monte Carlo (MCMC) algorithm to find the hyperparameters that are translated in the TVP-VAR model represented in the state space. The state-space model adopted in this study has first-order hyperparameters that follow the first-order condition. Given this assumption, the Monte Carlo simulation method was used to find the sample and recapitulate the interaction of hyperparameters using the Markov chain approach. In this regard, MCMC deals with the evolution matrix of the time-varying hyperparameters in a Markov chain approach (Koop and Korobilis, 2010; Pfaff, 2008; Primiceri, 2005; Kilian and Lütkepohl, 2017; Iiboshi et al., 2019). The density function of the evolution likelihood or transition probability under the MCMC process is compared against all provisional likelihood or conditional probability density functions of the vectors. The Gibbs sampling algorithm is vital for the MCMC. Therefore, this study uses Gibbs sampling to determine the parameters of provisional likelihood dissemination and update the selection of provisional densities (Koop and Korobilis, 2010; Pfaff, 2008; Primiceri, 2005; Kilian and Lütkepohl, 2017; Iiboshi et al., 2019). The conceptual discussion of the MCMC discussed above can be expressed in phases one to five:

- Phase 1: β, a, h, V ,
- Phase 2: sample $\beta|a, h, V, y; \Omega_\beta|\beta$

- Phase 3: sample $a|\beta, h, V, y; \Omega_a|a$
- Phase 4: sample $h|\beta, a, V, y; \Omega_h|h$
- Phase 5: going back to phase 2.

Repetition in the MCMC selection process remains to the determined value of the iterations to hold. [Koop and Korobilis \(2010\)](#) and [Primiceri \(2005\)](#) use 10 000 maximum values of interactions. The goal of MCMC methods is to assess the joint posterior distributions of the parameters of interest under certain prior probability densities set in advance ([Primiceri, 2005](#)).

5.4.9 MCMC and TVP-VAR for time-varying Parameters

Section [5.4.9.1](#) discusses the process undertaken in this study using MCMC for time-varying coefficients of the variables of interest.

Phase one of the MCMC and TVP-VAR: illustration coefficients

This study focuses on computing the time-varying coefficients of β_t and Ω_β . The TVP-VAR model presented in Equations [5.73](#) and [5.74](#) shows time-varying parameters.

$$y_t = \beta_t X'_t + A_t^{-1} \sum_{e_t} H \varepsilon_t \quad (5.73)$$

$$\beta_t = \Phi \beta_{t-1} + v_t \quad (5.74)$$

where the only change is in the error term innovation $G_d t = A_t^{-1} \sum_{e_t} z \varepsilon_t = A_t^{-1} \sum_{e_t} H \varepsilon_t$. This study differentiates it from the TVP-VAR and MCMC frameworks. The time-varying parameter in matrices [5.75](#) to [5.77](#) follows Gaussian innovations.

$$A_t = \begin{bmatrix} 1 & 0 & \cdots & 0 \\ \beta_{2,1,t} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ \beta_{n,1,t} & \cdots & \beta_{n,k-1,k} & 1 \end{bmatrix} \quad (5.75)$$

$$E \left(\varepsilon_t, \varepsilon'_t \right) = \sum_{e_t} H \varepsilon_t = \begin{bmatrix} \sigma^2_{e_{t1,t}} & 0 & \cdots & 0 \\ 0 & \sigma^2_{e_{t2,t}} & \cdots & \vdots \\ \vdots & \vdots & \ddots & 0 \\ 0 & 0 & \cdots & \sigma^2_{e_{tn,k}} \end{bmatrix} \quad (5.76)$$

$$V = Var \begin{pmatrix} t \\ v_t \\ \varsigma_t \\ \xi_t \end{pmatrix} = \begin{bmatrix} I_n & 0 & 0 & 0 \\ 0 & \Omega_\beta & 0 & 0 \\ 0 & 0 & \Omega_a & 0 \\ 0 & 0 & 0 & \Omega_h \end{bmatrix} \quad (5.77)$$

Therefore, given Gaussian innovations, the transition probability for β_t is conditional on A_t , $\sum_{e_t} H\varepsilon_t$ and V density function is composed of all conditional probability density functions of vectors (Primiceri, 2005; liboshi et al., 2019). The transition probability conditional on the hyperparameters over time is generally given by Equation 5.78.

$$P(X|Y^n) = P\{x(n)Y^n\} \prod_{t=1}^{n-1} P\{x(t)Y^t, x(t+1)\} \quad (5.78)$$

Equation 5.78 adopted from the rationale of Carter and Kohn (1994), advocates that the general computation of X is given by conditional probability, which can be generated starting from $x(n)$ and $P\{x(n)Y^n\}$. In this regard to get values from $(t = n - 1)$ the variables need to the time-varying which the TVP-VAR assists with that, then for $x(t)$ is generated from the transition conditional probability $P\{x(t)Y^t, x(t+1)\}$ which are given by the Gaussian density, in the effort to get every value of $x(t)$ there is a need to calculate the $E\{x(n)Y^n\}$ and the var $P\{x(n)Y^n\}$. In this regard, the expected transition conditional probability that reflects $x(t)$ values in the next period and over time is given by Equation 5.79.

$$E\{x(t)|Y^t, x(t+1)\}, \text{ var}\{x(t)|Y^t, x(t+1)\} \quad t = n - 1, \dots, 1 \quad (5.79)$$

In this study, the same approach is adopted to determine the transition conditional probability given by Equation 5.80.

$$P(\beta_t|A_t, H_t, V, y_t) = P(\beta_{T,it}|A_t, H_t, V_t, y_t) \prod_{t=1}^{T-1} P(\beta_{t+1}|A_t, H_t, V, y_t) \quad (5.80)$$

Equation 5.80 P denotes that the probability density function of the transition conditional probability of β_t follows a normal distribution and is conditional on A_t, H_t, V, y_t . To obtain all values of β_t over time, the Gaussian density function of the transition conditional probability is expressed in Equations 5.81–5.83.

$$\beta_t | A_t, H_t, V, y_t \sim N(\beta_{t|it+1} | P_{t|it+1}) \quad (5.81)$$

$$\beta_{t|t+1} = E(\beta_t | \beta_{t+1}, A_t, H_t, V, y_t) \quad (5.82)$$

$$P_{t|t+1} = Var(P_t | \beta_{t+1}, A_t, H_t, V, y_t) \quad (5.83)$$

The values of β_t over time can be explained by the innovation information of the next period, denoted by $\beta_{t|t+1}$ and $P_{t|t+1}$, which can be generated using the forward Kalman filter equations 5.84 to 5.89.

$$\widehat{\beta}_{t+1|t} = \widehat{\beta}_{t|it} \quad (5.84)$$

$$P_{t+1|t} = P_{t|it} + \Omega_\beta \quad (5.85)$$

$$\widehat{\beta}_{t+1|,t+1} = \widehat{\beta}_{t+1|t} + P_{t+1|t} X (X' P_{t+1|t} X + R)^{-1} (y - X' \widehat{\beta}_{t+1|t}) \quad (5.86)$$

$$P_{t+1|,t+1} = P_{t+1|t} - P_{t+1|t} X (X' P_{t+1|t} X + R)^{-1} (y - X' P_{t+1|t}) \quad (5.87)$$

$$\widehat{\beta}_{t|t+1} = \widehat{\beta}_{t|it} + P_{t+1|it}^{-1} (\widehat{\beta}_{t+1|it} - \widehat{\beta}_{t+1|t}) \quad (5.88)$$

$$P_{t|t+1} = P_{t|it} + P_{t+1|it}^{-1} (P_{t+1|T,it} - P_{t+1|it}) (P_{t|t} P_{t+1|it}^{-1})' \quad (5.89)$$

The computation of the opening values of $\widehat{\beta}_{t+1|t}$ and $P_{t+1|t}$ are determined by reproducing their means, using the initial values of $\widehat{\beta}_{0|it}$ and $P_{0|it}$. On the other hand, the parameters at time $t + 1$ are computed using the forward Kalman filter to determine the posterior distribution variance and mean. As such, the study obtains able to get all the values of $\widehat{\beta}_{t|t}$ and $P_{t|t}$ which are time-varying, and computes the parameters of $\widehat{\beta}_{t|t}$ and $P_{t|t}$ posterior distribution variance and mean using the backward Kalman filter (Primiceri, 2005).

5.4.9.1 Phase two of the MCMC and TVP-VAR: illustration of covariance

In Section 5.4.2, we focus on the computation of time-varying covariance denoted by a_t and Ω_a . The TVP-VAR model in Equation 5.90 can be expressed as Equation 5.91.

$$y_t = \beta_t X'_t + A_t^{-1} \sum_{e_t} H \varepsilon_t \quad (5.90)$$

$$A_t (y_t - \beta_t X'_t) = H \varepsilon_t \quad (5.91)$$

The evolution of β_t is assumed to follow first-order autoregression and is estimated with $\widehat{\beta}_t$

as well as \hat{y}_t , and thus $\hat{y}_t = y_t - \beta_t X'_t$ which can change Equation 5.91 to Equation 5.92.

$$A_t \hat{y}_t = H \varepsilon_t \quad (5.92)$$

Given diagonal matrix A_t Equation 5.92 can be expressed as matrix 5.93.

$$A_t \begin{bmatrix} \hat{y}_{1,t} \\ \hat{y}_{2,t} \\ \hat{y}_{3,t} \\ \vdots \\ \hat{y}_{n,t} \end{bmatrix} = \begin{bmatrix} 1 & 0 & \cdots & 0 \\ a_{2,1,t} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ a_{n,1,t} & \cdots & a_{n,k-1,t} & 1 \end{bmatrix} \begin{bmatrix} \hat{y}_{1,t} \\ \hat{y}_{2,t} \\ \hat{y}_{3,t} \\ \vdots \\ \hat{y}_{n,t} \end{bmatrix} \quad (5.93)$$

where matrix 5.93 can be converted into a factor in the identity matrix, as reflected in Equation 5.94.

$$I_n \hat{y}_t = \hat{y}_t \quad (5.94)$$

Where Equation 5.94 can be represented in matrix form, as shown in matrix 5.95.

$$\begin{bmatrix} \hat{y}_{1,t} \\ \hat{y}_{2,t} \\ \hat{y}_{3,t} \\ \vdots \\ \hat{y}_{n,t} \end{bmatrix} = \begin{bmatrix} 0 & \cdots & \cdots & 0 \\ -\hat{y}_{1,t} & 0 & \cdots & 0 \\ 0 & -\hat{y}_{[1,2]t} & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ 0 & \cdots & 0 & -\hat{y}_{[1,\dots,n-1]t} \end{bmatrix} \begin{bmatrix} a_{21,t} \\ a_{31,t} \\ a_{41,t} \\ \vdots \\ a_{n(n-1),t} \end{bmatrix} + H \varepsilon_t \quad (5.95)$$

Given that, in Equation 5.94 \hat{y}_t is reflected on both sides, this indicates that \hat{y}_t and a_t are not jointly normally distributed. As such, the Kalman filter is limited to making the computation of the transition conditional probability, which is time-varying for \hat{y}_t and a_t . Nevertheless, the Kalman filter and the backward recursion are effects as a remedy for such limitations. The model adopted in this study is also present in the state space mode, which is assumed to follow the first-order autoregressive model of the Kalman filter that backward recursion has an attractive feature is a remedy (Primiceri, 2005; Koop and Korobilis, 2010). The state-space model for matrix 5.95 is reflected in Equations 5.96–5.98.

$$\hat{y}_{2,t} = -a_{21,t} \hat{y}_{1,t} + H \varepsilon_t \quad (5.96)$$

$$a_{31,t} = a_{31,t-1} + \varsigma_{31t} \quad (5.97)$$

$$a_{32,t} = a_{32,t-1} + \varsigma_{32t} \quad (5.98)$$

Equation 5.95 and first-order autoregressive are reflected in Equation 5.99 (Primiceri, 2005; Koop and Korobilis, 2010).

$$a_{t|t-1} = \Omega a_t + \prod_{t=1}^{T-1} (\beta_{t+1} | A_t, H_t, V, y_t) \quad (5.99)$$

$$a_t = E (a_t | a_{t|t-1}, A_t, H_t, V, y_t) \quad (5.100)$$

$$P_{t|t+1} = Var (P_t | a_{t|t-1}, A_t, H_t, V, y_t) \quad (5.101)$$

Given the evolution of a_t , we can also find the Ωa_t transition conditional probability that is jointly connected to the other variables of interest ((Primiceri, 2005; Koop and Korobilis, 2010).

5.4.9.2 Phase three of the MCMC and TVP-VAR: illustration of volatility

Section 5.4.2 focuses on the computation of volatility denoted by h_t and Ω_h . Given the assumption that β_t and A_t are known, this can be expressed as Equation 5.102.

$$\tilde{y} = A_t (y_t - \beta_t X'_t) \quad (5.102)$$

If β_t and A_t are assumed to be known, then Equation 5.102. Acceptance of this assumption results in Equation 5.103.

$$\tilde{y}_t = H \varepsilon_t \quad (5.103)$$

The representation of Equation 5.103 in logarithm this change yields Equation 5.104.

$$\ln \left((\tilde{y}_t)^2 \right) = 2H_t + \ln (\varepsilon_t^2) \quad (5.104)$$

As proposed by Primiceri (2005), this study adds 0.001 to the parameters \tilde{y}_t for non-zero elements; therefore, $\tilde{\tilde{y}}_t = \ln \left((\tilde{y}_t)^2 \right) + 0.001$ and Equation 5.104 can be expressed as Equation 5.105.

$$\tilde{\tilde{y}}_t = 2H_t + \ln (\varepsilon_t^2) \quad (5.105)$$

The state space model that is assumed to be following the first order auto-regressive of

volatility h_t and Ω_h is presented in Equation 5.106

$$h_t = h_{t-1} + \varsigma_t \quad (5.106)$$

When h_t is known it can then be presented in the transition probability in Equation 5.107

$$h_t|h = \Omega h_t + \prod_{t=1}^{T-1} (h_t - h_{t-1}) (h_t - h_{t-1})' \quad (5.107)$$

These four phases ensure that MCMC with a time-varying coefficient can be effectively achieved. The fifth phase begins in phase two.

5.4.9.3 Stylise data and diagnostic test

5.4.9.4 Hodrick-Prescott-filter

One of the key variables in this study is \hat{y} the potential GDP or the trend in the content of the business cycle. This variable is used to find $\frac{\hat{y}}{Y}$ in proportion to output. The study uses (Hodrick and Prescott, 1997) to find the Y^P trend and cyclical components of a series Y^{cyclical} to find Y^P that can be used to find the output gap of GDP. (Hodrick and Prescott, 1997) is given by Equation 5.108.

$$\frac{\text{Min}}{\{Y^P\}_{t=-1}^T} \sum_{t=1}^T (Y_t - Y^P_t)^2 + \lambda \sum_{t=1}^T (Y^P_t - Y^P_{t-1})^2 - (Y^P_t - Y^P_{t-2})^2 \quad (5.108)$$

Where $Y^{\text{cyclical}} = Y - Y^P$ reflecting that Y^{cyclical} component is explained by deviations from Y , and the first item of the equation reflects the penalization of the cyclical component. Parameter λ denotes the relative weight of the smoother time series, while the second term of Equation 5.108 reflects the sum of the squares of the trend's component second differences (Hodrick and Prescott, 1997). There are implications for the value of the smoothing parameter λ . The higher the value of the smoothing parameter, the more the trend moves away from the original data series, whereas the lower the value of the smoothing parameter, the closer it is to the trend of the original data series. In the extreme case where the smoothing parameter is zero, this implies that $Y_t = Y^{\text{trend}}_t$ which indicates that the trend would not be penalized at all from the difference. The trend depends on λ , the moving average, and weights, conditional on the number of observations (Bouthevillain et al., 2001).

One limitation of the Hodrick-Prescott filter is a related problem that econometricians define

it as an endpoint problem. This limitation is observed given that Y^{trend}_t is influenced by the weighted average of the data series distribution, which can gradually become skewed at the end of the series (Bouthevillain et al., 2001). Nevertheless, this limitation can be addressed by a section with a lower value of λ . Hodrick-Prescott filter proposed that when the quarterly data has been used, the value of 1600 needs to be applied (Bouthevillain et al., 2001). The European Commission finds that in its methodology, the parameter $\lambda = 100$ results in the constancy of detrending the data series over time (Bouthevillain et al., 2001). This study follows the Hodrick-Prescott filter used by the IMF and the European Commission. One of the variables, $\frac{y_t}{Y_t}$ output gap in the estimation equations of this study is reflected in Equations 5.109 and 5.111.

$$\varepsilon_{tgr} = |TGR_t = \beta_0 + \beta_1 \sum_{j=1}^4 TGR_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (5.109)$$

$$\varepsilon_{tgr} = \beta_1 = \text{constnt_elstcy_tgr} \quad (5.110)$$

$$\varepsilon_g = |G_t = \beta_0 + \beta_1 G_t \left(\frac{y_t}{Y_t} \right) + \mu_t \quad (5.111)$$

$$\varepsilon_{tgr} = \beta_1 = \text{constnt_elstcy_g} \quad (5.112)$$

The HP filter is used to calculate y_t as the output gap, as shown in Equations 5.109 and 5.111.

5.4.10 Model specification of TR for objective two

The threshold autoregressive regime is effectively used to determine the effect (one set of coefficients) up to the threshold and another effect (another set of coefficients) beyond it Hansen (2000). These properties of the Threshold Autoregressive Regime model are attractive, as the empirical work of this study seeks to investigate whether the threshold of CAPB can be attributed to fiscal consolidation. Moreover, the threshold autoregressive regime model allows for an effect beyond the threshold (Hansen, 2000; Ramos-Herrera and Sosvilla-Rivero, 2020). This means that this study's empirical work can also ascertain the effect of fiscal consolidation episodes. The threshold autoregressive regime model can move from different economic states. This provides attractive properties as the empirical work of this study can find the threshold present with the different states of domestic government debt. A threshold variable that is above or below a threshold value identified may have numerous thresholds, and one can either specify a known number or let the Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), or Hannan–Quinn Information Criterion (HQC) find that number for you (HQIC)

(Ramos-Herrera and Sosvilla-Rivero, 2020; Rubio et al., 2004; Iqbal et al., 2017). The Threshold Autoregressive Regime model of Hansen (1996, 2000) is presented in Equations 5.113–5.114.

$$y_t = \theta'_1 x_t + \epsilon_{1t} \quad \text{if } q_t \leq \gamma \quad (5.113)$$

$$y_t = \theta'_2 x_t + \epsilon_{2t} \quad \text{if } q_t > \gamma \quad (5.114)$$

where y_t denotes the dependent variable, x_t denotes the independent variable, q_t denotes the threshold variable, ϵ_{1t} denotes the error term, and γ denotes the threshold value. Equation 5.113 indicates that the threshold variable is smaller than the threshold value. In Equation 5.114 the threshold variable was greater than the threshold value. The model assumes a dummy variable $I_t(\gamma) = q_t \leq \gamma$ and that is an indicator function. The dummy variable can also be presented as $q_t < \gamma$ then, $I = 1$; otherwise, $I = 0$. If we let $x_t(\gamma) = x_t I_t(\gamma)$, this will result in rewriting Equations 5.113 and 5.114 as Equation 5.115.

$$y_t = \theta'_1 x_t + \rho' x_t(\gamma) + \epsilon_{1t} \quad \text{and} \quad \epsilon_{1t} \text{ iid}(0, \sigma_t^2) \quad (5.115)$$

Where $\theta = \theta_2$, $\rho = \theta_1 - \theta_2$, and the error term $\epsilon_{1t}\epsilon_{2t}$, where θ, ρ and γ are the parameters to be estimated and arrive at the sum of squared errors, are presented in Equation 5.116.

$$S_1(\gamma) = \hat{\epsilon}'_t(\gamma) \hat{\epsilon}_t(\gamma) \quad (5.116)$$

The optimum threshold value is given by Equation 5.117.

$$\hat{\gamma} = \arg \min S_1(\gamma) \quad (5.117)$$

The variance in the residual is given by Equation 5.118.

$$\hat{\sigma}^2 = \frac{1}{T} \hat{\epsilon}'_t \hat{\epsilon}_t = \frac{1}{T} S_1(\hat{\gamma}) \quad (5.118)$$

Once $\hat{\gamma}$ is obtained, the vectors of the slope coefficient to be estimated are $\hat{\theta} = \hat{\theta}(\hat{\gamma})$ and $\hat{\rho} = \hat{\rho}(\hat{\gamma})$. The theoretical framework outlined in Equations 5.117 and 5.118 was applied to the threshold autoregressive regime model outlined in Equations 5.113 and 5.114, as presented in Equations 5.119–5.124.

$$gd = \begin{cases} \beta_{01} + \beta_{11}gdt_t + \beta_{12}gt_t + \beta_{13}tgr_t + \beta_{14}tvp_elstcy_CAPB_tgr_t & \\ \beta_{02} + \beta_{21}gdt_t + \beta_{22}gt_t + \beta_{23}tgr_t + \beta_{24}tvp_elstcy_CAPB_tgr_t + \epsilon_t^* & \end{cases} \quad (5.119)$$

$$gd = \begin{cases} tvp_elstcy_CAPB_tgr_t & [q_t \leq \gamma] \\ tvp_elstcy_CAPB_tgr_t & [q_t > \gamma] \end{cases} \quad (5.120)$$

$$gd = \begin{cases} \beta_{01} + \beta_{11}gdt_t + \beta_{12}gt_t + \beta_{13}tgr_t + \beta_{14}tvp_elstcy_CAPB_gt & \\ \beta_{02} + \beta_{21}gdt_t + \beta_{22}gt_t + \beta_{23}tgr_t + \beta_{24}tvp_elstcy_CAPB_gt + \epsilon_t^* & \end{cases} \quad (5.121)$$

$$gd = \begin{cases} tvp_elstcy_CAPB_gt & [q_t \leq \gamma] \\ tvp_elstcy_CAPB_gt & [q_t > \gamma] \end{cases}, \quad (5.122)$$

$$gd = \begin{cases} \beta_{01} + \beta_{11}gdt_t + \beta_{12}gt_t + \beta_{13}tgr_t + \beta_{14}tvp_elstcy_CAPB_t & \\ \beta_{02} + \beta_{21}gdt_t + \beta_{22}gt_t + \beta_{23}tgr_t + \beta_{24}tvp_elstcy_CAPB_t + \epsilon_t^* & \end{cases} \quad (5.123)$$

$$gd = \begin{cases} tvp_elstcy_CAPB_t & [q_t \leq \gamma] \\ tvp_elstcy_CAPB_t & [q_t > \gamma] \end{cases} \quad (5.124)$$

The threshold value γ is determined by estimating Equations 5.120, 5.122, and 5.124 from the minimum of one of the sums of squared errors in a reorder threshold variable. The thresholds are $tvp_elstcy_CAPB_tgr$, $tvp_elstcy_CAPB_g$ and $tvp_elstcy_CAPB_g$ which can be attributed to fiscal consolidation, as outlined by (Alesina and Ardagna, 1998; Yang et al., 2015; Alesina and Ardagna, 2013). The thresholds from the regime-model estimations are outlined in Equations 5.119, 5.121, and 5.123.

5.4.11 Model specification of MSDR for objective three

Markov-switching dynamic regression is used for series that are believed to transition over a finite set of unobserved states, allowing the process to evolve differently in each state. These transitions occur according to a Markov process. The transition time from one state to another and the duration between state changes are random (Hamilton, 1989, 1990). If the given economic data series is denoted by y_t , where $t = 1, 2, \dots, T$, and is characterized by two states, the economic data series can be presented in Equations 5.125 and 5.126.

$$State1 : y_t = \mu_1 + \epsilon_t \quad (5.125)$$

$$State2 : y_t = \mu_2 + \epsilon_t \quad (5.126)$$

where μ_1 and μ_2 are the intercept terms in states 1 and 2, respectively, ϵ_t is the white noise error with variance σ^2 . The two-state model shifts the intercept term (Hamilton, 1989, 1990). If the timing of the switches is known, the above model can be expressed as shown in Equation 5.127.

$$y_t = s_t \mu_1 + (1 - s_t) \mu_2 + \epsilon_t \quad (5.127)$$

The subscript s_t is 1 if the process is in state 1 and 0 otherwise. Markov-switching regression models allow the parameters to vary over the unobserved states. The MSDR model, with a state-dependent intercept term, is reflected in question 5.128.

$$y_t = s_t \mu_{s_t} + \epsilon_t \quad (5.128)$$

where μ_{s_t} is the parameter of interest and $\mu_{s_t} = \mu_1$ when $s_t = 1$ and $\mu_{s_t} = \mu_2$ when $s_t = 2$. The probability of being in each state can be estimated using the transition probabilities. One-step transition probabilities are given by $p_{st}, s_t + 1$, so for a two-state process, P_{11} denotes the probability of remaining in state 1 in the next period, given that the process is in state 1 in the current period. Similarly, P_{22} and P_{33} denote the probabilities of staying in states 2 and 3, respectively, (Hamilton, 1989, 1990). The transition probabilities from one state to another can be presented in matrix 5.129.

$$P = \begin{pmatrix} p_{11} & p_{12} & p_{13} \\ p_{21} & p_{22} & p_{23} \\ p_{31} & p_{32} & p_{33} \end{pmatrix} \quad (5.129)$$

$$gd = \begin{cases} \beta_{01} + \beta_{11}g_t + \beta_{21}tgr_t + \beta_{31}rd_t + \beta_{41}m3_t + \beta_{51}tvp_elstcy_capb_tgr_t + \epsilon_{1,t} \\ \beta_{02} + \beta_{12}g_t + \beta_{22}tgr_t + \beta_{32}rd_t + \beta_{42}m3_t + \beta_{52}tvp_elstcy_capb_tgr_t + \epsilon_{2,t} \\ \beta_{03} + \beta_{13}g_t + \beta_{23}tgr_t + \beta_{33}rd_t + \beta_{43}m3_t + \beta_{53}tvp_elstcy_capb_tgr_t + \epsilon_{3,t} \end{cases} \quad (5.130)$$

$$gd = \begin{cases} \beta_{01} + \beta_{11}g_t + \beta_{21}tgr_t + \beta_{31}rd_t + \beta_{41}m3_t + \beta_{51}tvp_elstcy_capb_g_t + \varepsilon_{1,t} \\ \beta_{02} + \beta_{12}g_t + \beta_{22}tgr_t + \beta_{32}rd_t + \beta_{42}m3_t + \beta_{52}tvp_elstcy_capb_g_t + \varepsilon_{2,t} \\ \beta_{03} + \beta_{13}g_t + \beta_{23}tgr_t + \beta_{33}rd_t + \beta_{43}m3_t + \beta_{53}tvp_elstcy_capb_g_t + \varepsilon_{3,t} \end{cases} \quad (5.131)$$

$$gd = \begin{cases} \beta_{01} + \beta_{11}g_t + \beta_{21}tgr_t + \beta_{31}rd_t + \beta_{41}m3_t + \beta_{51}tvp_elstcy_capb_t + \varepsilon_{1,t} \\ \beta_{02} + \beta_{12}g_t + \beta_{22}tgr_t + \beta_{32}rd_t + \beta_{42}m3_t + \beta_{52}tvp_elstcy_capb_t + \varepsilon_{2,t} \\ \beta_{03} + \beta_{13}g_t + \beta_{23}tgr_t + \beta_{33}rd_t + \beta_{43}m3_t + \beta_{53}tvp_elstcy_capb_t + \varepsilon_{3,t} \end{cases} \quad (5.132)$$

5.4.12 Model specification of TT and 2SLS for objective four

The threshold autoregressive regime model of [Hansen \(1996, 2000\)](#) is presented in Equations [5.133–5.134](#).

$$y_t = \theta'_1 x_t + \varepsilon_{1t} \quad \text{if } q_t \leq \gamma \quad (5.133)$$

$$y_t = \theta'_2 x_t + \varepsilon_{2t} \quad \text{if } q_t > \gamma \quad (5.134)$$

where y_t is the dependent variable, x_t is the independent variable, q_t is the threshold variable, ε_{1t} is the error term and γ is the threshold value. Equation [5.133](#) shows that the threshold variable is smaller than the threshold value. In Equation [5.134](#) the threshold variable was greater than the threshold value. The model assumes a dummy variable $I_t(\gamma) = q_t \leq \gamma$ and that is an indicator function. The dummy variable can also be presented as $q_t < \gamma$, then $I = 1$, or otherwise $I = 0$. If we let $x_t(\gamma) = x_t I_t(\gamma)$, we can rewrite Equations [5.133](#) and [5.134](#) as in Equation [5.135](#).

$$y_t = \theta'_1 x_t + \rho' x_t(\gamma) + \varepsilon_{1t} \quad \text{and} \quad \varepsilon_{1t} \text{ iid}(0, \sigma_t^2) \quad (5.135)$$

where $\theta = \theta_2$, $\rho = \theta_1 - \theta_2$, and error term $\varepsilon_{1t}\varepsilon_{2t}$, where θ, ρ and γ are the parameters to be estimated. The parameters and arrive at the sum of squared errors, are presented in Equation [5.136](#).

$$S_1(\gamma) = \hat{\varepsilon}'_t(\gamma) \hat{\varepsilon}_t(\gamma) \quad (5.136)$$

The optimum threshold value is given by Equation [5.137](#).

$$\hat{\gamma} = \arg \min S_1(\gamma) \quad (5.137)$$

The variance in the residual is given by Equation 5.138.

$$\hat{\sigma}^2 = \frac{1}{T} \hat{\epsilon}'_t \hat{\epsilon}_t = \frac{1}{T} S_1(\hat{\gamma}) \quad (5.138)$$

Once $\hat{\gamma}$ is obtained, the vectors of the slope coefficient to be estimated are $\hat{\theta} = \hat{\theta}(\hat{\gamma})$ and $\hat{\rho} = \hat{\rho}(\hat{\gamma})$. The theoretical framework and Equations 5.133–5.134 were applied to the threshold autoregressive regime model outlined in Equations 5.133 and 5.134, as presented in the estimation equations 5.139 and 5.141.

$$GDP_t = \begin{cases} \beta_{11}GD_{t-1} + \beta_{12}tvp_elstcy_CAPB \\ \beta_{21}GD_{t-1} + \beta_{22}tvp_elstcy_CAPB \\ \beta_{31}GD_{t-1} + \beta_{32}tvp_elstcy_CAPB + \epsilon_t^* \end{cases} \quad (5.139)$$

$$\frac{\partial Y_t}{\partial L_t} = \begin{cases} \beta_{11}(1-\alpha)\frac{Y_t}{(L_t)} + \beta_{12}GD + \beta_{13}tvp_elstcy_CAPB \\ \beta_{21}(1-\alpha)\frac{Y_t}{(L_t)} + \beta_{22}GD + \beta_{23}tvp_elstcy_CAPB \\ \beta_{31}(1-\alpha)\frac{Y_t}{(L_t)} + \beta_{32}GD + \beta_{33}tvp_elstcy_CAPB + \epsilon_t^* \end{cases} \quad (5.140)$$

$$\frac{\partial Y_t}{\partial K_t} = \begin{cases} \beta_{11}\alpha\left(\frac{Y_t}{(K_t)}\right) + \beta_{12}GD + \beta_{13}tvp_elstcy_CAPB \\ \beta_{21}\alpha\left(\frac{Y_t}{(K_t)}\right) + \beta_{22}GD + \beta_{23}tvp_elstcy_CAPB \\ \beta_{31}\alpha\left(\frac{Y_t}{(K_t)}\right) + \beta_{32}GD + \beta_{33}tvp_elstcy_CAPB + \epsilon_t^* \end{cases} \quad (5.141)$$

The Two-Stage Least Squares (2SLS) method, which uses a single equation framework, is preferred when the data set is not that large as it is capable of successfully eliminating the degrees of freedom (DOF) (Bollen, 1996). It is also an efficient estimator for reduced-form equations even in the presence of multicollinearity (Bollen, 1996). The 2SLS method may also be less sensitive to specification errors in the sense that those parts of the system that are correctly specified may not be appreciably affected by specification errors (Bollen, 1996). The 2SLS model is expressed by Equation 5.142.

$$GDP_t = \beta_1 K_t + \beta_2 L_t + \beta_3 GD + \beta_4 GD^2 + \beta_5 tvp_elstcy_CAPB_t + \beta_6 \sum_{t=1} (X_intr_t) \quad (5.142)$$

Where X_t is the vector of the variables considered in the model outline in Equations 5.142 and X_intr_t reflects the instrument variables. In an effort to find the empirical work of this

study using the first-order derivative and equating it to 0 in an effort to find the minimum or maximum point. The first-order condition is reflected in the Equation 5.143

$$\frac{\partial GDP_t}{\partial GD_t} = \frac{\beta_3}{2 * \beta_4 GD_t} \quad (5.143)$$

5.5 Pre-test

5.5.1 Unit root test

One of the key aspects of econometrics and estimation is to ensure that the data used are stationary. Stationarity implies that the statistical properties of a time series do not change with time. If the variable is stationary, it is concluded to be $I(0)$, implying an integration of order zero. If the first difference form produces a stationary time series, it is known as $I(1)$, meaning that the first difference is stationary (Elliott et al., 1992; Pantula et al., 1994). To test whether the data are Dickey-Fullerity, the Dickey-Fuller test can be utilized, which can be presented in the simple AR(1) model shown in Equation 5.144.

$$y_t = \rho y_{t-1} + u_t \quad (5.144)$$

where y_t is the variable of interest, t is the time index, ρ is a coefficient, and u_t is the error term. A unit root exists if $\rho = 1$ (Elliott et al., 1992). The model is nonstationary and the regression model can be written as Equation 5.145.

$$\Delta y_t = (\rho - 1)y_{t-1} + u_t = \delta y_{t-1} + u_t \quad (5.145)$$

where Δ is the first-difference operator and $\delta \equiv \rho - 1$. This model can be estimated and testing for a unit root is equivalent to testing $\delta = 0$ (DeJong et al., 1992; Elliott et al., 1992; Pantula et al., 1994). Three main versions of the test are reflected in Equations 5.146–5.148.

$$\Delta y_t = \delta y_{t-1} + u_t \quad (5.146)$$

$$\Delta y_t = a_0 + \delta y_{t-1} + u_t \quad (5.147)$$

$$\Delta y_t = a_0 + a_1 t + \delta y_{t-1} + u_t \quad (5.148)$$

Equation 5.146 reflects the test for a unit root, Equation 5.147 tests for a unit root with a constant, and Equation 5.148 tests for a unit root with a constant and deterministic time

trend. The Phillips–Perron test uses a time series to test the null hypothesis that a time series is integrated with order $I1$. Dickey-Fuller Dickey–Fuller test of the null hypothesis addresses the issue that the process generating data for y_t might have a higher order of autocorrelation than is admitted in the test equation, making y_{t-1} endogenous (DeJong et al., 1992; Elliott et al., 1992; Pantula et al., 1994).

Null : $H : \beta = 0$ Unit root i.e. selected variable is non-stationary.

Alt : $H : \beta \neq 0$ The selected variables were considered to be stationary.

5.5.2 Lag selection and cointegration

Economic choices have impacts that may not occur immediately but are conveyed over future periods. An alteration within the current trend of an economic variable can be a result of what happened in past periods, and cannot be explained by other economic variables (Gujarati, 2021).

Consider the $AP(p)$ of the time-series data of Y_t which can be given by Equation 5.149.

$$y_t = \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \alpha_3 y_{t-3} + \cdots + \alpha_p y_p + \epsilon_t \quad (5.149)$$

The lag selection can be given by the following criteria reflected in Equations 5.150 to 5.154.

$$AIC_p = n \ln(\hat{\sigma}^2) + 2p \quad (5.150)$$

$$SIC_p = n \ln(\hat{\sigma}^2) + n^{-1} p \ln(n) \quad (5.151)$$

$$HQCP = n \ln(\hat{\sigma}^2) + 2n^{-1} p \ln(\ln(n)) \quad (5.152)$$

$$FPE_P = n \ln(\hat{\sigma}^2)(n + p)(n - p)^{-1} \quad (5.153)$$

$$AIC_P = n \ln(\hat{\sigma}^2) + \frac{1 + p/n}{1 - (p + 2)/n} \quad (5.154)$$

In the equations, where $\hat{\sigma}^2$ is the dimensional autoregression, n is the effective sample size, and p is the number of lags. Equation 5.150 shows Akaike’s information criterion, 5.151 shows the Schwarz information criterion, 5.152 shows the Hannan-Quinn criterion, 5.153 shows the final prediction error, and 5.154 shows the corrected version of AIC (Gujarati, 2021).

Cointegration is a statistical method used to test the correlation between two or more non-stationary time series in the long run or for a specified period (Gujarati, 2021). This method helps to identify long-run parameters or equilibria for two or more sets of variables. The hy-

potheses for cointegration are as follows:

Null : $H : \beta = 0$ Cointegration was not observed.

Alt : $H : \beta \neq 0$ There is cointegration.

In this study's empirical work, the Johansen test is used to test whether the economic variables of interest have a long-term relationship. The Johansen test assesses the validity of a cointegrating relationship using the maximum likelihood estimates (MLE) approach. If the Null hypothesis is accepted, the VAR model is effective, whereas if the null hypothesis is rejected and Alt is accepted, the VEC model is used (Gujarati, 2021).

5.5.3 Endogeneity

Endogeneity is also a concern in the data used, and in general, it is common in economic growth regression that some of the explanatory variables are endogenous. Statistically, endogeneity may be caused by simultaneous relationships among the variables (Duncan and Leigh, 1985; Wooldridge, 2010; Ullah et al., 2018). In the context of this study, endogeneity might be caused by causality running from *GDP* economic growth per person to *GD* domestic government debt or vice versa. This study adopts a regression-based approach to detect endogeneity within variables. The problem with endogeneity is that it may result in the rejection of type 1 errors or biases when there is a need to reject the null hypothesis (Duncan and Leigh, 1985). On the other hand, what may trigger endogeneity is that country-specific properties may be unobserved or there may be omitted variables. Therefore, in such a case, there could be overestimation and underestimation of the coefficients. The misspecification of the model and biased estimators may lead to endogeneity (Duncan and Leigh, 1985; Wooldridge, 2010; Ullah et al., 2018).

Null : $H : \beta = 0$ This variable is not endogenous.

Alt : $H : \beta \neq 0$ This variable is not endogenous.

In practice, the regression-based approach is used to detect if the variable is endogenous by using the predicted residual of the variable in the estimated model. Three steps were involved in testing whether the variable was endogenous. Firstly, the variable is estimated in the model as a dependent variable. Second, the residuals of the variables were predicted using the model results, where the variable was estimated as a dependent variable. Thirdly, both the predicted residual and variable are estimated in the second model as independent variables with other regressors in the model. If the predicted residual is found to be statistically significant, it means that the

variable is endogenous. On the other hand, if the predicted residual is found to be statistically insignificant we can conclude that the variable is not endogenous (Wooldridge, 2010).

5.5.4 Instruments variables

The instruments in this study are found by using the large variables provided by a positive correlation with X_intr_t , X_t and GDP_t but negatively correlated with e_t . The rationale for identifying this instrument is shown in Equation 5.155. Pearson's correction was used to identify instruments. The Pearson correlation is used because it gives correlation, and correlation significance and shows how strong the relationship is and the significance of the results (Pflueger and Wang, 2015; Olea and Pflueger, 2013; Wooldridge, 2010).

$$\begin{array}{ccccccc}
 X_intr_t & \rightarrow & X_t & \rightarrow & GDP_t & & \\
 & & \uparrow & \nearrow & & & \\
 & & e_t & & & &
 \end{array} \tag{5.155}$$

5.6 Post estimation

5.6.1 Durbin–Wu–Hausman and overall stability of the model

Given the difficulties in finding effective instrument variables, this empirical work will also consider alternative methods of finding instrument variables using the institution. However, to check the validity of the instrument used in this study's empirical work, we also used the Durbin–Wu–Hausman Test (DWH) (Patrick, 2021). The primary purpose of the DWH test is to test for endogeneity by comparing the ordinary least squares (OLS) estimate of the structural parameters in the IV regression to that of the two-stage least squares (2SLS) (Wooldridge, 2010; Patrick, 2021). The empirical work also uses the Sargan–Hansen test to test over-identifying restrictions in a statistical model. This test will indicate if there is an endogenous variable in the model specification, and if there is, then we can conclude the 2SLS model is effective to be used (Wooldridge, 2010; Patrick, 2021).

5.7 Conclusion of chapter

This chapter presents the methodology employed in this study to investigate its objectives. The chapter begins by introducing the overall framework and justification of the chosen models.

Theoretical frameworks were established to provide a conceptual basis for each objective considering the specific factors and variables involved. The model specifications were then detailed, considering the nature of the objectives and the data at hand. For the first objective, this study employed the TVP-VAR model, justifying its suitability for capturing the time-varying dynamics of the variables under investigation. Additionally, the VAR and VEC models were specified for objectives two and three, respectively. Objective Four utilized the TR, MSDR, and TT models supported by 2SLS estimation.

Various diagnostic tests were performed to ensure the robustness and reliability of the models. Endogeneity issues were outlined, and how these would be addressed by employing instrumental variables when necessary was discussed. Unit root tests were performed to assess the stationarity of the variables, and lag selection techniques were outlined to determine the appropriate model orders. Cointegration analysis was used to identify long-term relationships among the variables. Post-estimation examined the Durbin-Wu-Hausman test to assess the presence of endogeneity and overall stability of the models. This allowed us to validate the reliability of our findings and to draw meaningful conclusions.

This section provides a comprehensive overview of the methodology employed in this study. By carefully selecting and justifying the models, specifying appropriate parameters, conducting diagnostic tests, and addressing endogeneity, this chapter lays the foundation for conducting rigorous analysis in subsequent chapters. The adopted methodology ensures the credibility and robustness of our findings, allowing us to draw reliable conclusions regarding the objectives outlined in this study.

Chapter 6

Results

6.1 Introduction

This chapter provides the results for all objects used in this study. Firstly, we discuss the results. Secondly, the chapter discusses econometric results and provides a graphical presentation of the objective results. Third, we discuss two objective results. Fourthly, we discuss three objective results. Fifth, the four objective results are discussed. Finally, we provide a brief conclusion to this study.

6.2 Descriptive statistics and diagnostic results

6.2.1 Descriptive statistics

Table 6.1 shows the descriptive statistics of the economic variables used in this study from 1979 to 2022. The data are sourced from different institutions, as outlined in Section 5.2 in this study, and the second part of Table 6.1 reflects the descriptive statistics of the estimated data. This is because this study uses a time-varying model. The observation period spans from 1979 to 2022, with an average of 2000.5. This indicates the time frame over which the data was collected. The *gd* domestic government debt has a mean of 37.22%, with a standard deviation of 11.21%. This suggests that, on average, government debt is around 37.23 units, with fluctuations of approximately 11.21 units around this average. The relatively high standard deviation implies that the government debt levels vary significantly over time. These fluctuations could result from various factors such as changes in fiscal policy, economic conditions, borrowing needs, and interest rates. High levels of government debt may strain public finances, leading to concerns about

debt sustainability, creditworthiness, and the ability to fulfill debt obligations. Policymakers must carefully monitor and manage government debt levels to mitigate risks and ensure fiscal sustainability. This may involve implementing measures to control spending, enhance revenue generation, and improve debt management practices.

The level of g government expenditure is found to have an average of 27.94% between 1979 and 2022 with a relatively low standard deviation of 3.0%, indicating less variability around the mean compared to government debt. A low standard deviation indicates that government expenditure tends to be relatively stable over the observed period. This stability can be advantageous for economic planning and budgeting as it provides a degree of predictability for both the public and private sectors. Stability in government spending suggests that fiscal policy measures related to expenditure may be consistent or less prone to large fluctuations than government debt. This indicates that policymakers have implemented measures to control spending or have maintained a relatively stable level of public investment and services provision over time.

The total government revenue, tgr is found to have a mean growth rate of 14.32% with a standard deviation of 8.75%. The higher standard deviation in total government revenue compared with government expenditure indicates greater variability in revenue streams over the observed period. This volatility could stem from fluctuations in factors such as tax revenue, non-tax revenue, and other sources of government income. In the context of fiscal consolidation, variability in government revenue can have significant implications. Uncertain revenue streams may hinder efforts to achieve a fiscal balance or surplus, as revenue shortfalls could necessitate spending cuts or tax increases to meet budgetary targets. Volatile government revenue can impose constraints on budgetary decision-making and fiscal policy implementation. During periods of revenue shortfall, policymakers may face pressure to reduce expenditures or increase taxation to maintain fiscal discipline and debt sustainability. Conversely, windfall revenues during economic booms may present opportunities for increased investment or debt reduction.

The supply of money, proxied by $m3$ is found to have an index value of 12.79 over the period. The standard deviation is 6.12 suggests that variability in the money supply can influence interest rates, which in turn impact the cost of borrowing for governments. Fiscal consolidation efforts may face challenges if fluctuations in M3 lead to volatility in interest rates, affecting the affordability of servicing government debt and implementing fiscal policy measures. The gdp gross domestic product per capita growth rate was 0.25% between 1979 and 2022 on average.

The standard deviation is 2.61%, the relatively low mean and variability in GDP indicate a degree of stability in economic output over the observed period. Although the standard deviation is relatively low, it's important to recognize that GDP can still exhibit cyclical fluctuations due to various factors such as business cycles, economic shocks, and policy changes.

Table 6.1: Descriptive statistic of the data sourced and estimated

Sourced data					
Variable	Obs	Mean	Std. Dev.	Min	Max
years	44	2000.5	12.84523	1979	2022
gd	44	37.22682	11.20625	21.99	73.18
g	44	27.94886	3.003128	23.3	37.5
tgr	44	14.32779	8.754365	-5.2537	36.8419
m3	44	12.795	6.120927	1.79	27.3
gdp	43	.255814	2.60926	-7.7	4.4
Estimated data					
gdp_c	43	-1.60e-08	2.222427	-6.404503	5.216139
gdp_p	43	.2558139	1.168958	-1.41614	2.185033
dtgr=tgr(y/Y)	44	4.444318	40.99032	-165.02	156.86
dg=g(y/Y)	44	4.900227	61.81538	-296.42	130.05
cnstnt_elstcy_tgr	44	-5.545716	0	-5.545716	-5.545716
cnstnt_elstcy_g	44	.0645911	0	.0645911	.0645911
cnstnt_elstcy_CAPB_tgr	44	.621052	2.510306	-8.082819	11.76652
cnstnt_elstcy_CAPB_g	44	-119.6091	343.7059	-1814.65	575.3934
cnstnt_elstcy_CAPB	44	120.2301	346.1164	-583.4762	1826.417
tvp_elstcy_tgr	44	-.2936364	.0048661	-.3	-.29
tvp_elstcy_g	44	.7606818	.2967059	.36	1.4
tvp_elstcy_CAPB_tgr	44	-1.356591	12.22918	-47.3	49.72
tvp_elstcy_CAPB_g	44	5.259546	45.5113	-247.4	67.85
tvp_elstcyCAPB	44	6.616136	56.26286	-297.13	115.15

The data estimated in the empirical work of this study reveal the *gdp_c* gross domestic product per capita growth rate cyclical component found with the use of the HP filter¹ has a mean

¹The Hodrick-Prescott (HP) filter refers to a data-smoothing technique. The HP filter is commonly applied during analysis to remove short-term fluctuations associated with the business cycle. The removal of these short-

rate of -1.60e%. The standard deviation of 2.222427 indicates the variability of the cyclical component around the mean. The range from -6.404503 to 5.216139 indicates the extent of cyclical fluctuations in GDP, with negative values representing contractions and positive values representing expansions. Understanding the cyclical components of GDP is crucial for assessing the business cycle phase. Positive values indicate economic expansion, whereas negative values indicate economic contraction. Policymakers use this information to implement appropriate economic policies to stabilize the economy during downturns and prevent overheating during periods of expansion. The gdp_p gross domestic product per capita growth rate trend component is found using the HP filter, and has a mean rate of 0.25%. The standard deviation of 1.168958 indicates the variability of the trend component around the mean growth rate. The trend component of the GDP reflects the underlying growth rate of the economy over time, abstracted from short-term fluctuations. A positive trend indicates economic growth, while a negative trend suggests economic contraction.

The $tgr = tgr(y/Y)$ government revenue times the output gap and the $dg = g(y/Y)$ government expenditure times the output gap are found to have averages of 4.44% and 4.90%, respectively, throughout the analysis. The time-varying elasticity for total government revenue and government expenditure is found to have a constant mean of -5.54% and 0.06%, respectively, between 1979 and 2022. The time-varying CAPB total government revenue and government expenditure were found to have main values of 0.62% and -119.60%, respectively. The time-varying CAPB has an average value of 120.23%. The tvp_elstcy_tgr time-varying elasticity for total government revenue and tvp_elstcy_g time-varying elasticity for government expenditure are found to have mean value of -0.29% and 0.76%, respectively. The average values were relatively lower than those found in time-varying elasticity. The $tvp_elstcy_CAPB_tgr$ time-varying CAPB for total government revenue, $tvp_elstcy_CAPB_g$ time-varying CAPB for government expenditure, and the tvp_elstcy_CAPB time-varying CAPB were found to have mean values of -1.35%, 5.25%, and 6.61%, respectively.

The constant elasticity parameters of $cnstnt_elstcy_tgr$, $cnstnt_elstcy_g$, $cnstnt_elstcy_CAPB_tgr$, $cnstnt_elstcy_CAPB_g$, and $cnstnt_elstcy_CAPB$. The varying ranges of these parameters reflect the sensitivity of revenue and expenditure to changes in the economic conditions and policy measures. Understanding elasticities and CAPB is essential for assessing the impact of fiscal term fluctuations reveals long-term trends. It is important to note that the estimated explains how it is calculated in the respective sections.

policies on revenue and expenditure dynamics. Policymakers can use this information to calibrate fiscal measures effectively by considering their potential effects on revenue generation and expenditure management. In contrast, time-varying elasticity tvp_elstcy_tgr , tvp_elstcy_g , $tvp_elstcy_CAPB_tgr$, $tvp_elstcy_CAPB_g$, and tvp_elstcy_CAPB . These parameters represent time-varying elasticities or CAPB for the total government revenue and government expenditure. The variability in these parameters reflects the changes in the responsiveness of revenue and expenditure to economic conditions over time. Time-varying elasticities provide insight into the dynamic nature of fiscal policy effectiveness. Policymakers can use this information to adapt fiscal measures in response to evolving economic conditions, ensuring that fiscal consolidation efforts remain effective and sustainable.

6.2.2 Correlation results

Table 6.2 highlights the correlation among the economic variables of interest used in the empirical work of this study. Correlation is a statistical term describing the degree to which two variables move in coordination with one another (Gujarati, 2021). The objective of fiscal consolidation is to reduce gd domestic government debt, and fiscal consolidation can be measured using the CAPB. As such, we analyze the correlation of gd domestic government debt with other economic variables, as well as those found to be statistically significant. In Table 6.2 it is found that g government expenditure has a positive 0.42 value of correlation with gd domestic government debt.

The rd debt service ratio is found to have a positive correlation of 0.70 and is statistically significant at $\alpha 5\%$. This result suggests the potential for a debt trap in the South African economy in the long run if the government increases payment, but government debt over time also increases. The tgr total government revenue was found to have a negative correlation value of -0.35. These results are in line with the economic theory of fiscal consolidation, which suggests that when there is an increase in tax or total government revenue, government debt will decrease.

The money supply variable, which is a proxy for the $m3$ money supply in South Africa, is found to have a negative correlation of -0.40 with gd government debt. This suggests that, as money supply increases in the economy, it is anticipated that government debt in the economy will fall. This suggests that quantitative easing may be effective in stabilizing government debt. The dgp gross domestic product per person was found to have a negative relationship with

domestic government debt, with a value of -0.10. When the time-invariant cyclically adjusted primary balance is factored in the correction, it is found that *cnstnt_elstcy_CAPB_tgr* and *cnstnt_elstcy_CAPB_g* which show the time-invariant cyclically adjusted primary balance government revenue, as well as government expenditure, have a positive correlation with domestic government debt with a value of 0.02 and 0.05 respectively. This direction is reflected in the positive correlation of both *_elstcy_CAPB_tgr* and *cnstnt_elstcy_CAPB_g* with *gd* which is not in line with the fiscal consolidation rationale that government expenditure cuts and the tax increase will result in the reduction of domestic government debt. Nevertheless, *cnstnt_elstcy_CAPB* is found to have a negative correlation with *gd* domestic government debt, with a value of -0.05. This indicates that fiscal consolidation might be successful in reducing domestic government debt if it is undertaken through the use of both government expenditure cuts and tax increases.

When we account for the time variation of elasticity, we find that the cyclically adjusted primary balance for total government revenue has a positive relationship with government debt, reflected by the value of 0.1. Moreover, similar to the cyclically adjusted primary balance for total government revenue, the cyclically adjusted primary balance for government expenditure was also found to have a positive relationship with government debt, with a value of 0.10. The time-varying adjusted primary balance also has a positive relationship with government debt, at a value of 0.08.

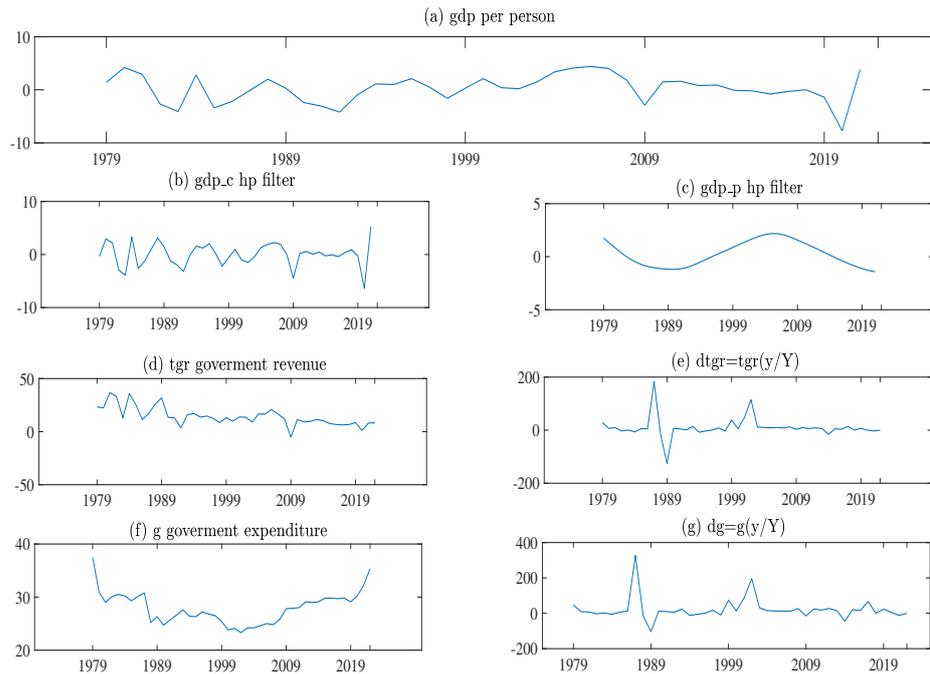
Table 6.2: Co-relation matrix result

Variables	gd	g	rd	tgr	m3	gdp	cnstnt_elstcy_CAPB_tgr	cnstnt_elstcy_CAPB_g	cnstnt_elstcy_CAPB
gd	1.0000								
g	0.4240	1.0000							
	0.1487								
rd	0.7076*	0.6201*	1.0000						
	0.0006	0.0120							
tgr	-0.3529	0.0351	-0.4376	1.0000					
	0.6765	1.0000	0.6332						
m3	-0.4095	-0.2981	-0.3470	0.6799*	1.0000				
	0.2078	1.0000	1.0000	0.0000					
gdp	-0.1044	-0.1745	-0.5967*	0.3623	0.4087	1.0000			
	1.0000	1.0000	0.0289	0.6111	0.2345				
Co-relation result with constant time-varying CAPB									
Variables	gd	g	rd	tgr	m3	gdp	cnstnt_elstcy_CAPB_tgr	cnstnt_elstcy_CAPB_g	cnstnt_elstcy_CAPB
cnstnt_elstcy_CAPB_tgr	0.0253	0.0147	0.1406	-0.3442	-0.1377	-0.0629	1.0000		
	1.0000	1.0000	1.0000	0.7976	1.0000	1.0000			
cnstnt_elstcy_CAPB_g	0.0563	0.0184	-0.1055	0.0948	-0.0554	-0.0135	-0.9285*	1.0000	
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000		
cnstnt_elstcy_CAPB	-0.0558	-0.0182	0.1057	-0.0967	0.0540	0.0129	0.9295*	-1.0000*	1.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	
Co-relation result with time-varying CAPB									
Variables	gd	g	rd	tgr	m3	gdp	cnstnt_elstcy_CAPB_tgr	cnstnt_elstcy_CAPB_g	cnstnt_elstcy_CAPB
tvp_elstcy_CAPB_tgr	0.0125	0.0083	0.1354	-0.3463	-0.1387	-0.0620	1.0000		
	1.0000	1.0000	1.0000	0.7672	1.0000	1.0000			
tvp_elstcy_CAPB_g	0.1050	0.0004	0.0235	0.0680	-0.0802	-0.0200	-0.8485*	1.0000	
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000		
tvp_elstcy_CAPB	0.0822	-0.0015	-0.0101	0.1303	-0.0347	-0.0027	-0.9038*	0.9934*	1.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	

6.2.3 Hodrick-Prescott filter results

Section 5.4.9.4 shows that the HP filter is used to find the \hat{y} that reflects the proportion of the output gap to the total output Y . Figure 6.1 shows the dgp gross domestic product factored in the HP filter framework. The empirical work of this study uses yearly data and follows [Bouthevillain et al. \(2001\)](#) and [Hodrick and Prescott \(1997\)](#) by using 100 as λ as the smoothing parameter.

Figure 6.1: Hodrick-Prescott filter for the GDP.



Graph (a)-(g) is the Hodrick–Prescott filter for GDP. Note graph (a) and dgp per person is the gross domestic product, graph (b) and $dgp.c.hp_filter$ is the gross domestic product trend component from the Hodrick-Prescott (HP) Filter, graph (c) and $dgp.p.hp_filter$ is the gross domestic product cyclical component from the Hodrick-Prescott (HP) Filter, graph (d) and tgr is the total government revenue, graph (e) and $tgr = tgr(y/Y)$ is the total government revenue times the proportion of the output gap, graph (f) and g is government expenditure, graph (g) and $g = g(y/Y)$ is government expenditure times the proportion of the output gap.

In figure 6.1, graph (a) reflects the actual data for dgp ; when it is a factor in the HP filter, the $dgp.c$ cyclical component of the gross domestic product per person, as shown in graph (b). By contrast, $dgp.p$ reflects the trend component of the gross domestic product per person, as shown in graph (c). In graph (b), $dgp.c$ is more volatile than $dgp.p$. To find a description of the action that can be attributed to fiscal authorities to apply fiscal consolidation, cyclical movements in economic variables need to be filtered out. If the cyclical component is filtered out, it is left with a trend that is not related to cyclical movement ([Alesina and Perotti, 1995](#)). As

such, fiscal consolidation focuses on the trend movement, as reflected in Figure 6.1, Graph (c). Figure 6.1, graph (c), *gdp.c.hp.filter* is the gross domestic product cyclical component from the Hodrick-Prescott (HP) filter . On the other hand, graph (f) reflects *g* government expenditure over time, which has been on a downward trend from 1979 until 1994, when it started showing an upward trend. In an effort to find movement from the total government revenue as well as government expenditure, which are not associated with the cyclical movement as advocated in the fiscal consolidation policy. The two economies are multiplied by the trend component of the gross domestic product per person, and the results are presented in graphs (f) and (g).

6.2.4 Unit root results

Table 6.3 shows the stationary test results of the Dickey-Fuller and Phillips-Perron tests for the unit roots.

Table 6.3: Dickey-Fuller and Phillips-Perron test for unit root

Variables	Test	Dickey-Fuller test for unit root				Phillips-Perron test for unit root			
		Test	1%	5%	10%	Test	1%	5%	10%
d.gd	Z(t)	-3.902	-3.634	-2.952	-2.610	-3.924	-3.634	-2.952	-2.610
d.g	Z(t)	-7.018	-3.634	-2.952	-2.610	-7.124	-3.634	-2.952	-2.610
d.tgr	Z(t)	-9.221	-3.634	-2.952	-2.610	-3.506	-3.628	-2.950	-2.608
d.m3	Z(t)	-6.166	-3.634	-2.952	-2.610	-2.677	-3.628	-2.950	-2.608
gdp	Z(t)	-4.710	-3.634	-2.952	-2.610	-4.649	-3.634	-2.952	-2.610
d.rd	Z(t)	-9.403	-3.736	-2.994	-2.628	-10.045	-3.736	-2.994	-2.628

MacKinnon approximate p-value for Z(t) = 0.0000 and number of obs = 42

The ADF and P-P test results show that, at a level, the unit root null hypothesis could not be rejected, which was not stationary at the level for all economic variables considered except for *gdp*. The ADF and P-P test results show that the unit root null hypothesis could not be rejected in levels, but was rejected in the first differences at the 1% level. This is because all *t* – test values of the economic variables of *d.gd*, *d.g*, *d.rd*, *d.tgr* and *d.m3* are greater than the first differences at the 1% level. Thus, it is concluded that the economic variables of *d.gd*, *d.g*, *d.rd*, *d.tgr* and *d.m3* are stationary at the first differences.

6.2.5 Lag selection and cointegration result

Table 6.4 shows the selection order criteria of lag that must be used when considering the model estimated in this study.

Table 6.4: Selection-order criteria

Selection-order criteria for variables: tgr and $dg = t * (dtgr_p/gdp)$								
lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-340.914				95795	17.1457	17.1762	17.2301*
1	-336.294	9.2392	4	0.055	92923.1	17.1147	17.2063	17.368
2	-330.807	10.974	4	0.027	86443.4	17.0404	17.193	17.4626
3	-324.851	11.913*	4	0.018	78752.5*	16.9425	17.1563*	17.5336
4	-320.78	8.1412	4	0.087	79135.9	16.939*	17.2138	17.699
Sample: 1983 - 2022							Number of obs = 43	
Selection-order criteria for variables: g and $dg = g * gdp_p/gdp$								
lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-318.448				31152.9	16.0224	16.0529	16.1068
1	-284.882	67.132	4	0.000	7107.52*	14.5441*	14.6357*	14.7974*
2	-283.038	3.688	4	0.450	7932.88	14.6519	14.8046	15.0741
3	-277.886	10.305*	4	0.036	7523.66	14.5943	14.808	15.1854
4	-276.615	2.5409	4	0.637	8696.46	14.7308	15.0056	15.4908
Sample: 1983 - 2022							Number of obs = 42	
Note that * reflect the 1%, 5% and 10% levels, respectively denoted by *, **, and *** for statistical significance at the 1%, 5% and 10% levels, respectively.								

The elasticity equations 5.109 and 5.111 which are explained in Section 5.3.1 were applied in the economic models VAR and VEC, which allow economic variables to be explained by their past values. As such, it is important to ascertain which lag or past information (number of years back in the context of this study) of economic variables is to be used. For the elasticity of the total government revenue equation 5.109, it is found that the lag order that needs to be used is three. A lag order of three for the elasticity of total government revenue is approved by the selection order criteria LR, FPE, and HQIC, as reflected in Table 6.4. On the other hand, in the elasticity equation 5.111 for government expenditure, it is found that a lag order of one will be effectively used. The lag order of 1 for the elasticity equation for government expenditure is

approved by the FPE, AIC, HQIC, and SBIC, as shown in Table 6.4. The lag of one regressor captured the annual nature of the national budget process.

Table 6.5: Johansen tests for cointegration

Cointegration for variables: tgr and $dg = t * (dtgr_p/gdp)$					
maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	6	-368.91331	.	36.9264	15.41
1	9	-353.48155	0.52042	6.0628	3.76
2	10	-350.45013	0.13442		
Trend: constant			Number of obs = 42		
Sample: 1981 - 2022			Lags = 2		
Cointegration for variables: g and $dg = g * (gdp_p/gdp)$					
maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	6	-308.31537	.	23.0727	15.41
1	9	-296.88752	0.41968	3.76	0.2170
2	10	-296.77904	0.00515		
Trend: constant			Number of obs = 42		
Sample: 1981 - 2022			Lags = 2		

The Johansen cointegration test is shown in Table 6.5 and tests where there is a long-run relationship between the economic variables of interest for elasticity equations 5.109 and 5.111. Table 6.5 shows the elasticity of the total government revenue elasticity variables for equation 5.109 there is no long-run relationship between the economic variables. Thus, we can conclude that the VAR model is more effective than the error correction model. The Johansen tests for the cointegration test show that equation 5.111 of the elasticity for government expenditure has a maximum rank of 1. This reflects that is one system in equation 5.111 indicating that there is a long-run relationship between the economic variables. Equation 5.111 of the elasticity of government expenditure shows that the vector correction model is suitable for estimating the elasticity of government expenditure.

6.3 Objective one econometric results

6.3.1 Time in-variant elasticity of CAPB using VAR and VEC model results

Table 6.6 shows the VAR model as well as the VEC model econometric results from the estimate of time-invariant elasticity for equation 5.109 representing elasticity for total government revenue and equation 5.111 representing elasticity for government expenditure. The model was estimated to cover the period from 1979 to 2022. The findings outlined in section 6.2.5 show that the economic variables considered to estimate the elasticity of total government revenue outlined by equation 5.109 have no long-run relation, and the VAR model is estimated. It is found that the second lag $dtgr$ in total government revenue has a coefficient value of 0.06%, which is statistically significant at p 5%. These results suggest that for a 1% increase in the second lag, the total government revenue–output gap share to total output will result in a 0.06%² increase in total government revenue. The coefficient of $dtgr$ total government revenue output gap share to total output reflects the $cnstnt_elstcy_tgr$ constant elasticity of total government revenue. In the context of fiscal consolidation, $dtgr$ total government revenue output gap share to total output as an economic variable, filtered out the cyclical component using the HP filter. As such, it reflects a trend movement that is not associated with cyclical movements in the economy.

On the other hand, there is a reflection of insignificant coefficients for lag first and lag third of total government revenue implying that the immediate past first lag 1 and the preceding two periods' third lag of government revenue do not have a statistically significant impact on the current level of government revenue. This suggests that there may be other factors or dynamics at play that overshadow the influence of government revenue from the immediate or relatively recent past. For instance, changes in economic conditions, policy reforms, or external shocks may have a more pronounced effect on current government revenue than revenue patterns just one or two periods ago. At the policy level, policymakers must focus on understanding and addressing the immediate determinants of government revenue. This suggests that efforts to influence government revenue should be responsive to current economic conditions and policy contexts, rather than relying solely on recent revenue patterns. Additionally, policymakers may need to consider long-term trends and structural factors that could affect government revenue

²It is important to note that the coefficient value of 0.06 reflects the responsiveness of fiscal authority using government revenue or tax. This does not reflect discretionary actions. The discretionary action is reflected when $dtgr$ is multiplied by tgr which reflects the CAPB undertaken through taxes.

sustainability and growth rather than solely focusing on short-term fluctuations. Moreover, the insignificant coefficients for the first lag and third lag emphasize the importance of considering a broader range of variables and potential drivers of government revenue when designing fiscal policies and revenue forecasting models.

Table 6.6: VAR model and EVC model

	VAR model	VEC model
Variable	tgr	g
main		
L.dtgr	0.0341 (1.35)	
L2.dtgr	0.0646** (2.65)	
L3.dtgr	0.0380 (1.45)	
D.dg		
L.ce1		-5.546*** (-5.90)
_cons	2.283 (1.02)	0.000500 (0.00)
N	41	43

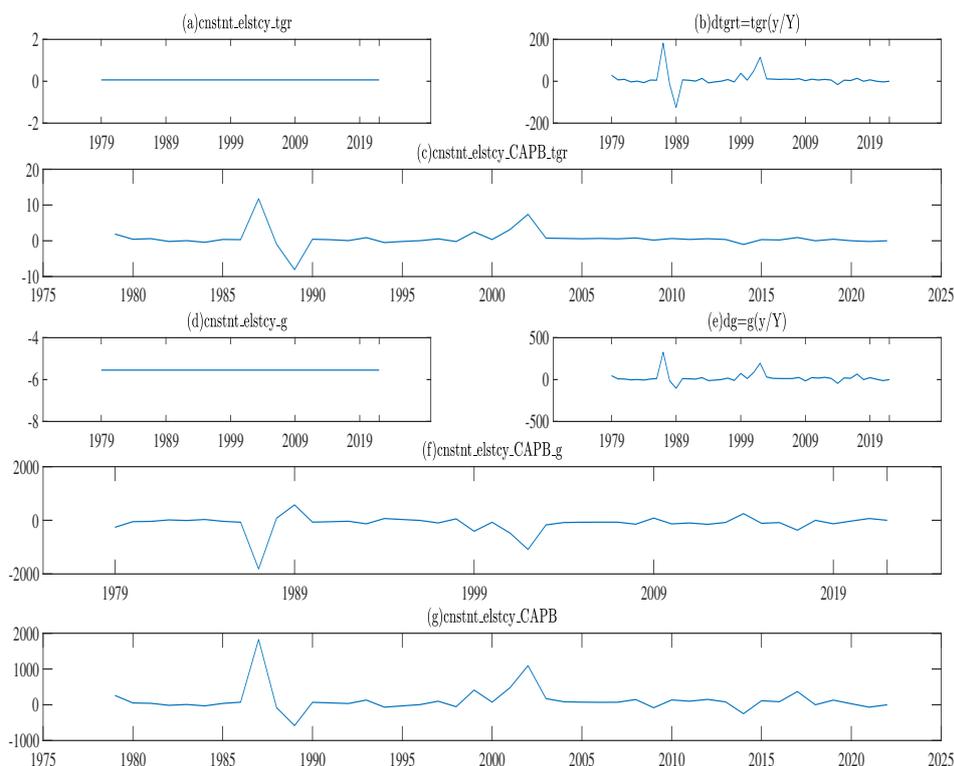
t statistics in parentheses * $p < 0.05$ meaning there is less than a 5% chance that the observed results occurred by random chance. The ** $p < 0.1$, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** $p < 0.01$, meaning there is less than a 1% chance that the observed.

When cyclical components have been filtered out, what is left is the trend component remains, which can be attributed to government intervention or discretionary action by fiscal authorities in the economy. The government intervention or discretionary action of fiscal authorities in applying fiscal consolidation through tax can be presented as the *dtgr* total government rev-

enue output gap share to total output. This rationale was advocated by (Giorno et al., 1995; Van den Noord, 2000; Bouthevillain et al., 2001; Braconier et al., 2004; Girouard and André, 2006; Fedelino et al., 2009; Princen et al., 2013; Moure et al., 2013), among others. A positive value of $dtgr$ represents the fiscal policy authority's intention to increase taxes. The empirical work of this study can conclude that the coefficient value of 0.06% reflects how responsive African fiscal policy authorities are in using taxes from 1979 to 2022. Given the very low value of the coefficient of 0.06%, this suggests that South African fiscal policy authorities are not responsive to using tax to stabilize the economy. We find that a 1% increase in g government expenditure output gap share to total output will result in a 5.5% decrease in government expenditure. The coefficient of g government expenditure output gap share to the total output reflects the $cnstnt_elstcy_g$ time-in-varying elasticity of government expenditure. The 5.5% coefficient reflects fiscal authorities' constant responsiveness in the use of government expenditure.

Figure 6.2 shows the constant elasticity of CAPB derived from one of the estimations in Table 6.6. The CAPB is a measure of a government's fiscal stance adjusted to exclude cyclical factors that affect the government's budget balance, such as changes in tax revenues and spending due to the economic cycle. The IMF and OECD frameworks use the constant elasticity of CAPB as a measure of fiscal consolidation, which is the process of reducing a government's budget deficit or debt. The constant elasticity of the CAPB can be used as a measure of fiscal consolidation. Figure 6.2 graphs (a) and (d) show the $cnstnt_elstcy_tgr$ and $cnstnt_elstcy_g$ constant elasticities of total government revenue, respectively. These constant elasticities are multiplied by the output gap that has filtered out the cyclical moments shown with $tgr = tgr(y/Y)$ and $dg = g(y/Y)$ of graphs (b) and (e), which represent the application Equations 5.4 and 5.6. Given that $tgr = tgr(y/Y)$ and $dg = g(y/Y)$ show movements that filter out the cyclical movement, $tgr = tgr(y/Y)$ and $dg = g(y/Y)$ movements can be attributed to the discretion of fiscal authorities. When $tgr = tgr(y/Y)$ and $dg = g(y/Y)$ (discretionary action of fiscal authority) are multiplied by the elasticity of $cnstnt_elstcy_tgr$ and $cnstnt_elstcy_g$, respectively, we obtain graphs (c) and (f). Figure 6.2 graphs (c) and (f) reflect the constant or time-invariant elasticity of the CAPB of total government revenue denoted by $cnstnt_elstcy_CAPB_tgr$ and constant or time-invariant elasticity of the CAPB of government expenditure denoted by $cnstnt_elstcy_CAPB_g$ respectfully reflecting the application of 5.1 and 5.2 outlined in the theoretical framework in Section 5.3.1.

Figure 6.2: CAPB of G and TGR with constant elasticity

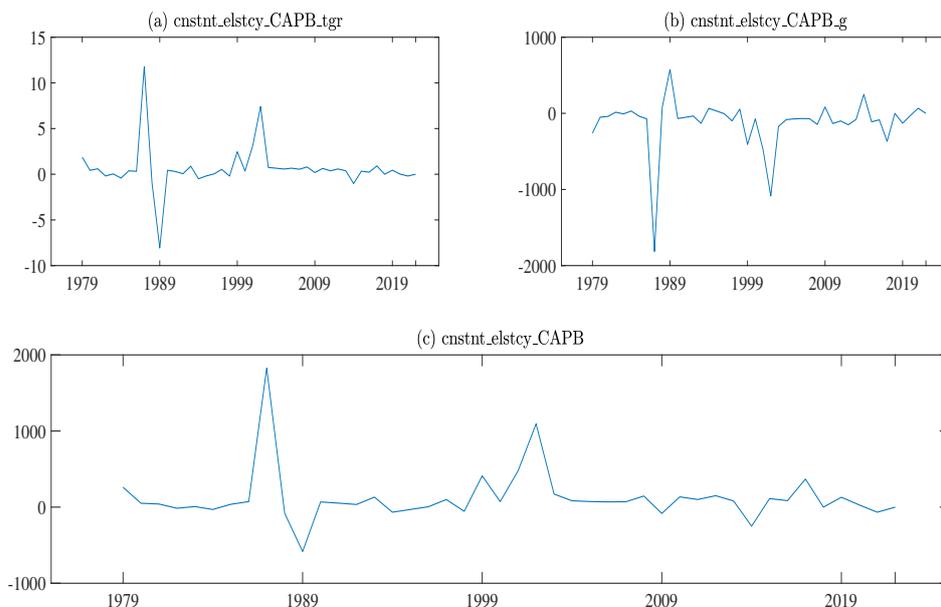


Note: graph (a)-(g) is the CAPB with constant elasticity. The economic variable that gdp is the gross domestic product, $gdp_c_hp_filter$ is the gross domestic product cyclical component from the Hodrick-Prescott (HP) Filter, $gdp_c_hp_filter$ is the gross domestic product cyclical component from the Hodrick-Prescott (HP) Filter, tgr is the total government revenue, $tgr = tgr(y/Y)$ is the total government revenue times the proportion of the output gap, g is government expenditure, and $g = g(y/Y)$ is government expenditure times the proportion of the output gap.

Figure 6.2 presents the important policy implications for governments and policymakers. The constant elasticity of the CAPB is a measure of a government's fiscal stance adjusted for the effects of the economic cycle, and it provides a useful tool for assessing the effectiveness of fiscal policies in achieving budgetary consolidation. The results in Figure 6.2 can inform policy decisions by providing information on the appropriate mix of revenue and expenditure measures required to achieve fiscal consolidation. Policymakers can use the constant elasticities of revenue and expenditure to identify the most effective measures to achieve their desired fiscal targets. For example, if the constant elasticity of revenue is higher than that of expenditure, it may be more effective to focus on revenue-raising measures such as tax increases rather than expenditure

reductions. Furthermore, the time-invariant elasticity of the CAPB can be used as a benchmark to assess the sustainability of a government’s fiscal stance in the long term. If a government’s fiscal policy is not aligned with the constant elasticity of CAPB, it may face challenges in achieving long-term sustainability.

Figure 6.3: CAPB with constant elasticity



Note: that *cnstnt_elstcy_tgr* is the time in-varying elasticity for total government revenue, *cnstnt_elstcy_g* it is the time in-varying elasticity for government expenditure, and *cnstnt_elstcy_CAPB* is the time in-varying CAPB for total government revenue and government expenditure

Figure 6.3 shows a CAPB with a constant elasticity. Figure 6.3 graph (c) shows the CAPB with constant elasticity reflection for the application of equation 5.3 outlined in the theoretical framework in Section 5.3.1. The period from 1979 to 1994 reflects the high volatility of *cnstnt_elstcy_CAPB_tgr*, *cnstnt_elstcy_CAPB_g* and *cnstnt_elstcy_CAPB*. This reflects the government’s willingness to apply for fiscal consolidation.

Table 6.7: VAR stability condition

Eigenvalue stability condition		
Eigenvalue		Modulus
.8781253		.878125
-.3918611	+ .6125297i	.72715
-.3918611	- .6125297i	.72715
.08273033	+ .5868185i	.592622
.08273033	- .5868185i	.592622
.05459666		.054597

Table 6.7 reflects the VAR stability condition, and the results in the table indicate that the model is stable; hence, all model eigenvalues are below 1. Table 6.8 shows the results for normally distributed residuals. In table 6.8 it is found the probability values are less than 0.01 which means that you reject the null hypothesis of normality of residuals. When the residuals are not normally distributed, the hypothesis is that they are random datasets. This means that there may be limits in explaining all trends in the dataset. This indicates that the data are further embedded in the time-varying model, not the VAR model; however, this is not a limitation. As such the time-varying model is the one that will fully explain the behaviour of a system of the model applied in the empirical work of this study.

Table 6.8: Normally distributed residuals

Jarque-Bera test					
Equation	chi2	df	Prob	chi2	
tgr	12.381	2	0.00205		
dtgr	73.254	2	0.00000		
ALL	85.636	4	0.00000		
Kurtosis test					
Equation	Kurtosis	chi2	df	Prob	chi2
tgr	5.3889	9.750	1	0.00179	
dtgr	8.3698	49.259	1	0.00000	
ALL		59.009	2	0.00000	

6.3.2 Time-varying elasticity of CAPB using TVP-VAR model results

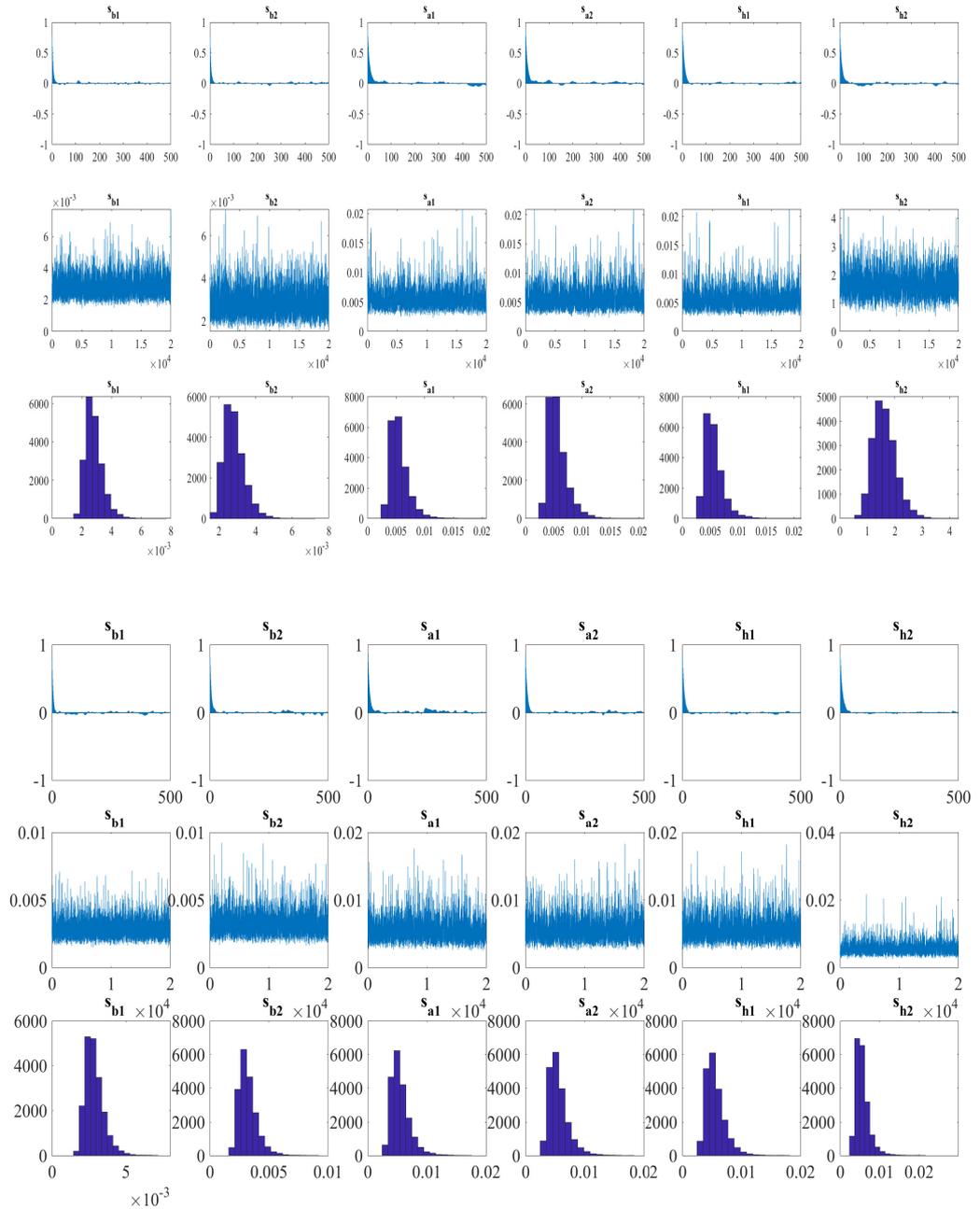
Table 6.9: Estimation of selected parameters in the TVP-VAR model

Estimation of <i>tpvar_elstcy_tgr</i>						
Parameter	Mean	Stdev	95%U	95%L	Geweke	Inef.
sb1	0.0029	0.0006	0.0020	0.0043	0.157	9.97
sb2	0.0028	0.0006	0.0020	0.0042	0.346	6.59
sa1	0.0056	0.0016	0.0034	0.0097	0.912	12.51
sa2	0.0058	0.0022	0.0034	0.0109	0.319	26.66
sh1	0.0056	0.0017	0.0034	0.0100	0.995	14.81
sh2	1.5984	0.4177	0.9125	2.5323	0.420	11.63
TVP-VAR model (Lag = 1)				Iteration: 20000		
Estimation of <i>tpvar_elstcy_g</i>						
Parameter	Mean	Stdev	95%U	95%L	Geweke	Inef.
sb1	0.0028	0.0006	0.0020	0.0042	0.630	8.37
sb2	0.0028	0.0006	0.0020	0.0043	0.842	7.23
sa1	0.0055	0.0015	0.0034	0.0093	0.124	11.92
sa2	0.0056	0.0018	0.0034	0.0100	0.271	13.39
sh1	0.0057	0.0018	0.0034	0.0100	0.324	20.59
sh2	0.0055	0.0016	0.0033	0.0096	0.084	15.98
TVP-VAR model (Lag = 1)				Iteration: 20000		

Table 6.9 shows the estimated results for the posterior means, standard deviations, the 95% credible intervals, the convergence diagnostics of Geweke, and the inefficiency factors and were estimated using the MCMC sample. Estimations of the selected parameters are performed for government revenue and government expenditure in equations 5.8 and 5.10 respectively. The Convergence Diagnostics (CD) advocated by Geweke (1992) and the null hypothesis for the convergence of posterior distributions are not rejected. This is because all Geweke results are greater than the 5% level of significance. Moreover, the posterior mean of the estimated parameters is within the confidence intervals. The inefficiency factors imply that the null hypothesis of convergence to the posterior distribution is not rejected for any model parameter. Therefore, the diagnostic results confirm that the MCMC algorithm efficiently generated posterior draws.

The results also indicate efficient sampling because the inefficiency factors are below 100.

Figure 6.4: Estimation sample autocorrelation

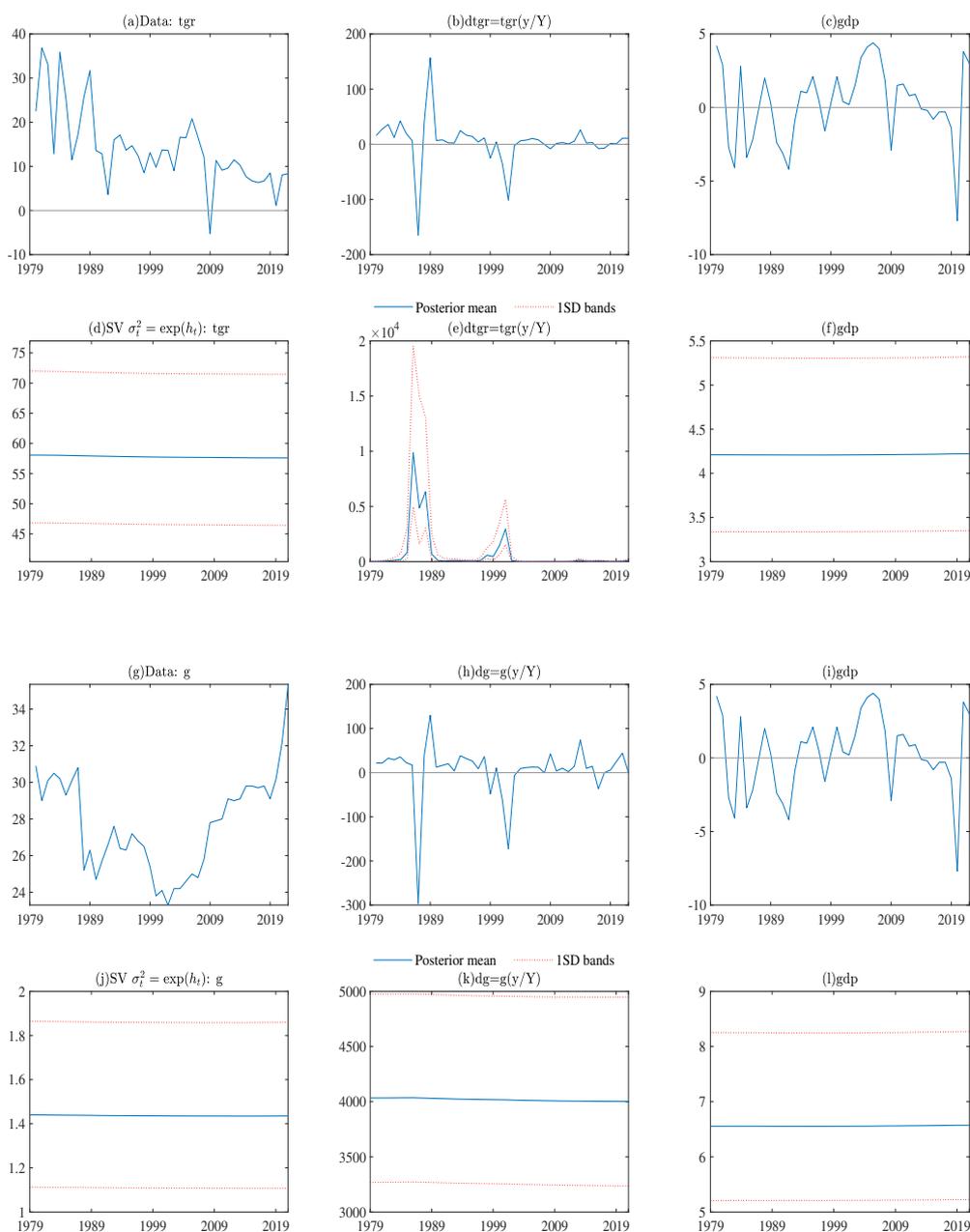


Note: The first three-row graphs reflect the estimates of the moments and posterior distributions of the model for G . Note: Estimates of \sum_a and \sum_β are multiplied by 100. On the other hand, the last three-row graphs reflect the estimates of the moments and posterior distributions of the model for TGR . Note: The estimates of \sum_a and \sum_β are multiplied by 100.

Figure 6.4 shows the estimation sample autocorrelation for the TVP-VAR regression model using the simulated data by drawing $M=20\,000$ samples after discarding the initial 2,000 samples by assuming the following prior distributions. Figure 6.4 shows the sample autocorrelation function, sample paths, and posterior densities of the selected parameters. After discarding the samples in the burn-in period (initial 2,000 samples), the sample paths appear stable, and the sample autocorrelations experience a stable drop, indicating that our sampling method efficiently produces samples with low autocorrelation. The estimation results of the TVP regression model (with stochastic volatility) for the simulated data are shown together with the sample autocorrelations (top panel), sample paths (middle panel), and posterior densities (bottom panel). The top panel in Figure 6.4 shows the sample autocorrelation, as in Nakajima et al. (2011), which is reflected in efficient minimal autocorrelation. The sample paths (middle panel) reflect the sample data that were considered using 20 000 iterations and the burden on 2000. Posterior densities (bottom panel) were normally distributed.

Figure 6.5 shows the data from 1979 to 2020, reflected in rows 1 and 3 of the economic variables considered in Equations 5.8 and 5.10 in the first and second panels, respectively. Figure 6.5 shows the stochastic volatility estimates for data from 1979 to 2022. The volatility among the economic variables is found to be stable over time, where *dtgr* total government revenue gap share to total output was found to be volatile in the 1980s as well as between 1990 and 1996.

Figure 6.5: Data and posterior estimates for stochastic volatility



Note: the economic variable that gdp is the gross domestic product, tgr is the total government revenue, $tgr = tgr(y/Y)$ is the total government revenue times the proportion of the output gap, g is government expenditure, and $g = g(y/Y)$ is government expenditure times the proportion of the output gap.

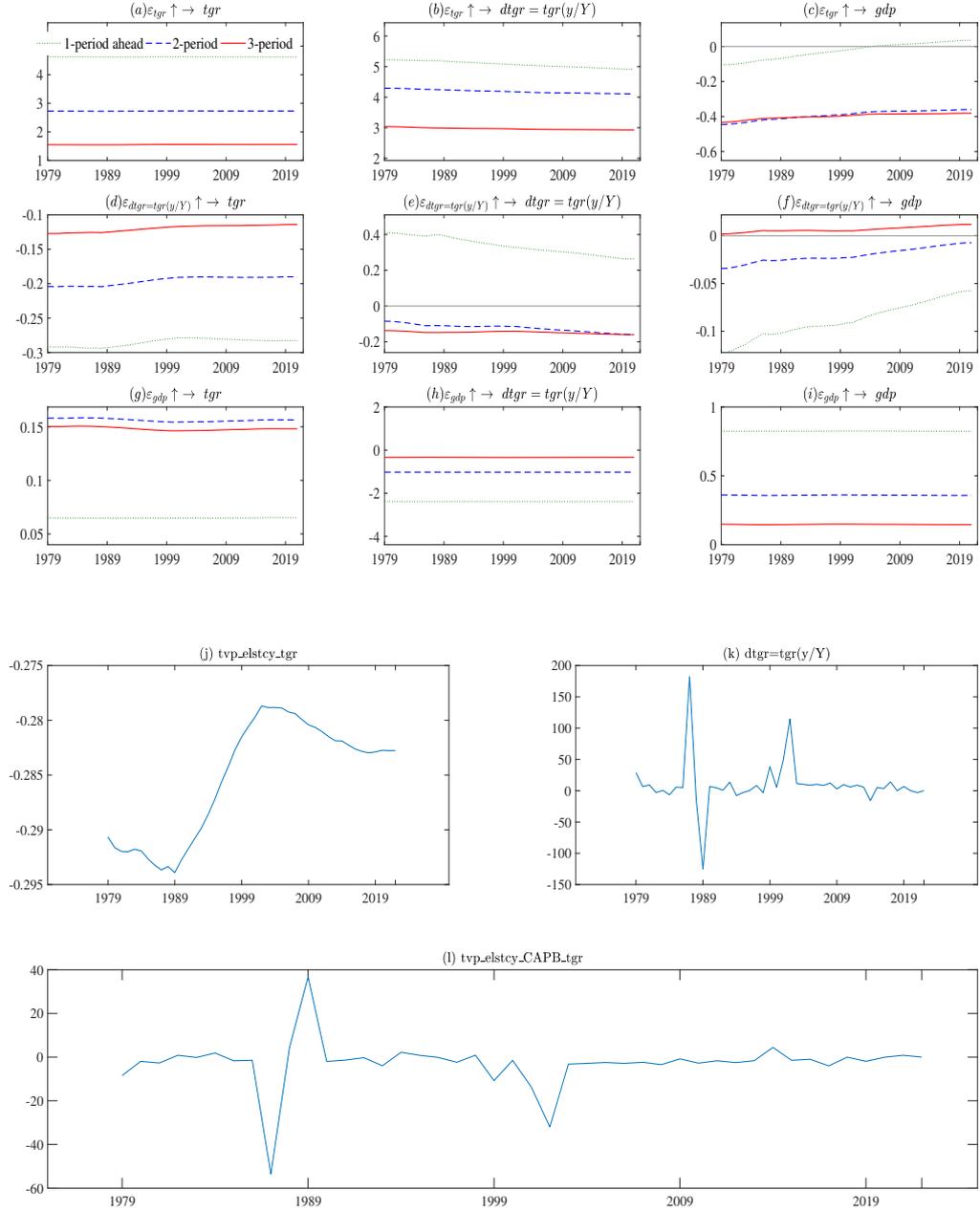
Figure 6.6 shows the TVP-VAR impulse responses for 1979 to 2022. The $dtgr$ total government revenue gap shares the total output, reflecting the application in equation 5.8, factored in

the TVP-VAR model in equation 5.73 and the state-space model in equation 5.74. The variable of interest is graph (d); in Figure 6.6 impulse responses in the context of fiscal consolidation reflect time-varying elasticities, which are in contrast to the constant elasticity applied in the IMF framework. This time-varying elasticity reflected in graph (d) is from the TVP-VAR model and is also reflected in graph (j) in Figure 6.6 reflecting movement over time. To represent this elasticity in fiscal consolidation, the $dtgr$ total government revenue gap shares with the total output in graph (k) of Figure 6.6 is multiplied by $tvpelestcy_tgr$ in graph (g). This results in $tvpelestcy_CAPB_tgr$, which reflects the CAPB with a time-varying elasticity graph (i) in Figure 6.6.

Figure 6.7 shows the TVP-VAR impulse responses for 1979 to 2022. The government expenditure gap in dg shares the total output, reflecting the application of equation 5.10, factored in the TVP-VAR model in equation 5.73 and the state-space model in equation 5.74. The variable of interest is graph (d) in Figure 6.6 dg government expenditure gap share to total output impulse responses from 1979 to 2022 in the context of fiscal consolidation reflected by the time-varying elasticities, which are in contrast to the constant elasticity applied in the IMF framework. This time-varying elasticity reflected in graph (d) is from the TVP-VAR model and is also reflected in graph (j) in Figure 6.7 reflecting movement over time. To represent this elasticity in fiscal consolidation, the dg government expenditure gap share in the total output graph (k) of figure 6.7 is multiplied by $tvpelestcy_g$ in graph (g). This results in $tvpelestcy_CAPB_g$, which reflects the CAPB with a time-varying elasticity graph (i) in Figure 6.7.

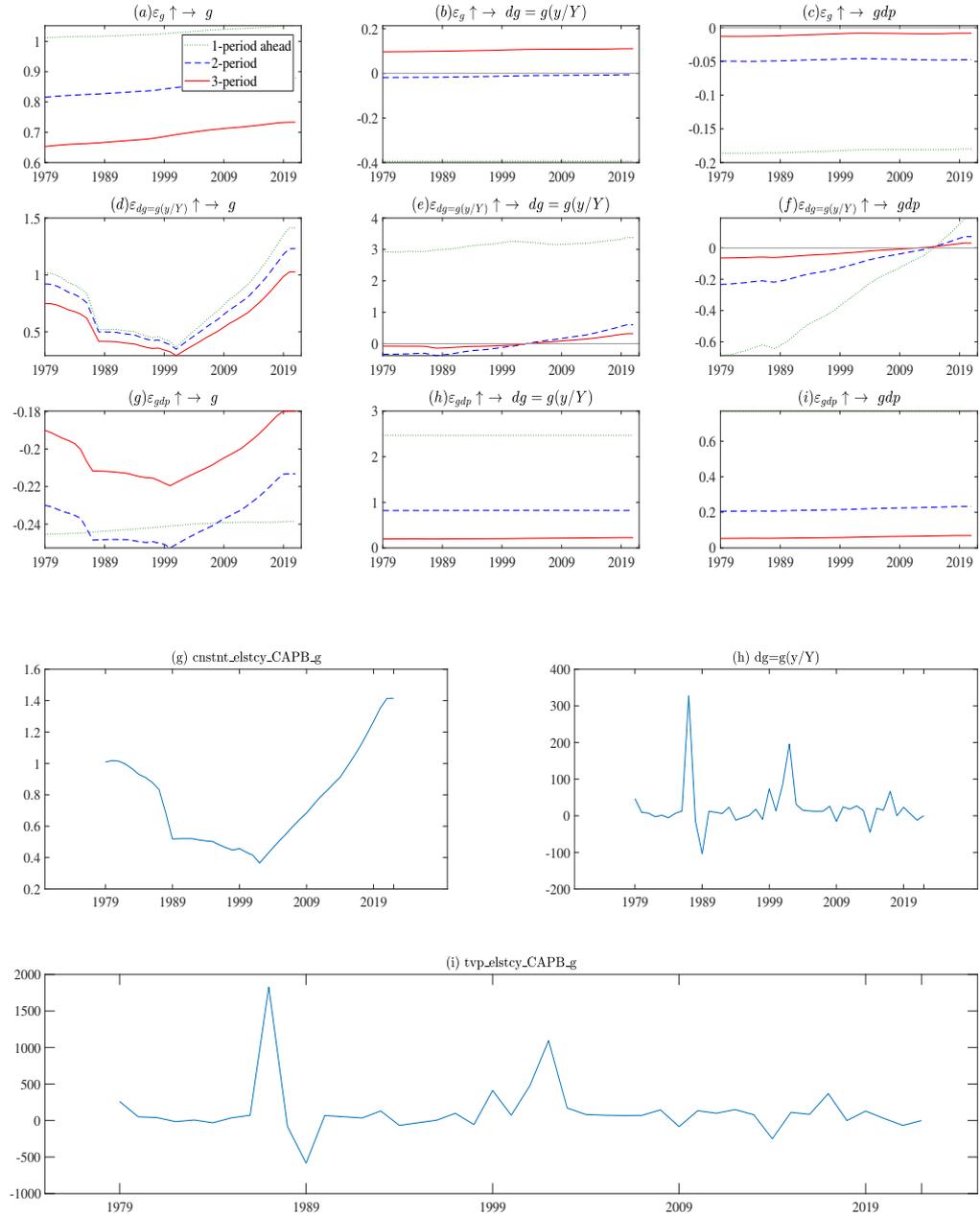
Figure 6.8 shows the time-varying data for $tvpelestcy_CAPB_tgr$, $tvpelestcy_CAPB_g$ and $tvpelestcy_CAPB$ from 1979 to 2022. In figure 6.8 (c), $tvpelestcy_CAPB$ reflects the cyclically adjusted primary balance with time-varying elasticity calculated in this empirical study as per the theoretical framework as well as the model explaining section 5.2 in the methodology. The time-varying cyclically adjusted primary balance represented in Graph (c) is the summation of the cyclically adjusted primary balance for government revenue less cyclically adjusted primary balance as well as government expenditure. It was found that $tvpelestcy_CAPB$ was very volatile throughout the analyses. The $tvpelestcy_CAPB$ has a range of -297.13% and 115.5% as the maximum values, respectively. In the first eight years, $tvpelestcy_CAPB$ was characterized by an average value of 26.36%. In the same period, the maximum value was 45.85% in 1989 and the lowest value was -11.06% in 1985. The $tvpelestcy_CAPB$ drastically fell to -297.13%, which is thought to be an outlier in the data. The observation of data reflects that this could be related to a fall in gross domestic product per person in the same year. The $tvpelestcy_CAPB$ next

Figure 6.6: TVP-VAR impulse responses and time-varying elasticity of $tvp_elstcy_CAPB_tgr$



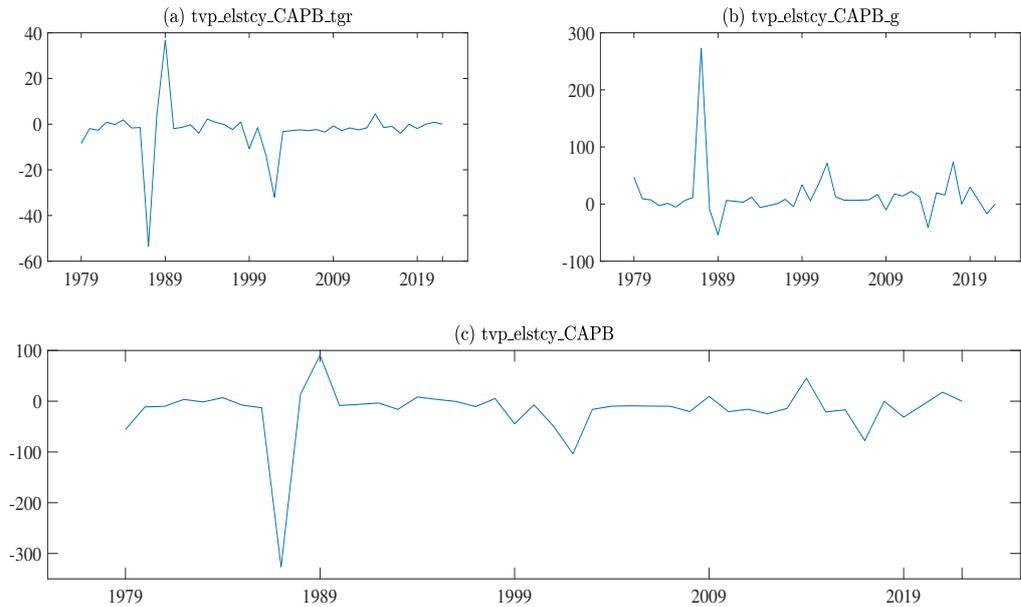
Note: the economic variable that gdp is the gross domestic product, tgr is the total government revenue, $tgr = tgr(y/Y)$ is the total government revenue times the proportion of the output gap, g is government expenditure, $g = g(y/Y)$ is government expenditure times the proportion of the output gap, tvp_elstcy_tgr is the time-varying elasticity for government revenue, and $tvp_elstcy_CAPB_tgr$ is the time-varying CAPB for total government revenue.

Figure 6.7: TVP-VAR impulse responses and time-varying elasticity of $tvp_elstcy_CAPB_g$



Note: the economic variable that gdp is the gross domestic product, g is the government expenditure, $g = g(y/Y)$ is government expenditure times the proportion of the output gap, tvp_elstcy_tgr is the time-varying elasticity for government revenue, and $tvp_elstcy_CAPB_g$ is the time-varying CAPB for total government expenditure.

Figure 6.8: TVP-VAR data for $tvp_atcy_CAPB_tgr$, $tvp_elstcy_CAPB_g$ and tvp_elstcy_CAPB



Note: the economic variable of $tvp_elstcy_CAPB_tgr$ is the time-varying CAPB for total government revenue, $tvp_elstcy_CAPB_g$ is the time-varying CAPB for government expenditure, and tvp_elstcy_CAPB is the time-varying CAPB.

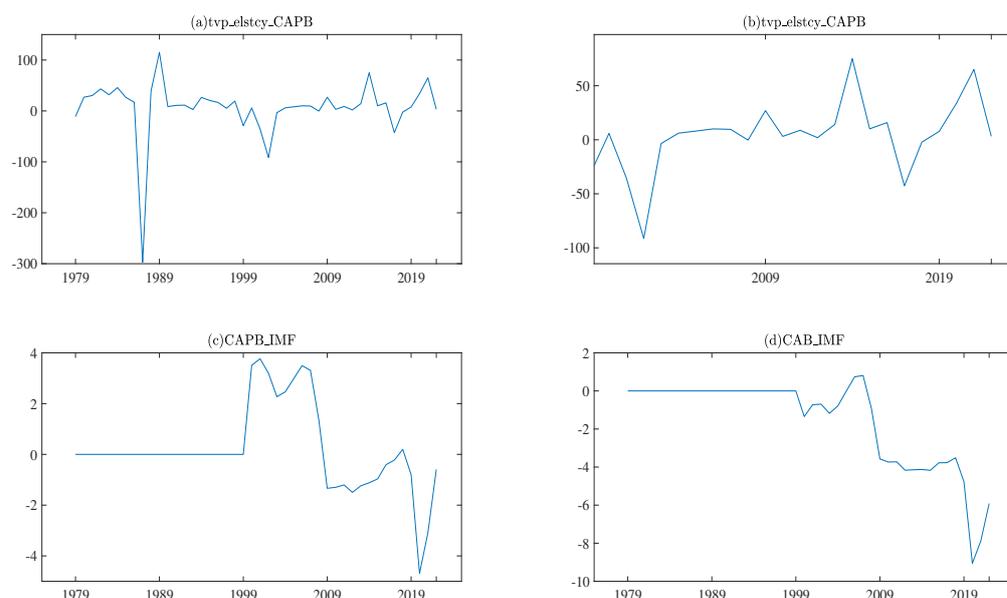
point was found to be high in 1989, at 115.15%. After 1989, tvp_elstcy_CAPB became stable in terms of volatility. Between 1989 and 2022, tvp_elstcy_CAPB recorded an average of 6.76%, maximum value of 75.30%, and minimum value of -91.40%.

6.3.3 Comparison of the CAPB of this study and the IMF

Figure 6.9 graphs (a) and (b) show the $tvp_elstcy_CAPB_g$ cyclically adjusted primary balance with time-varying elasticity calculated using the empirical work of this study. Figure 6.9 graphs (c) and (d) show data sourced from IMF (2022) of $CAPB_IMF$ and CAB_IMF in the cyclically adjusted primary balance and the cyclically adjusted balance using time-invariant elasticity for the methodology of the IMF, respectively. From 1979 to 1999, the cyclically adjusted primary balance was not calculated, and only the cyclically adjusted primer balance was calculated for 2000.

Both $CAPB_IMF$ and CAB_IMF reflect the downward trends from 2000 to 2020. In 2000, the cyclically adjusted primary adjusted balance recorded a 3.51%, while the cyclically adjusted balance recorded a negative 1.4% in 2000. The data from the IMF of the $CAPB_IMF$ reflect that from 2000 to 2020, the South African fiscal authority had been increasingly less engaged

Figure 6.9: Comparison of the time-varying elasticity and CAPB for IMF



Note: $tvp_elstcyCAPB$ is the time-varying CAPB and $CAPB_{IMF}$ is the time-in-varying CAPB.

in the adoption of discretionary fiscal policy in an effort to stabilize the economy. On the other hand, CAB_{IMF} reflects the cyclical component of the fiscal policy economic variables that have been used less to stabilize the economy. Throughout 2000 and 2022, $CAPB_{IMF}$ and CAB_{IMF} had minimum values of -4.68% and -9.05% , maximum values of 3.76% and 0.80% , and averages of 0.35% and -3.06% , respectively.

However, over time, the IMF has made policy recommendations reconditioned for South Africa to adopt fiscal consolidation to stabilize domestic government debt. In 2014, the IMF stated that there was a need to adopt sizable fiscal consolidation for government expenditure cuts and tax increases (AIRSR, 2014). However, fiscal authorities in South Africa at the time responded by outlining that the country would implement fiscal consolidation by maintaining the expenditure ceiling and eliminating wasteful expenditures (AIRSR, 2014; MTBPS, 2014).

Table 6.10 shows the descriptive statistics of the tvp_elstcy_CAPB time-varying estimated cyclically adjusted primary balance used in the study, as well as the $CAPB_{IMF}$ cyclically adjusted primary balance and CAB_{IMF} cyclically adjusted balance from the IMF data. With time-varying elasticity, the cyclically adjusted primary balance has 44 observations, whereas the IMF has 23 observations. This reflects the fact that the empirical work of this study has gone to great

lengths to determine what can be used to analyze fiscal consolidation. In terms of variation as well as volatility, the time-varying elasticity and cyclical primary balance calculated in this empirical study have a standard deviation of 56.26%. This indicates that there is a 56% variation in the day-cyclical adjusted primary balance when using time-varying elasticity.

Table 6.10: Descriptive statics of estimation of this CAPB of this study and the of IMF

Variable	Obs	Mean	Std. Dev.	Min	Max
IMF data of CAPB for South Africa					
tvp_elstcy_CAPB	44	6.616136	56.26286	-297.13	115.15
IMF data of CAPB for South Africa					
CAPB_IMF	23	.3516041	2.361112	-4.687403	3.766418
CAB_IMF	23	-3.063716	2.552726	-9.054413	.8080437

Using IMF data, the *CAPB_IMF* cyclically adjusted primary balance standard deviation was found to be 2.36% and 2.55%, respectively. This indicates that there is a 2.3% variation in the *CAPB_IMF* cycle-adjusted primary balance and a 2.3% variation in the *CAB_IMF* cycle-adjusted balance. The IMF data suggest that there is little intervention or discretionary action that the South African fiscal authority has taken in the effort to stabilize the economy or domestic government debt. However, when we consider elasticity using time-varying elasticity, we observe volatility. This suggests that there has been an effort or discretionary action taken by South African fiscal authorities to stabilize the economy as well as domestic government debt. It can then be concluded that the use of data from the IMF may underestimate the actions taken by South African fiscal authorities to stabilize the economy.

Table 6.11: Correlation matrix

	tvp_elstcy_CAPB	CAPB_IMF	CAB.IMF
tvp_elstcy_CAPB	1.0000		
CAPB_IMF	-0.5200	1.0000	
CAB.IMF	-0.4533	0.9380	1.0000

In an effort to ascertain the difference between the *tvp_elstcy_CAPB* time-varying elasticity, the cyclically adjusted primary balance is calculated in this empirical work, and the correlation of the cyclically adjusted primal balance of the IMF is used. It is found that *CAPB_IMF* the

cyclically adjusted primary balance for the IMF, has a negative correlation with a value of 0.52. Moreover, the cyclically adjusted balance for IMF had a negative correlation value of 0.45. This indicates that the data calculated in the empirical study with time-varying elasticity is 52% different from that of the IMF. When comparing the cyclically adjusted primary balance, there is a 45% difference between the cyclically adjusted balance of the IMF data and the time-varying elasticity cyclically adjusted primary balance. This result indicates that there is a significant difference when we account for time-varying elasticity rather than using constant elasticity as the IMF approach.

The results obtained from the TVE approach diverge significantly from those obtained using the constant elasticity framework, as employed by the IMF. The TVE approach indicates higher volatility and variation in the cyclically adjusted primary balance, suggesting more active fiscal policy intervention by South African authorities. These findings suggest that constant elasticity may underestimate the actions taken by fiscal authorities to stabilize the economy. Therefore, the results are more in line with the time-varying elasticity framework, which captures the dynamic nature of fiscal policy interventions and their impact on economic stabilization.

6.3.4 Impact of fiscal consolidation of domestic government debt using time-varying CAPB

Figure 6.10 shows a time-varying cyclically adjusted primary balance proxy of the fiscal consolidation impact in the respective economic variable of interest adopted as part of the econometric model and the theoretical framework of this empirical work. Fiscal consolidation $\varepsilon_{tvp_elstcy_CAPB} \uparrow \rightarrow gd$ over time is found to result in the volatility of the domestic government debt, which is only a downward trend after the implementation of fiscal consolidation, which was expected in three, six, and twelve years. A downward trend in the impact of fiscal consolidation was observed from 1979 to 1997. Domestic government debt increased thereafter in the presence of fiscal consolidation, reflecting an upward trend until 2014. Domestic government debt fell between 2014 and 2017. The fiscal consolidation implemented from 2017 to 2022 increased domestic government debt.

Figure 6.11 shows a time-varying cyclically adjusted primary balance proxy and the fiscal consolidation impact on the respective economic variable of interest adopted as part of the econometric model and theoretical framework of this empirical work. Using $\varepsilon_{tvp_elstcy_CAPB} \uparrow \rightarrow gd$ we find that the shock of fiscal consolidation when it is anticipated to be implemented over 12 years will

result in a fall in domestic government debt in the following year. After 1 year, it will start to stabilize until year 5; thereafter, the domestic government debt will start to increase until year 10. However, fiscal consolidation is anticipated to be implemented in three or six years to create a policy that has a detrimental effect on domestic government debt. This is because domestic government debt starts to increase and remain at a higher rate.

The $\varepsilon_{tvp_elstcy_CAPB} \uparrow \rightarrow g$ fiscal consolidation expected to be implemented in years 3, 6, and 12 has a similar impact on government expenditure. Fiscal consolidation results in an increase in government expenditure in year 1 after implementation. After year 1, government expenditure falls; however, it does not reach the sustainable level before the implementation of the policy. The $\varepsilon_{tvp_elstcy_CAPB} \uparrow \rightarrow rd$ fiscal consolidation anticipated to occur in year 12, resulting in a decrease in the debt service ratio from year one until year six. Subsequently, fiscal consolidation increases the debt-service ratio. However, if fiscal consolidation is anticipated to occur in year 6, this will increase the debt service ratio in the first year and subsequently decrease it until it reaches a stable level. The $\varepsilon_{tvp_elstcy_CAPB} \uparrow \rightarrow tgr$ fiscal consolidation is anticipated to occur in years 3, 6, and 12, resulting in an increase in total government revenue for three years and return to equilibrium thereafter. The $\varepsilon_{tvp_elstcy_CAPB} \uparrow \rightarrow m3$ fiscal consolidations anticipated to occur in years 3, 6, and 12 will increase in money supply for the first two years of fiscal consolidation implementation and fall after 10 years.

Figure 6.10: TVP-VAR impulse responses shocks

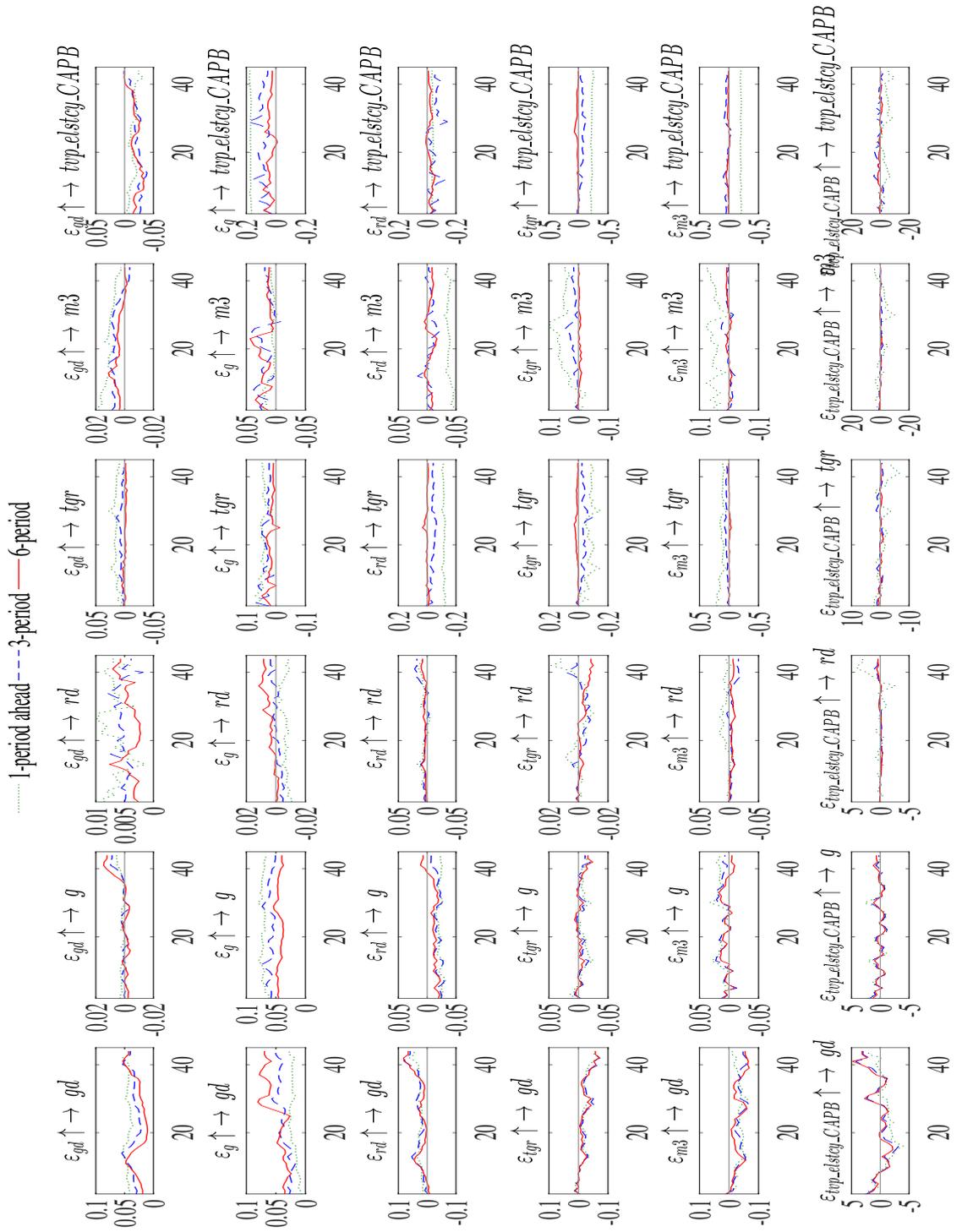
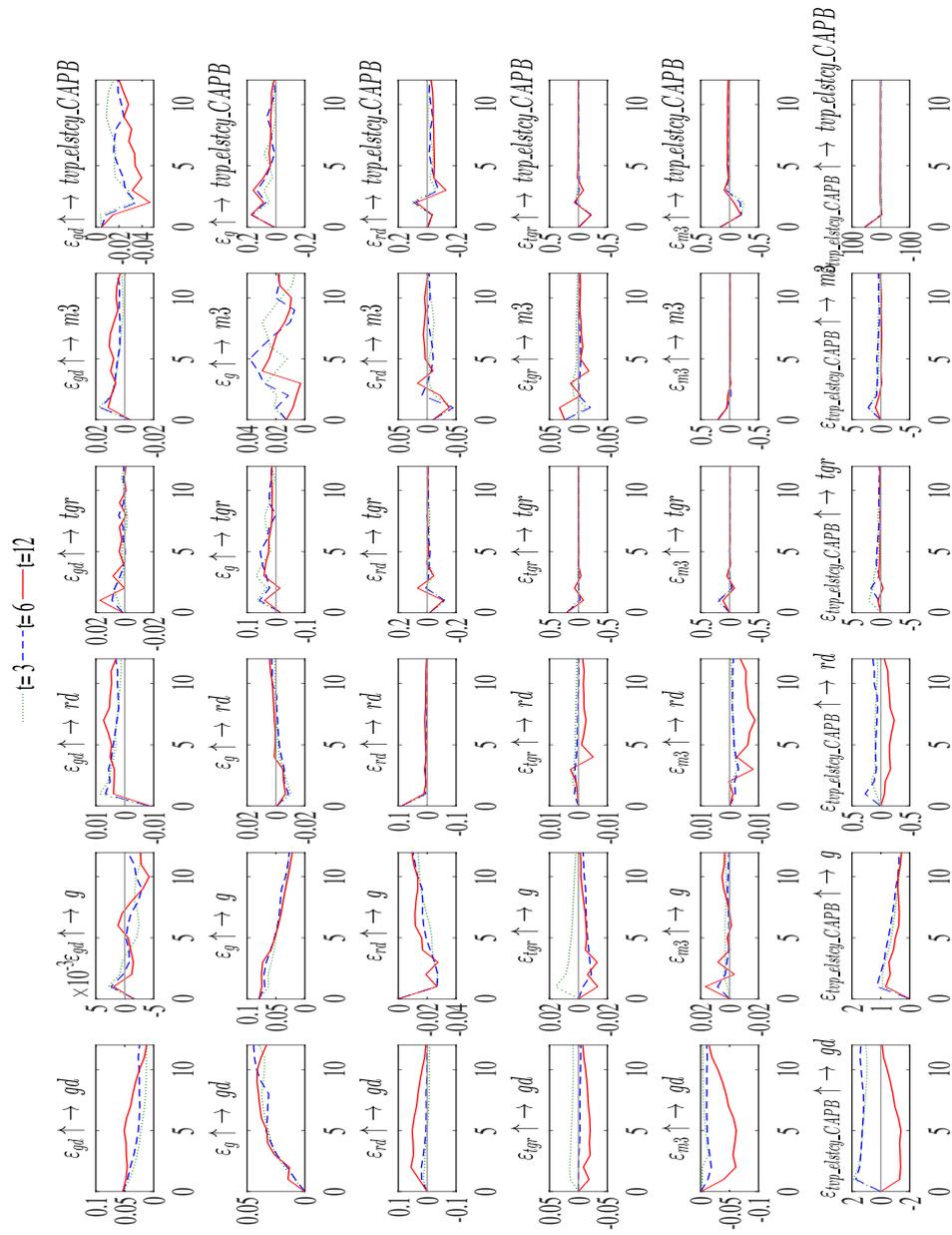


Figure 6.11: TVP-VAR impulse responses shocks



6.4 Objective two econometric results

Table 6.12 shows the Threshold Autoregressive Regime model for 1979 to 2022. It is found that the domestic government debt has a mean value of 36.22% in regime 1 which is statistically significant at p 1%. This rate is 1.22 % lower than the mean rate of the sample, which is 37.22% of domestic government debt. This regime reflects a stable domestic government debt level.

Table 6.12: Threshold autoregressive regime model with focus on the regimes mean

Estimation	1	2	3
Variable	<i>gd</i>	<i>gd</i>	<i>gd</i>
Region1			
<i>_cons</i>	36.22** (0.000)	34.07** (0.000)	34.75** (0.000)
Region2			
<i>_cons</i>	45.89** (0.000)	45.75** (0.000)	45.75*** (0.000)
Threshold	1	2	3
<i>thre_g_tvp_elstcy_capb_tgr</i>	2.8962		
<i>thre_g_tvp_elstcy_capb_g</i>		0.4755	
<i>thre_g_tvp_elstcy_capb</i>			0.4418
Statistics	1	2	3
ssr	4946.8619	3979.0865	4437.257
aic	204.29124	191.58465	199.72513
bic	207.76658	195.0118	203.20047
hqic	205.56509	192.83263	200.99898
N	42	41	42

t statistics in parentheses * $p < 0.05$ meaning there is less than a 5% chance that the observed results occurred by random chance. The ** $p < 0.1$, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** $p < 0.01$, meaning there is less than a 1% chance that the observed.

On the other hand, it is found that in regime 2 domestic government debt has a mean value of 45.89%, which is statistically significant at a p-value of 1%, holding all other factors constant. This regime reflects an unstable domestic government debt level. The rate of 45.89% is 8.67% higher than the sample means, and the rate of domestic government debt is 37.22%. The difference between the two regimes was 9.367%. It is critical for South Africa to manage its domestic government debt because failing to do so may result in a major rise in risk and decrease in the effectiveness of the market for government securities. As a result, it is crucial for the government to develop and implement a clear and efficient plan to control its debt levels. The creation of a legal framework outlining the government's ability to borrow, issue, invest in, and trade additional debt may be required, in addition to adopting such a strategy. This framework needs to be created to lower domestic government debt and ensure that all borrowing and investing operations are conducted responsibly and openly. An effective market for government securities is essential for the health of the economy because it provides investors with a secure and trustworthy investment opportunity, while also enabling the government to receive money at fair rates. South Africa can support the upkeep of a steady and functional market for government securities by properly controlling debt levels and placing a regulatory framework that encourages responsible borrowing and investment practices. Ultimately, the success of any plan for controlling government debt in South Africa would depend on several variables, including the state of the economy, political stability, and the capacity of the government to make tough choices and put them into action. However, South Africa can contribute to ensuring long-term economic stability and prosperity by prioritizing this issue and adopting proactive measures to address it.

The *thre_g_tvp_elstcy_capb_tgr* growth of the time-varying elasticity of the cyclical adjusted primary balance for total government revenue is found to have a threshold of negative 2.8962%. The *thre_g_tvp_elstcy_capb_g* threshold is 0.4755% of the time-varying elasticity of the cyclically adjusted primary balance for government expenditure, which proxies the fiscal consolidation achieved through government expenditure cuts. It should also be 0.4418% of the *thre_g_tvp_elstcy_capb* time-varying elasticity of the cyclical adjusted primal balance. Using proxies for fiscal consolidation using the summation of tax increases and government expenditure cuts, we find a threshold of 0.44%.

Table 6.13: Threshold autoregressive regime model with focus on thresholds

Estimation	1	2	3
Variable	<i>gd</i>	<i>gd</i>	<i>gd</i>
<i>g</i>	2.257*** (0.000)	1.873*** (0.001)	1.971*** (0.000)
<i>tgr</i>	-0.451** (0.008)	-0.312 (0.059)	-0.358* (0.026)
Region1			
.cons	-14.82 (0.347)	-11.59 (0.443)	-13.31 (0.379)
Region2			
.cons	-19.69 (0.221)	-1.211 (0.940)	-3.503 (0.827)
Threshold	1	2	3
<i>thre_g_tvp_elstcy_capb_tgr</i>	-1.2168		
<i>thre_g_tvp_elstcy_capb_g</i>		1.9182	
<i>thre_g_tvp_elstcy_capb</i>			1.9270
Statistics			
ssr	3298.5002	2918.1422	3030.1741
aic	191.26925	182.87035	187.70564
bic	198.21993	189.72463	194.65632
hqic	193.81695	185.3663	190.25334
N	42	41	42
t statistics in parentheses * p < 0.05 meaning there is less than a 5% chance that the observed results occurred by random chance. The ** p < 0.1, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** p < 0.01, meaning there is less than a 1% chance that the observed.			

Table 6.13 represents a Threshold Autoregressive Regime model from 1979 to 2022 with a focus on the thresholds. Table 6.13 uses estimation equations 5.119, 5.121, 5.123 with the

respective thresholds of equations 5.120, 5.122, 5.124 as discussed in Section 5.4.10. This was outlined in the econometric framework, which was extended to answer the equation. What is the threshold of the cyclically adjusted primal balance that can be attributed to fiscal consolidation?

In Table 6.13, estimation 1, it is found that g government expenditure has a positive impact on domestic government debt, and it is found to be statistically significant at the p value of 1%, holding all other factors constant. These results suggest that a 1% increase in government expenditure would result in a 2.257% increase in domestic government debt, *ceteris paribus*. These results are in line with the classical school of thought rationale that there is less need for government intervention than is needed in the economy. Moreover, the government's role in government expenditure has a detrimental effect on the economy Mankiw (2014). The tgr total government revenue is found to have a negative relationship with domestic government debt, and it is statistically significant at p value of 10%, holding all other factors constant. These results indicate that a 1% increase in total government revenue results in a 0.451% decrease in domestic government debt. These results are in line with the rationale of fiscal consolidation that tax increases result in a fall in government debt, as outlined by McDermott and Wescott (1996); Zaghini (2001); Gupta et al. (2005); Afonso et al. (2006). On the other hand, McDermott and Wescott (1996); Zaghini (2001); Gupta et al. (2005); Afonso et al. (2006) point out that fiscal adjustment through government expenditure cuts leads to higher GDP growth rates and government debt reductions than a tax increase.

The $thre_g_tvp_elstcy_capb_tgr$ growth of the time-varying elasticity of the cyclical adjusted primary balance for total government revenue is found to have a threshold of negative 1.2168%. These results suggest that the growth rate of the time-varying elasticity of the cyclically adjusted primary balance for total government revenue above 1.2168% can be attributed to fiscal consolidation achieved through the use of tax increases. This threshold is 0.2832 % lower than the threshold improvement in the CAPB advocated by McDermott and Wescott (1996); Blanchard (1990); Guajardo et al. (2014); Arestis et al. (2018) among other scholars. On the contrary, the negative sign on the threshold of the growth of the time-varying elasticity of the cyclically adjusted primary balance for total government revenue suggests that if $thre_g_tvp_elstcy_capb_tgr$ is 1.2168%. These fiscal consolidation episodes resulted in a reduction in domestic government debt. These results are not in line with the results of McDermott and Wescott (1996); Zaghini (2001); Gupta et al. (2005); Afonso et al. (2006) among others, that point tax fiscal consolidation has less effect on the reduction of government debt. Moreover, the results suggest that South

African fiscal authorities need to examine different tax brackets to apply fiscal consolidation, which may reduce domestic government debt.

The *thre_g_tvp_elstcy_capb_g* growth rate time-varying elasticity cyclical adjusted primary balance for government expenditure is found to have a threshold value of 1.9182%. These results suggest that if *thre_g_tvp_elstcy_capb_g*, the time-varying elasticity cyclical adjusted primer balance for government expenditure has a value above 1.9182%, which identifies the fiscal consolidation episode that is undertaken through the government expenditure cut. This threshold is higher than 0.418% in [Arestis et al. \(2018\)](#) which is identified through an increase in CAPB. The positive sign on the threshold suggests that beyond the threshold of 1.9128%, fiscal consolidation achieved through government expenditure cuts will increase domestic government debt. These results are contrary to those outlined by [Alesina and Perotti \(1997\)](#); [Alesina and Ardagna \(1998\)](#); [Alworth and Arachi \(2012\)](#); [Baldacci et al. \(2013\)](#); [Banday and Aneja \(2019\)](#) that government expenditure cuts reduce debt. However, the rationale for fiscal consolidation through government expenditure cuts does not hold in the given result.

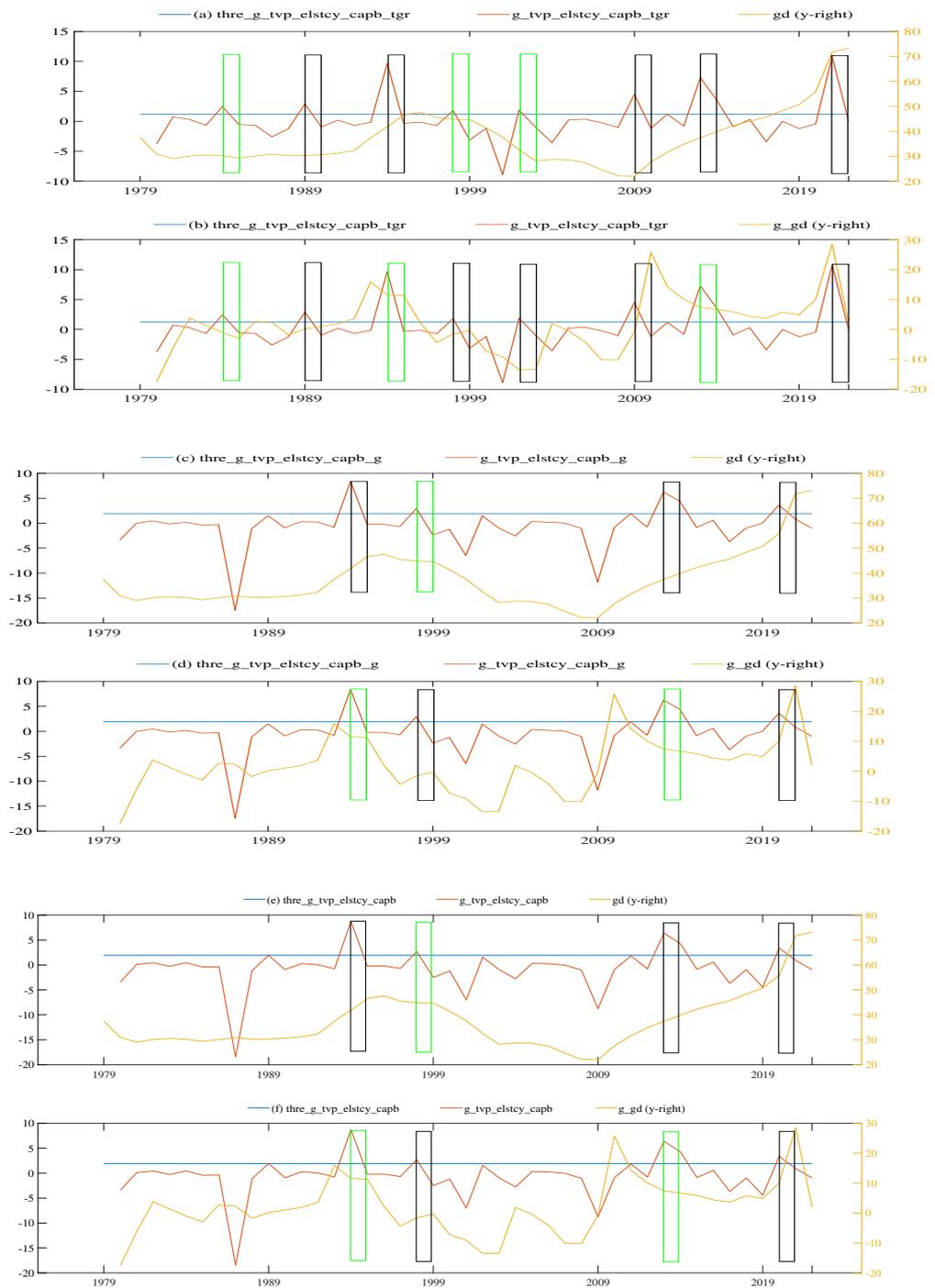
The classical view suggests that there is less need for government intervention in the economy, and excessive government expenditure could have detrimental effects. In the presented results, an increase in government expenditure g is found to have a positive impact on domestic government debt, supporting the notion that higher government spending contributes to increased debt levels. This aligns with the classical view that excessive government spending leads to higher debt levels. On the other hand, Wagner's law posits that as a country's economy develops, government spending tends to increase due to rising public demand for government services. While the results do not explicitly mention Wagner's Law, the positive relationship between government expenditure g and domestic government debt could be interpreted as supporting this view, as it suggests that higher government spending contributes to higher debt levels. The Keynesian view suggests that, during economic downturns, governments should increase spending to stimulate demand and stabilize the economy. The negative relationship found between total government revenue (tgr) and domestic government debt supports the idea that increasing revenue (possibly through taxes) can lead to debt reduction, which aligns with Keynesian principles of fiscal policy.

The *thre_g_tvp_elstcy_capb* growth rate time-varying elasticity cyclically adjusted primary balance shows that both fiscal consolidation achieved through government expenditure cuts and a tax increase have a threshold value of 1.9270%. This threshold is 0.427 % higher than that

in [Arestis et al. \(2018\)](#); [McDermott and Wescott \(1996\)](#); [Blanchard \(1990\)](#) which is identified through an increase in the CAPB of 1.5%. The threshold has a positive value of 1.9270%, suggesting that fiscal consolidation is achieved through government expenditure cuts, as well as tax increases. If adopted simultaneously, this would increase the domestic government debt. Therefore, the adoption of fiscal consolidation using both tax increases and government expenditure cuts is not desirable in South Africa because it reflects that this will increase domestic government debt. This result is contrary to that of [Glavaški and Beker-Pucar \(2020\)](#), who found that the cyclically adjusted primary budget balance has a positive impact on economic growth and that the primary budget balance in GDP increases by 1%.

Figure 6.12 shows the identification of fiscal consolidation using thresholds to determine whether they result in success in reducing domestic government debt. Figure 6.12, graph a, shows the *thre_g_tvp_elstcy_capb_tgr* growth of the time-varying elasticity of the cyclically adjusted primary balance for the total government revenue with a threshold value of 1.2168%. Given this threshold, there are eight fiscal consolidation episodes in South Africa that use a tax-based approach. Fiscal consolidation episodes occurred in 1984, 1989, 1994, 1998, 2002, 2013, and 2021. The success of fiscal consolidation through tax revenue is defined as a reduction in *gd*.

Figure 6.12: Fiscal consolidation episodes



Note: the blue line $thre_g_tvp_elstcy_CAPB_tgr$ is the threshold estimate, the vertical green box is successful full fiscal consolidation episodes, the black vertical box is unsuccessful full fiscal consolidation, $tvp_elstcy_CAPB_tgr$ is the time-varying CAPB for total government revenue, and g_gd is the growth rate of domestic government debt.

The application of fiscal consolidation episodes through tax increases is found to have been followed by the reduction of domestic government debt in the years: 1984, 2002, and 2013. In 1984, trends in General Sales Tax (GST) and VAT increased from 6% to 10% (TCOSA, 2020). This is evident in the real world in South Africa, and the threshold of this consolidation finds fiscal episodes that can be referred to in the real world. This also outlines the effectiveness of using time-varying elasticity in the CAPB. In 2000, the marginal tax rates applicable to the top-income group increased from 42% to 43% (TCOSA, 2020). The levy on plastic shopping bags, which had been at 4 cents per bag since 2009, was increased to 6 cents per bag from April 1, 2013, (TCOSA, 2020). The years 1984, 2002, and 2013 indicate that there were 3 successful fiscal consolidations were undertaken through government revenue. The years 1989, 1994, 2002, 2013, and 2021 reflect 5 fiscal consolidation episodes, given that domestic government debt increased after these episodes. Zaghini (2001), found 52 consolidations that were characterized as effective in the reduction of government debt.

Apart from looking at fiscal consolidation's success in reducing domestic government debt, this empirical study also looks at the success of fiscal consolidation in the context of how fast it is in reducing domestic government debt. As such, the g_gd growth rates of domestic government debt are considered in the fiscal consolidation episodes identified through the threshold analysis. Figure 6.12, graph (b), shows that there are 3 out of 8 fiscal consolidation episodes that were successful in the reduction in the g_gd growth rate of domestic government debt. These results suggest that there is a 37.5% chance that fiscal consolidation undertaken through government revenue would reduce domestic debt and growth in the domestic government debt rate. There is a 62.5% chance that fiscal consolidation undertaken through government revenue will not be successful in reducing the domestic government debt and the growth rate in domestic government debt

Figure 6.12 graph (c) shows the $thre_g_tvp_elstcy_capb_g$ growth rate time-varying elasticity cyclically adjusted primary balance for government expenditure, which is found to have a threshold value of 1.9182%. Given this threshold, four fiscal consolidation episodes of government expenditure have been identified in 1994, 1998, 2013, and 2020. Heylen and Everaert (2000), found 39 fiscal consolidation episodes of government expenditure. In this empirical study, fiscal consolidation, which reduces domestic government debt, was established in 1998. The fiscal consolidation episodes that are followed by a reduction in the g_gd growth in domestic government debt are shown in figure 6.12 graph (d), in the years 1994 and 2013. This result suggests

that there is a 25% chance that, after fiscal consolidation, episodes of government expenditure will result in a reduction in domestic government debt. The result also suggests that there is a 50% chance that after fiscal consolidation episodes of government expenditure, there will be a reduction in the g growth rate of domestic government debt.

Figure 6.12 graph (e), shows the $thre_g_tvp_elstcy_capb$ growth of the time-varying elasticity of the cyclical adjusted primary balance. Similar to $thre_g_tvp_elstcy_capb_g$, four fiscal consolidation episodes are identified using the threshold of 1.9270% in the years 1994, 1998, 2013, and 2020. The year 1998 was successful in reducing domestic government debt. The fiscal consolidation episodes that are followed by the reduction in the g_gd growth domestic government debt are shown in figure 6.12 graph (d), in the years 1994 and 2013.

The findings suggest that policymakers should consider a range of fiscal consolidation strategies, including revenue-raising measures and expenditure cuts, when trying to reduce domestic government debt and its growth rate. Given the findings of the study, revenue-raising measures may be more effective in achieving fiscal consolidation than expenditure cuts, and policymakers should prioritize such measures in their policy design. This could involve implementing measures, such as tax reforms, broadening the tax base, or increasing tax rates on certain goods and services. Moreover, it is important to monitor and evaluate the effectiveness of fiscal consolidation efforts to ensure they achieve their intended goals. Policymakers should regularly review their fiscal consolidation policies and adjust them as necessary based on the results of monitoring and evaluation. Furthermore, controlling the growth rate of domestic government debt is as important as reducing the overall debt level. Policymakers should prioritize measures that aim to control the growth rate of debt while also reducing the overall debt level.

Table 6.14: Summary of fiscal consolidation episodes and that of this study

Author	Definition	EB	TB	TE	TS	% S
Alesina and Perotti (1995)	Threshold of 1.5% CAPB	59	60	119	66	55.46%
Alesina and Perotti (1997)	Changes in the CAPB that are at least 5%	125	98	223	43	19.28%
McDermott and Wescott (1996)	Threshold of 1.5% CAPB	34	74	108	43	39.81%
Alesina and Ardagna (1998)	Threshold of 2% CAPB	23	28	51	19	37.25%
Zaghini (2001)	Threshold of 1.6% or 1.4% of CAPB	52	48	100	52	52.00%
Zaghini (2001)	Threshold of 1.6% or 1.4% of CAPB	52	48	100	52	52.00%
Agnello et al. (2019)	Threshold of 1.5% CAPB			51	15	29.41%
Afonso and Silva Leal (2019)	Threshold of 1.5% CAPB			100	51	18.61%
Duperrut (1998)	Threshold of 1.5% CAPB			9	2	22.22%
This study	<i>thre_g_tvp_elstcy_capb_tgr</i> 1.2168%		8	8	3	37.50%
	<i>thre_g_tvp_elstcy_capb_g</i> 1.9182%	4		4	1	25.00%
	<i>thre_g_tvp_elstcy_capb</i> 1.9270%			4	1	25.00%

Note: EB reflects the expenditure base fiscal consolidation, TB tax-based fiscal consolidation, TE total expenditure-based, TS total fiscal consolidation success and % Total fiscal consolidation success as a percentage. The authors' processing of the table

Table 6.14 summarizes the fiscal consolidation episodes in this study. There is an indication that out of eight fiscal consolidations of *thre_g_tvp_elstcy_capb_tgr* there are 3 that are successful, which is 37.50%, and can be deemed effective in reducing domestic government debt. On the other hand, the result in table 6.14, suggests that there is a 25% chance that after *thre_g_tvp_elstcy_capb_g* fiscal consolidation episodes will result in the reduction in domestic government debt. The results also suggest that there is a 50% chance that fiscal consolidation episodes will result in a reduction in the *g* growth rate of domestic government debt. These fiscal consolidation episodes resulted in expansionary effects, thus empirically confirming the existence of non-Keynesian effects ([Mankiw, 2014](#)). Comparison of the *thre_g_tvp_elstcy_capb_tgr*

and *thre_g_tvp_elstcy_capb_g* success rates. The implications of the empirical analysis that policymakers should consider is that spending-based fiscal consolidation, as opposed to tax cuts, is associated with greater effects, successful government debt reductions, and successful budget deficit reductions. The implications of the empirical analysis that must be taken into consideration by policymakers are indicative of the fact that fiscal consolidations based on a reduction in public spending are more often connected with expansionary effects and with success in reducing public debt and budget deficits in comparison with a reduction in taxes.

6.5 Objective three econometric results

Table 6.15 shows the Markov chain dynamic regression model for 1979 to 2022. In the first state model estimation (1) of *gd* domestic government debt, we find that domestic government debt has a mean of 30.15%, which is statistically significant at the 5% *p* value. This is the lowest regime mean for this study's empirical work. However, it is as high as 27.4%, as found by Burger et al. (2016). In state 1, we find that the *rd* debt service ratio has a positive impact on domestic government debt, with a 1% increase in the debt service ratio resulting in a 3.1% increase in domestic government debt holding all other factors constant. On the other hand, it is found that in state 1, money supply, which is proxied by *m3* has a negative relationship with domestic government debt. It is found that a 1% increase in money supply results in a 0.6% decrease in domestic government debt. The fiscal consolidation undertaken is presented with *tvp_elstcy_CAPB_tgr* which is a time-varying CAPB for total government revenue (representing fiscal consolidation of the tax increase), *tvp_elstcy_CAPB_g* which is time-varying CAPB for government expenditure (representing fiscal consolidation of government expenditure cut), and *tvp_elstcy_CAPB* the time-varying CAPB (application of both fiscal consolidations through a tax increase and government expenditure cut). We find that *tvp_elstcy_CAPB_tgr* which is a time-varying CAPB denoting fiscal consolidation implemented with government revenue (tax increase), has a positive impact on domestic government debt. However, the value of 0.0511% was statistically insignificant at the 5% *p* value. As such, the magnitude of the increase in domestic government debt as a result of implementing fiscal consolidation through tax increases if the economy operates in state 1.

These findings of *tvp_elstcy_CAPB_tgr* are consistent with non-Keynesian consequences, which may potentially be related to tax rises at high levels of public debt. The "expectations perspective of fiscal policy" serves as the foundation for this style of reasoning. For instance, there

may be an induced wealth effect, which would raise private spending if the fiscal consolidation program is perceived by the public as a serious endeavor to lower the public sector borrowing requirements, as maintained by Blanchard (1990). The results suggest that debt service ratio and money supply are important factors in determining domestic government debt levels. Policymakers may want to consider strategies for managing the debt service ratio and money supply to help control domestic government debt. The finding that implementing fiscal consolidation through tax increases has a positive impact on domestic government debt could also be relevant for policymakers. However, given that the magnitude of the impact is statistically insignificant, policymakers may need to carefully consider the potential trade-offs in implementing fiscal consolidation through tax increases, particularly if the policy has other negative economic effects. These findings suggest that managing the factors affecting domestic government debt levels requires a comprehensive approach that considers multiple factors and their interrelationships. Policymakers may want to use the results of the study to inform their decisions and design policies that help achieve their goals while minimizing potential negative effects.

With regard to *ttp_elstcy_CAPB_g* time, varying the CAPB for government expenditure, which reflects fiscal consolidation, is implemented through government expenditure cuts. Fiscal consolidation through government expenditure cuts has a negative impact on domestic government debt. It is not clear how much domestic government debt will decrease. As a result, in state 1, it is statistically insignificant, with a negative coefficient of 0.577%. The *ttp_elstcy_CAPB* time-varying CAPB represents the application of both fiscal consolidations through a tax increase, and government expenditure cuts are found to have a negative impact on domestic government debt. However, it is not clear how much domestic government debt will fall in terms of magnitude, given that the coefficient value of 0.0498% is a statistically insignificant head alpha 5% *p* value. The results suggest that fiscal consolidation measures, particularly government expenditure cuts and a combination of tax increases and expenditure cuts, may not be effective in reducing domestic government debt, at least in the short term. If policymakers are considering implementing fiscal consolidation measures, they may want to carefully consider the potential impacts on domestic government debt as well as the potential economic and social implications of such measures. It may be worthwhile to explore other options for reducing debt, such as increasing revenue through economic growth or implementing more targeted spending cuts rather than broad-based cuts to government expenditure.

ttp_elstcy_CAPB_tgr which is a time-varying CAPB for total government revenue, has a

Table 6.15: Markov-switching dynamic regression from 1979 to 2022

	(1)	(2)	(3)	(4)
State1	gd	gd	gd	gd
rd		3.101*** (6.08)	0.800 (1.17)	0.860 (1.66)
m3		-0.401 (-1.21)	-0.635*** (-3.30)	-0.807*** (-4.68)
tvp_elstcy_capb_tgr		0.0511 (0.44)		
tvp_elstcy_capb_g			-0.0577 (-1.25)	
tvp_elstcy_capb				-0.0498 (-1.91)
_cons	30.15*** (35.72)	-20.35 (-0.96)	-24.38*** (-4.56)	-15.92*** (-3.20)
State2	gd	gd	gd	gd
rd		1.195 (1.36)	3.647 (.)	3.782*** (12.04)
m3		-0.983* (-2.04)	-0.209 (-0.20)	-0.187 (-1.04)
tvp_elstcy_capb_tgr		-0.456 (-1.50)		
tvp_elstcy_capb_g			0.0768 (1.06)	
tvp_elstcy_capb				0.0831* (2.05)
_cons	44.89*** (38.25)	8.364 (0.32)	-43.12 (.)	-36.90*** (-8.46)
State3	gd	gd	gd	gd
rd		7.640** (2.59)	1.689 (1.39)	2.801*** (4.18)
m3		-0.136 (-0.22)	-0.635** (-2.63)	-0.491** (-2.66)
tvp_elstcy_capb_tgr		0.173 (0.13)		
tvp_elstcy_capb_g			0.0935* (2.42)	
tvp_elstcy_capb				0.0918*** (4.38)
_cons	72.39*** (25.25)	-21.55 (-1.69)	-16.07 (.)	-15.32** (-3.17)
Insigma				
_cons	1.370*** (12.50)	1.002** (2.82)	0.584 (1.74)	0.682*** (4.58)
gd				
g		1.560* (2.15)	2.215*** (8.16)	1.946*** (13.61)
tgr		0.635** (2.94)	0.511*** (4.21)	0.574*** (4.36)
N	44	29	29	29

t statistics in parentheses * p < 0.05 meaning there is less than a 5% chance that the observed results occurred by random chance. The ** p < 0.1, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** p < 0.01, meaning there is less than a 1% chance that the observed.

positive impact on domestic government debt. This indicates that fiscal consolidation undertaken through tax increases results in an increase in domestic government debt. However, it is not ascertained how much the increase will be on domestic government debt, given that the results are statistically insignificant at p 5% with positive coefficient values of 0.173%. Similarly, in stage 2, we find that $tpv_elstcy_CAPB_g$ time-varying CAPB for government expenditure fiscal consolidation has a positive impact on domestic government debt. This is reflected by the positive coefficient value of 0.768%, which is statistically insignificant at the 5% p value. As such, the magnitude of the increase in domestic government debt cannot be determined. tpv_elstcy_CAPB time-varying CAPB (fiscal consolidation) has a positive effect on domestic government debt. For a 1% increase in tpv_elstcy_CAPB time-varying CAPB (fiscal consolidation), this will result in a 0.0831% increase in domestic government debt, holding other factors equal to the 5% p value.

$tpv_elstcy_CAPB_tgr$ which is a time-varying CAPB for total government revenue, has a positive impact on domestic government debt. This indicates that if fiscal consolidation is undertaken through tax increases, this results in an increase in domestic government debt. However, it is not ascertained how much the increase will be on domestic government debt, given that the results are statistically insignificant at p 5% with positive coefficient values of 0.173%. Similarly, in stage 2 it is found that $tpv_elstcy_CAPB_g$ time varying CAPB for government expenditure fiscal consolidation results in a positive impact on the domestic government debt. This is reflected in the positive coefficient value of 0.768%, which is statistically insignificant at 5% p value. As such the magnitude of the increase in the domestic government debt is not attainable. The tpv_elstcy_CAPB time varying CAPB (fiscal consolidation) is found to have a positive impact on the domestic government debt. For a 1% increase in tpv_elstcy_CAPB time-varying CAPB (fiscal consolidation), this will result in a 0.0831% increase in domestic government debt holding other factors in contact at the 5% p value.

The Solow Growth Model focuses on the role of technological progress, savings, and population growth in driving long-term economic growth. While the empirical results do not directly address these factors, they provide insights into how fiscal policy measures, such as government spending and revenue changes, can influence economic variables, including domestic government debt, which could, in turn, affect long-term growth prospects. The endogenous growth theory suggests that economic growth is driven by factors within the economic system itself, such as human capital accumulation, technological innovation, and institutional changes. The empiri-

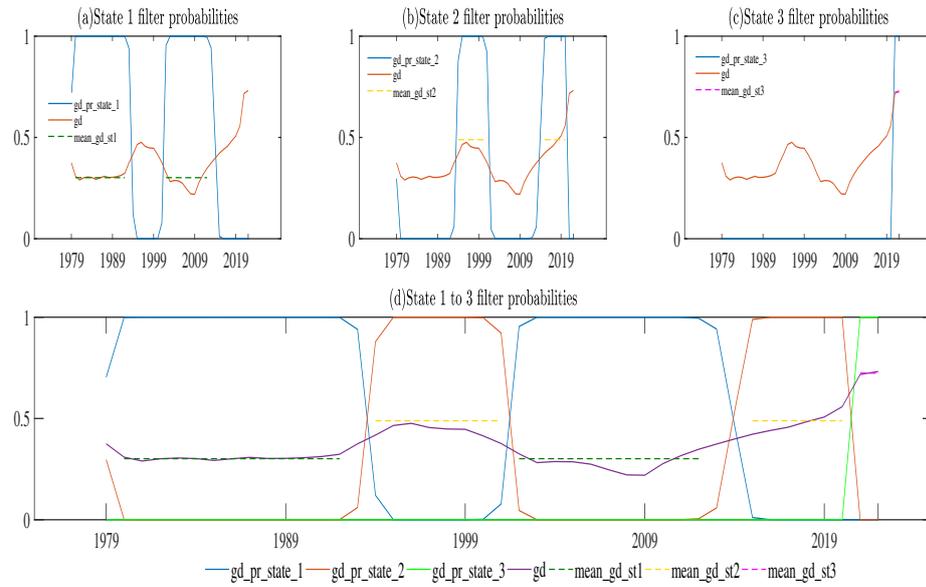
cal results may not directly align with this theory, as they focus primarily on the short-term implications of fiscal policy measures on domestic government debt levels. However, changes in government spending and revenue could indirectly affect factors such as human capital accumulation and technological innovation, which are central to the endogenous growth theory.

In state 3, it is found that the *rd* domestic government debt has a higher mean of 72.39%, holding all other factors constant. At this higher mean in stage 3, it is found that the *rd* debt service ratio has a positive impact on domestic government debt. A 1% increase in the debt service ratio results in a 2.801% increase in domestic government debt, holding all other factors constant and statistically significant at the 10% *p* value. Money supply, *m3*, has a negative impact on domestic government debt. A 1% increase in the money supply resulted in a 0.635% decrease in domestic government debt is statistically significant at the 10% *p* level.

The *ttp_elstcy_CAPB_tgr* which is a time-varying CAPB for total government revenue has a positive impact on the domestic government debt. This indicates that if fiscal consolidation is undertaken through tax increases, this results in an increase in domestic government debt. However, it is not ascertained as to how much the increase will be on domestic government debt, given that the results are statistically insignificant at *p* 5% with positive coefficient values of 0.0935%. *ttp_elstcy_CAPB_g* time-varying CAPB for government expenditure fiscal consolidation has a positive impact on domestic government debt and is statistically significant at the 5% *p* value. A 1% increase in fiscal consolidation through government expenditure cuts results in a 0.0935% increase in domestic government debt, holding all other factors constant. *ttp_elstcy_CAPB* which is a time-varying CAPB, reflects the application of the fiscal consolidation summation of both government expenditure cuts as well as a tax increase. It is found to have a positive impact on domestic government debt and is statistically significant at the 1% *p* level. A 1% increase in *ttp_elstcy_CAPB* results in a 0.0918% increase in domestic government debt, holding all other sectors constant.

Figure 6.13 shows the filter transition probability from state 1 to state 3, as well as *gd* domestic government debt. In figure 6.13 graph (a), represents the state 1 filter-transition probability. It is found that the domestic government debt in stage 1 operates with a mean value of 30.15%. The first transition to state 1 was from 1980 to 1992, during which it was found that the maximum domestic government debt was 32.33%, while the minimum domestic government debt was 29.00% overall, reflecting a slight upward trend. Ten years after 1992, domestic government debt

Figure 6.13: State 1 to 3 filter transition probabilities and *gd* domestic government debt



returned to State 1 from 2002 to 2012. During this period, the mean domestic government debt was 30.15%, and the domestic government moved downward until it reached a minimum value of 21.99% in 2009. Subsequently, it increased until it reached a maximum rate of 34.79% in 2012. Figure 6.13 graph (b) shows the state 2 filter transition probability for domestic government debt. In state 2, domestic government debt was found to have a mean value of 44.89%. The transition to State 2 was observed between 1994 and 2001. During this period, domestic government debt began to increase until it reached a maximum value of 47.60% in 1996. Thereafter, domestic government debt started to show a downward trend until it reached the minimum value of 37.64% in 2001. Domestic government debt transitioned back to state 2 from 2015 to 2020, yet still operating under a mean of 44.89%. During this period, domestic government debt showed an upward trend in 2015, starting with a minimum value of 42.22%, and continued with an upward trend up to the maximum value of 55.82% in 2020.

Figure 6.13 graph (c) shows the state 3 filter transition probability for domestic government debt. Since 1979, State 3 has not been present, and the transition to State 3 has occurred from 2021 to 2022. State 3 domestic government debt has an equal value of 72.39% for minimum, maximum, and mean values. State 3 transitioned beyond the threshold of 60% of domestic government debt, as advocated by the SADC regional group. SADC outlines that all countries within the regional grouping need to have domestic government debt equal to or below the threshold of 60% (Buthelezi and Nyatanga, 2018). It should be noted that domestic government

debt falls within State 1 or State 2, and policymakers may need to closely monitor the trend of the debt levels and take measures to stabilize or reduce it if it shows an upward trend. This is because high levels of government debt lead to lower economic growth and financial instability. On the other hand, domestic government debt falls within State 3, and policymakers may need to take immediate action to reduce the debt level below the 60% threshold recommended by the SADC regional group. This may involve implementing fiscal austerity measures, increasing tax revenues, or exploring external financing options. The analysis of filter transition probabilities can help policymakers anticipate the likelihood of future changes in domestic government debt levels and plan accordingly. This can include developing contingency plans for different scenarios, improving debt management strategies, and building buffers to mitigate the impact of economic shocks

Table 6.16: Transition Probabilities

	(1)	(2)	(3)	(4)
Transition Probabilities	Estimate	Estimate	Estimate	Estimate
p_{11}	0.9226203	0.9226203	0.7499819	0.7398255
p_{12}	0.0773796	0.0773796	0.2500173	0.2586099
p_{13}	4.36e-08	4.36e-08	7.88e-07	0.0015647
p_{21}	0.1083857	0.1083857	0.1042108	0.0972743
p_{22}	3.71e-08	3.71e-08	0.7554308	0.773724
p_{23}	0.8916142	0.8916142	0.1403584	0.1290016
p_{31}	3.08e-12	3.08e-12	0.0583995	0.0682174
p_{32}	1	1	4.13e-32	5.15e-24
p_{33}	4.63e-14	4.63e-14	0.9416005	0.9317826

Table 6.16 reflects the transition probabilities of the different states that domestic government debt can enter. In State 1, which is characterized by a mean of 30.15% of government debt, there is a 92.26% chance of the economy moving to the state and returning to the same state. In State 2, which is characterized by a mean of 44.49%, there is a 75.54% chance that domestic government debt will move from this state and return to the same state. In State 3, which is characterized by a mean of 72.39%, there is a 993.17% chance that domestic government debt will move from this state and return to the same state.

In State 1, which is characterized by a mean of 30.15% government debt, there is a 92.26% chance of the economy moving from the state and returning to the same state. Figure 7.6.4 shows a strong chance that domestic government debt will return to this state. In State 2 which is characterized by a mean of 44.49%, it is found that there is a 75.54% chance that domestic government debt will move from this state and also come back to the same state. In State 3, which is characterized by a mean of 72.39%, there is a 93.17% chance that domestic government debt will move from this state and return to the same state. There is a strong chance that the domestic government debt will return to this state.

Table 6.17: Expected duration

	(1)	(2)	(3)	(4)
State	Estimate	Estimate	Estimate	Estimate
State1	16.03985	12.92329	3.99971	3.843574
State2	6.902488	1	4.088822	4.419382
State3	8.207887	1	17.12342	14.65902

Table 6.17 shows the period in which the economy will undergo in each state. When the economy is in state 1, which is characterized by a mean of 30.15% government debt, it is found that there are 16 years in which the economy will be in this state. If the economy is in state 2, which is characterized by a mean of 44.49%, it is found that there will be six years and nine months for the economy to be in this state. In state 3, which is characterized by a mean of 72.39%, it is found that it will run for eight years and two months.

6.6 Objective four econometric results

Table 6.18 reflects the econometric results to investigate the impact of the domestic government debt threshold on gross domestic product per person in the presence of fiscal consolidation, as outlined in the theoretical framework as well as in the model specification, particularly by equation 5.139. Table 6.18 column 1, reflects that beyond 29.00% and 30.62% of the domestic government debt thresholds, the *GDP* gross domestic product will start to increase. However, beyond the thresholds of 29.00% and 30.62%, the presence of fiscal consolidation adopted through government expenditure cuts and tax increases, proxied by *tvp_elstcy_capb* the time-varying parameter elasticity cyclically adjusted primary balance results in a negative effect on gross

domestic product per person. These results are statistically significant p value of 5%. Therefore, a 1% increase in the sum of government expenditure cuts and a tax increase will result in a 0.158% decrease in gross domestic product holding all other factors constant. The negative effect of fiscal consolidation (government expenditure cuts and tax increases) on GDP per person beyond debt thresholds suggests that policymakers should carefully consider the timing and magnitude of fiscal consolidation measures. Rapid and drastic fiscal consolidation measures may negatively impact economic growth. The statistically significant relationship between fiscal consolidation and GDP per person implies that policymakers must carefully consider the trade-off between short-term pain (lower growth due to fiscal consolidation) and long-term gain (lower debt levels and sustainable growth). The finding that a 1% increase in the sum of government expenditure cuts and tax increases results in a 0.158% decrease in GDP per person implies that policymakers need to find a balance between reducing debt levels and maintaining economic growth. They may need to consider alternative policies such as increasing government revenue through economic growth or reducing government spending in less critical areas.

Table 6.18 column 2, reflects that beyond 28.74% and 30.31% of the domestic government debt thresholds, the GDP gross domestic product will start to increase. 28.74% and 30.31% of the domestic government debt thresholds increase GDP but $tvp_elstcy_capb_tgr$ fiscal consolidation is undertaken with tax $hum\ GDP$. The coefficient of $tvp_elstcy_capb_tgr$ is statistically significant p value 5% level, indicating that a 1% increase in tax will result in a 1.36 fall in the gross domestic product per person. Table 6.18 column 1, reflects that beyond 29.00% and 30.62% of the domestic government debt thresholds, the GDP gross domestic product will start to increase. Beyond the 29.00% and 30.62% domestic government debt thresholds, $tvp_elstcy_capb_g$ fiscal consolidation achieved through government expenditure cuts will have a negative impact on gross domestic product per person. This result indicates that $tvp_elstcy_capb_g$ has a statistically significant p value of 5%; therefore, a 1% increase in government expenditure cuts results in a 0.20% increase in gross domestic product per person.

Considering the $olbr$ average output labor ratio and $clbr$, the thresholds of domestic government debt are found to be 37.50% and 30.31%, respectively. In contrast, $olbr$ and $clbr$ have statistically significant p values of 5% and 1%, respectively. The $olbr$ average output labour ratio results in an increase in GDP reflecting that labour is productive in South Africa. Policies that encourage the implementation of labour-absorbing business activities in the economy must be encouraged. On the other hand, $clbr$ is found to have a negative impact on the gross domestic

Table 6.18: Threshold regression estimation 2 *GD* impact on *GDP*

Estimation	1	2	3
Region1	gdp	gdp	gdp
tvp_elstcy_capb	-0.158* (-2.57)		
tvp_elstcy_capb_tgr		-1.364** (-2.84)	
tvp_elstcy_capb_g			-0.201** (-2.86)
_cons	3.714*** (3.33)	0.807 (0.88)	3.839*** (3.55)
Region2	gdp	gdp	gdp
tvp_elstcy_capb	-0.00173 (-0.24)		
tvp_elstcy_capb_tgr		0.00179 (0.06)	
tvp_elstcy_capb_g			-0.00332 (-0.37)
_cons	-1.534 (-1.83)	-2.080* (-2.51)	-1.553 (-1.88)
Region3	gdp	gdp	gdp
tvp_elstcy_capb	0.00638 (0.44)		
tvp_elstcy_capb_tgr		-0.0658 (-1.19)	
tvp_elstcy_capb_g			0.00535 (0.31)
_cons	0.207 (0.42)	0.166 (0.39)	0.219 (0.45)
Threshold	1	2	3
gd_thr1	29.000	28.7400	29.0000
gd_thr2	30.620	30.3100	30.6200
Statistics	1	2	3
odr1 ssr	222.9307	205.9457	215.9071
odr2 ssr	202.2691	169.9869	195.2831
\underline{N}	42	42	42

t statistics in parentheses * $p < 0.05$ meaning there is less than a 5% chance that the observed results occurred by random chance. The ** $p < 0.1$, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** $p < 0.01$, meaning there is less than a 1% chance that the observed.

product per person in South Africa. This reflects that the use of technology in South Africa can have a detrimental effect on the gross domestic product per person in the economy. As such, the adoption of policies that encourage more technology usage needs to be aligned with the number of people in the economy to reduce the negative impact on gross domestic product per person.

Given the different signs in column 1 of *olbr* average output labour ratio and *clbr* average capital-labour ratio. It is important to understand the impact of fiscal consolidation by considering the average labor and average capital ratio on *GDP*. Across all the estimations from the columns, 2 to 7 the domestic government debt thresholds are 38.74% and 30.31%, respectively. Beyond these thresholds, the gross domestic product per person increases. Considering this, *olbr* in columns 2 to 5, all fiscal consolidation variables are found to have a negative impact on *GDP*. Similar to *clbr* all fiscal consolidation variables are found to have a negative impact on *GDP*.

Table 6.19: Threshold regression estimation 1 *GD* impact on *GDP*

Estimation	(1)	(2)	(3)	(4)	(5)	(6)	(7)
gdp		gdp	gdp	gdp	gdp	gdp	gdp
olbr	0.0000441* (2.09)	-0.00000293 (-0.14)	-0.00000486 (-0.24)	-0.00000199 (-0.10)			
clbr	-0.0000386*** (-3.52)				-0.00000904 (-0.71)	-0.0000116 (-0.93)	-0.00000821 (-0.65)
tvp_elstcy_capb		-0.00187 (-0.28)			-0.000810 (-0.12)		
tvp_elstcy_capb_tgr			-0.0196 (-0.65)			-0.0250 (-0.82)	
tvp_elstcy_capb_g				-0.00439 (-0.53)			-0.00315 (-0.37)
Region1		gdp	gdp	gdp	gdp	gdp	gdp
_cons	7.414 (1.66)	2.801 (0.72)	3.123 (0.81)	2.643 (0.68)	5.466 (1.19)	6.345 (1.40)	5.188 (1.13)
Region2		gdp	gdp	gdp	gdp	gdp	gdp
_cons	8.532 (1.88)	-1.601 (-0.44)	-1.320 (-0.37)	-1.795 (-0.50)	1.796 (0.32)	2.824 (0.52)	1.410 (0.25)
Region3		gdp	gdp	gdp	gdp	gdp	gdp
_cons	6.998 (1.58)	0.770 (0.21)	1.071 (0.30)	0.626 (0.17)	3.810 (0.76)	4.786 (0.97)	3.502 (0.70)
Threshold	1	2	3				
gd_thr1	37.5000	28.7400	28.700	28.700	28.700	28.700	28.700
gd_thr2	30.3100	30.3100	30.3100	30.3100	30.3100	30.3100	30.3100
Statistics	1	2	3	4	5	7	7
odr1_ssr	216.0737	244.6527	243.3134	244.4373	229.6004	225.7099	229.9389
odr2_ssr	208.0834	214.1648	212.1770	212.9997	211.3959	207.6605	210.6784
N	42	42	42	42	42	42	42

t statistics in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001

Table 6.19 reflects the econometric results to investigate the impact of the domestic government debt threshold on gross domestic product per person in the presence of fiscal consolidation, as outlined in the theoretical framework as well as in the model specification, particularly by Equations 5.36 and 5.37. Table 6.20 shows the economic results of analyzing different thresholds of domestic government debt using the dummy variable in the presence of fiscal consolidation. The results are in line with the application of the methodology outlined in equations 5.34 to 5.33. Table 6.20 presents the results of the presence of fiscal consolidation achieved using both the government expenditure cut and tax increase, proxied by *tvp_elstcy_capb*. In Table 6.20 column 1, the threshold of *dummy_gd_30* 30% domestic government debt has a negative impact on the gross domestic product per person. These results are consistent with the classical school of thought, which advocates that government debt is detrimental to economic growth (Mankiw, 2014). Despite this, South Africa has the PFMA Act, which outlines government management of funds. The results suggest that lower domestic government debt weakens the gross domestic product per person. Therefore, the country must introspect on how to manage domestic government debt, improve financial management, and plan to recover the negative impact of domestic government debt on gross domestic product per person. However, in line with Alesina and Ardagna (1998) *tvp_elstcy_capb* fiscal consolidation is found to have a slightly positive impact on gross domestic product, reflected in the coefficient value of 0.009. However, the value is statistically insignificant; therefore, we cannot tell how much the magnitude of fiscal consolidation at this stand will be apart from the direction of the positive impact.

The threshold of *dummy_gd_50* 50% of domestic government debt in Table 6.20 column 2, is found to have a positive impact on the gross domestic product per person. The threshold of 50% is statistically significant at *p* value of 1%, with a coefficient value of 4.05%. These results suggest that there is a 4.05% chance that the gross domestic product per person will increase at the threshold of 50% government debt. Similarly, fiscal consolidation undertaken with the use of government expenditure cuts, as well as a tax increase at the threshold of 50% of domestic government debt, is found to have a positive impact on the gross domestic product per person. However, the coefficient of fiscal consolidation is statistically insignificant, and the magnitude of fiscal consolidation is unclear. At the accumulated threshold of *dummy_gd_70* 70% of the domestic government debt in Table 6.20 column 3, it is found to have a positive impact on the gross domestic product per person. Moreover, physical consolidation has a positive impact on gross domestic product per person, with a coefficient value of 0.009. The threshold of domestic government debt applied with the utilization of the dummy variables in Table 6.20 from columns

Table 6.20: 2SLS model estimation 1

Estimation	(1)	(2)	(3)	(4)	(5)	(6)
Variable	gdp	gdp	gdp	gdp	gdp	gdp
clbr	-0.000254*** (-6.72)	-0.000257*** (-16.28)	-0.000273*** (-9.05)	-0.000249*** (-5.85)	-0.000294*** (-10.56)	-0.000228*** (-9.53)
olbr	0.000289*** (6.43)	0.000307*** (13.80)	0.000316*** (9.42)	0.000270*** (5.22)	0.000341*** (9.89)	0.000267*** (8.00)
gd	0.341*** (8.58)	0.455*** (11.09)	0.441*** (6.76)	0.377*** (4.88)	0.397*** (8.41)	0.358*** (6.17)
tvp_elstcy_capb	0.00993 (0.74)	0.00963 (1.03)	0.00913 (0.75)	0.00916 (0.80)	0.0178* (2.32)	0.00476 (0.47)
dmmmy_gd_30	-1.144 (-1.09)					
dmmmy_gd_50		4.052*** (3.85)				
dmmmy_gd_70			3.299 (1.66)			
dmmmy_gd_30_40				-0.516 (-0.85)		
dmmmy_gd_40_50					3.081*** (4.59)	
dmmmy_gd_50_60						-2.855** (-2.82)
_cons	30.48*** (4.48)	20.13*** (7.93)	25.31*** (5.69)	30.72*** (5.11)	32.48*** (7.36)	24.22*** (8.03)
N	26	26	26	27	27	26

t statistics in parentheses * p < 0.05 meaning there is less than a 5% chance that the observed results occurred by random chance. The ** p < 0.1, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** p < 0.01, meaning there is less than a 1% chance that the observed.

1 to 3 provides evidence of a U-shape, which is mostly advocated by [Checherita-Westphal and Rother \(2012\)](#) and [Megersa \(2015\)](#) among other scholars. Such evidence indicates that domestic government debt, which increases over time, can have a positive impact on gross domestic product per person in the presence of effective fiscal consolidation. These results also suggest that the contraction expansionary fiscal policy outlined by [Alesina and Perotti \(1995\)](#), [Alesina and Ardagna \(2010\)](#) and [Romer and Romer \(2010\)](#) among others, is evident in South Africa.

The cumulative range of thresholds of domestic government debt is reflected in Table 6.20 with rates ranging from 30% to 40%, 40% to 50%, and 50% to 60%, respectively, from columns 4 to 6 in the presence of fiscal consolidation achieved through government expenditure cuts as well as a tax increase. In column 4 of Table 6.20, the cumulative threshold between *dummy_gd_30_40* 30% and 40% is found to have a negative impact on the gross domestic product per person. On the other hand, the *tvp_elstcy_capb* fiscal consolidation undertaken through government expenditure cuts and tax increases accommodated this range with a positive impact on gross domestic product person. However, the magnitude impact is not detected given that the results are sta-

tistically insignificant; thus, the empirical work deals with the direction of the positive impact on *GD* coming from *tvp_elstcy_capb*. Table 6.20 column 5 reflects the cumulative threshold range of domestic government debt between *dummy_gd_40_50* 40% to 50% in the presence of *tvp_elstcy_capb* fiscal consolidation achieved through government expenditure cuts and tax increases. The cumulative threshold range of domestic government debt between *dummy_gd_40_50* is found to be statistically significant at the *p* value of 10% with the coefficient value of 3.081, while on the other hand, *tvp_elstcy_capb* fiscal consolidation is found to be statistically significant at 5% *p* value with the coefficient value of 0.0178. Moreover, in the presence of *tvp_elstcy_capb* fiscal consolidation, a 1% increase in both government expenditure cuts and a tax increase will result in a 0.0178% increase in the gross domestic product per person.

Fiscal consolidation achieved through government expenditure cuts and tax increases can positively impact GDP per person in the presence of domestic government debt. The impact of fiscal consolidation on GDP per capita varies, depending on the cumulative threshold range of domestic government debt. For instance, fiscal consolidation has a statistically significant positive impact on GDP per person in the range of 40% to 50%. The negative impact of domestic government debt on GDP per person became more significant as the cumulative threshold range increased. This suggests that policymakers need to monitor the level of domestic government debt and take appropriate measures to maintain it within reasonable limits. Policymakers need to consider the trade-off between short- and long-term goals when implementing fiscal consolidation policies. Although fiscal consolidation may lead to short-term pain, it can have long-term benefits by improving the economy's overall health.

Column 5 of Table 6.20 reflects the cumulative threshold range of domestic government debt between *dummy_gd_50_60* 50% and 60% in the presence of *tvp_elstcy_capb* fiscal consolidation achieved through government expenditure cuts and tax increases. The *dummy_gd_50_60* is found to be statistically significant at the *p* value of 5%, with a negative coefficient of 2.855, whereas *tvp_elstcy_capb* is fiscal consolidation, which is statistically insignificant. These results suggest that the accumulation thresholds of domestic government debts between 50% and 60% result in a 2.85% chance of a reduction in the gross domestic product per person, while fiscal consolidation provides an accommodative policy to increase the gross domestic product per person with a magnitude not ascertained statistically. Table 6.20 columns 4 to 6 of the cumulative threshold range of domestic government debt reflect a flat S-shaped clockwise impact on gross domestic product per person. These results suggest that a lower range of domestic government debt

thresholds has a detrimental effect on gross domestic product per person. However, mid-range domestic government debt has a positive impact on gross domestic product per person. Finally, a high range has a negative impact on gross domestic product. Nevertheless, fiscal consolidation provides evidence of stimulating the gross domestic product per person across all ranges of the threshold of domestic government debt.

Policymakers should be mindful of the threshold range of domestic government debt and its impact on GDP per capita. In particular, this study highlights that domestic government debt in the range of 50% to 60% has a negative impact on GDP per person. Therefore, policymakers may want to consider implementing policies to reduce government debt to prevent adverse effects on economic growth. The results underscore the importance of fiscal consolidation as a policy tool for mitigating the negative impact of government debt on GDP per person. Policymakers may consider implementing measures, such as government expenditure cuts and tax increases, to achieve fiscal consolidation and improve economic growth. The findings suggest that mid-range domestic government debt has a positive impact on GDP per person. Policymakers may want to consider policies that maintain government debt within this range to support economic growth.

Table 6.21 shows the economic results that analyze different thresholds of domestic government debt using a dummy variable in the presence of fiscal consolidation undertaken through government revenue or tax increases. In Table 6.21 column 1, the threshold of *dummy_gd_30* 30% domestic government debt has a negative impact on the gross domestic product per person. Similarly, fiscal consolidation undertaken through government tax increases is statistically significant at a p value of 1%, with a coefficient value of 0.127. These results suggest that *tvp_elstcy_capb_tgr* fiscal consolidation, characterized by a 1% increase in government expenditure cuts, will result in a 0.127% decrease in the gross domestic product per person. These results suggest that the cumulative threshold of domestic government debt *dummy_gd_50* will result in a 3.692 chance of an increase in gross domestic product per person. However, with the cumulative threshold of domestic government debt *dummy_gd_50*, *tvp_elstcy_capb_tgr* fiscal consolidation has a negative impact on the gross domestic product per person. This is reflected by the negative coefficient of 0.0870, which is statistically significant at p 10%. These results indicate that the implementation of fiscal consolidation through a 1% increase in government revenue or tax increases will result in a 0.0870% decrease in gross domestic product. 2

There is a need to manage government debt levels because the results suggest that high levels

of government debt can have a negative impact on economic growth. Therefore, policymakers may need to consider strategies for managing and reducing government debt over time. Fiscal authorities must choose appropriate fiscal consolidation measures because the results suggest that the type of fiscal consolidation measures implemented can have a significant impact on economic growth. Policymakers may need to carefully consider the trade-offs between implementing revenue increases and expenditure cuts when designing fiscal consolidation policies. Regarding context-specific policies, the results also suggest that the impact of government debt and fiscal consolidation on economic growth may depend on various contextual factors, such as the specific economic and political environment of a country. Therefore, policymakers may need to tailor their policies according to the unique context of their country.²

In table 6.21 column 3, the cumulative threshold of domestic government debt *dummy_gd_70* of 70% presents the chance of an increase in the gross domestic product per person. However, the magnitude of the increase in gross domestic product per person is not ascertained, given that the results are statistically insignificant. However, fiscal consolidation does not provide a supportive policy for domestic government debt at the accumulative threshold of 50%. This is because fiscal consolidation is statistically significant at the *p* value of 10%, with a negative coefficient of 0.0944. These results suggest that, at a threshold of 70% of cumulative domestic government debt, fiscal consolidation achieved through government revenue or a tax increase of 1% will result in a 0.0944% decrease in the gross domestic product per person.

The cumulative range of thresholds of domestic government debt is reflected in Table 6.21 with rates ranging from 30% to 40%, 40% to 50%, and 50% to 60%, respectively, from columns 4 to 6 in the presence of fiscal consolidation achieved through government revenue or tax increase only. In Table 6.21 column 4, the *dummy_gd_30_40* range threshold of the domestic government has a positive impact on the gross domestic product per person. However, the magnitude is not ascertained given that the results are statistically insignificant. This range of domestic government debt *dummy_gd_30_40*, *tvp_elstcy_capb_tgr* fiscal consolidation is achieved through government revenue, or the tax increase is found to be statistically significant at *p* value of 10% with a negative coefficient value of 0.124. These results suggest that fiscal consolidation undertaken with a 1% increase in government expenditure cuts results in a gross domestic product of 0.124

In Table 6.21 column 5, the *dummy_gd_40_50* range threshold of the domestic government is found to have a positive impact on gross domestic product per person. The *dummy_gd_40_50*

Table 6.21: 2SLS model estimation 2

Estimation	(1)	(2)	(3)	(4)	(5)	(6)
Variable	gdp	gdp	gdp	gdp	gdp	gdp
clbr	-0.000262 ^{***} (-8.06)	-0.000247 ^{***} (-14.83)	-0.000258 ^{***} (-8.80)	-0.000235 ^{***} (-6.40)	-0.000276 ^{***} (-10.14)	-0.000222 ^{***} (-9.50)
olbr	0.000292 ^{***} (7.51)	0.000290 ^{***} (12.00)	0.000292 ^{***} (8.09)	0.000247 ^{***} (5.60)	0.000316 ^{***} (8.67)	0.000253 ^{***} (7.83)
gd	0.335 ^{***} (10.98)	0.432 ^{***} (11.66)	0.406 ^{***} (7.28)	0.353 ^{***} (6.14)	0.382 ^{***} (9.24)	0.345 ^{***} (6.65)
tvplstscy_capb_tgr	-0.127 ^{***} (-3.29)	-0.0870 ^{***} (-3.55)	-0.0944 ^{***} (-3.31)	-0.124 ^{**} (-3.14)	-0.101 ^{**} (-2.97)	-0.0874 ^{***} (-3.49)
dmmmy_gd_30	-1.817 (-1.95)					
dmmmy_gd_50		3.692 ^{***} (4.35)				
dmmmy_gd_70			2.297 (1.64)			
dmmmy_gd_30_40				0.115 (0.21)		
dmmmy_gd_40_50					2.451 ^{***} (4.51)	
dmmmy_gd_50_60						-2.813 ^{**} (-2.83)
_cons	33.44 ^{***} (5.79)	20.68 ^{***} (8.61)	26.43 ^{***} (6.05)	30.57 ^{***} (5.61)	31.28 ^{***} (8.25)	24.93 ^{***} (8.58)
N	26	26	26	27	27	26

t statistics in parentheses * p < 0.05 meaning there is less than a 5% chance that the observed results occurred by random chance. The ** p < 0.1, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** p < 0.01, meaning there is less than a 1% chance that the observed.

is statistically significant at p value of 1%, with a positive coefficient value of 0.2451. These results indicate that there is a 0.2451% chance that there will be an increase in the gross domestic product per person when the domestic government debt threshold ranges between 40% and 50%. However, *tvpelestycapbtgr* fiscal consolidation is achieved through government revenue or tax increases, which proves to be a supportive policy instrument to the *dummygd40_50* in an effort to increase gross domestic product per person. This is because *tvpelestycapbtgr* is found to be statistically significant at p value of 5%, with a negative coefficient value of 0.1101. These results indicate that fiscal consolidation which is achieved through a 1% increase in government tax increases will result in a 0.101% decrease in the gross domestic product person.

The *dummygd50_60* in Table 6.21 column 6, is found to have a negative impact on the gross domestic product per person. Moreover, the *dummygd50_60* is statistically significant at p value of 5%, with a negative coefficient value of 2.2813. These results indicate that the threshold of domestic government debt is between 50% and 60%. The results indicate that there is a 2.813% chance that the gross domestic product per person will fall if it is at the threshold rate of *dummygd50_60*. On the other hand, for *dummygd50_60* fiscal consolidation is not effective in stabilizing the gross domestic product per person. This is because at *dummygd50_60*, *tvpelestycapbtgr* is found to be statistically significant at p value of 10% with a negative coefficient value of 0.0874%. The results indicate that fiscal consolidation implemented through a 1% increase in government tax will result in a 0.0874% decrease in the gross domestic product per person. The threshold of domestic government debt applied using the dummy variables in Table 6.21 from columns 1 to 3 provides evidence of a U-shape, which is mostly advocated by Checherita-Westphal and Rother (2012) and Megersa (2015) among other scholars. On the other hand, the range threshold of domestic government debt applied with the utilization of the dummy variables in Table 6.21 from columns 4 to 6, reflects an inverse U-shaped impact of the gross domestic product per person.

Table 6.22 shows the economic results that analyze different thresholds of domestic government debt using the dummy variable in the presence of fiscal consolidation undertaken through government expenditure cuts. In Table 6.22 column 1, the threshold of *dummygd30* 30% domestic government debt has a negative impact on the gross domestic product per person. However, fiscal consolidation through government expenditure cuts has a positive impact on the gross domestic product per person. In Table 6.22 column 2, the threshold of *dummygd50* 50% domestic government debt has a positive impact on the gross domestic product per person and is

Table 6.22: 2SLS model estimation 3

Estimation	(1)	(2)	(3)	(4)	(5)	(6)
Variable	gdp	gdp	gdp	gdp	gdp	gdp
clbr	-0.000280*** (-6.87)	-0.000265*** (-14.20)	-0.000296*** (-6.34)	-0.000252*** (-6.10)	-0.000298*** (-10.50)	-0.000226*** (-10.36)
olbr	0.000304*** (6.57)	0.000304*** (11.29)	0.000328*** (6.48)	0.000276*** (5.52)	0.000347*** (10.24)	0.000266*** (8.55)
gd	0.386*** (6.44)	0.487*** (10.07)	0.510*** (5.22)	0.386*** (5.11)	0.403*** (8.25)	0.357*** (6.70)
tvp_elstcy_capb_g	0.0143 (0.73)	0.0142 (1.03)	0.0162 (0.88)	0.00495 (0.36)	0.0194 (1.96)	0.000629 (0.05)
dmmmy_gd_30	-1.586 (-1.30)					
dmmmy_gd_50		4.615*** (3.81)				
dmmmy_gd_70			5.179 (1.95)			
dmmmy_gd_30_40				-0.609 (-0.93)		
dmmmy_gd_40_50					3.193*** (4.40)	
dmmmy_gd_50_60						-2.896** (-2.98)
_cons	36.07*** (4.43)	21.88*** (6.72)	27.40*** (4.87)	30.47*** (5.16)	32.61*** (7.13)	23.46*** (8.60)
N	27	27	27	27	27	26

t statistics in parentheses * p < 0.05 meaning there is less than a 5% chance that the observed results occurred by random chance. The ** p < 0.1, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** p < 0.01, meaning there is less than a 1% chance that the observed.

statistically significant at p value of 10% with a coefficient value of 4.615. These results indicate that there is a 4.615% change in the gross domestic product per person at a threshold rate of 50% of domestic government debt. On the other hand, *tvp_elstcy_capb_g* fiscal consolidation was also found to have a positive impact on the gross domestic product per person. Table 6.22 column 3, reflects the threshold of *dummy_gd_70* 70% domestic government debt has a positive impact on the gross domestic product per person and is statistically insignificant. Similarly, *tvp_elstcy_capb_g* fiscal consolidation of government expenditure cuts has a positive impact on gross domestic product per person; however, the coefficient value is statistically insignificant.

The cumulative range of thresholds of domestic government debt is reflected in Table 6.22 with rates ranging from 30% to 40%, 40% to 50%, and 50% to 60%, from columns 4 to 6, respectively, in the presence of fiscal consolidation achieved through government expenditure cuts only. In Table 6.22 column 4, the *dummy_gd_30_40* range threshold of the domestic government has a negative impact on the gross domestic product per person. However, the magnitude is not ascertained given that the results are statistically insignificant. This range of domestic government debt *dummy_gd_30_40*, *tvp_elstcy_capb_g* fiscal consolidation is achieved through government ex-

penditure cuts and is found to be statistically insignificant, reflecting a positive impact on gross domestic product per person in South Africa.

In Table 6.22 column 5, the *dummy_gd_40_50* range threshold of the domestic government has a positive impact on the gross domestic product per person. Moreover, the results of the *dummy_gd_40_50* are found to be statistically significant at p value of 1% with a coefficient value of 3.193. This reflects a 3.193% chance that there will be an increase in gross domestic product per person when the domestic government debt threshold is between 40% and 50%. The *tvp_elstcy_capb_g* fiscal consolidation also has a positive impact on the gross domestic product per person at the threshold of *dummy_gd_40_50*.

Table 6.22 column 6, the *dummy_gd_50_60* range threshold of the domestic government was found to have a negative impact on the gross domestic product per person. The *dummy_gd_50_60* has a coefficient value of 2.896, which is statistically significant at p value of 5%. These results indicate that there is a 2.896% chance of a fall in gross domestic product per person when the threshold is at *dummy_gd_50_60*. However, fiscal consolidation through government expenditure cuts at a threshold of *dummy_gd_50_60* is found to have a positive impact on gross domestic product per person, with a coefficient value of 0.0006, which is not statistically significant.

The threshold of domestic government debt applied with the utilization of the dummy variables in Table 6.22 from columns 1 to 3 provides evidence of a U-shape, which is mostly advocated by Checherita-Westphal and Rother (2012) and Megersa (2015) among other scholars. The range threshold of domestic government debt applied with the utilization of the dummy variables in Table 6.22 from columns 4 to 6, reflects an inverse S-shape of the impact of the gross domestic product per person.

Table 6.23 shows the economic results that analyze different thresholds of domestic government debt using the dg^2 square economic variable of domestic government debt. The economic results are in line with the application of the methodology outlined in Equations 5.142 to 5.143. Table 6.23 column 1, reflects the dynamic threshold with a negative coefficient value of 91.68. These results suggest that domestic government debt exceeds the threshold of 91.6. Eight would have a negative impact on the gross domestic product per person. On the other hand, the *tvp_elstcy_capb* fiscal consolidation achieved through the use of both government expenditure cuts and tax increases is found to have a positive impact on gross domestic product per person.

Table 6.23: 2SLS model estimation 4

Estimation	(1)	(2)	(3)
Variable	gdp	gdp	gdp
clbr	-0.000282*** (-6.82)	-0.000262*** (-6.64)	-0.000284*** (-6.81)
olbr	0.000312*** (6.16)	0.000285*** (5.74)	0.000316*** (6.28)
gd	0.806*** (3.86)	0.668*** (3.85)	0.813*** (3.71)
gd.2	-0.00439* (-2.47)	-0.00314* (-2.30)	-0.00440* (-2.33)
tvp_elstcy_capb	0.0192 (1.36)		
tvp_elstcy_capb_tgr		-0.128*** (-3.35)	
tvp_elstcy_capb_g			0.0184 (0.99)
Threshold	-91.68	-106.26	-92.26
_cons	25.72*** (5.85)	26.54*** (6.57)	25.53*** (5.86)
<u>N</u>	27	27	27

t statistics in parentheses * $p < 0.05$ meaning there is less than a 5% chance that the observed results occurred by random chance. The ** $p < 0.1$, meaning there is less than a 10% chance that the observed results occurred by random chance. The *** $p < 0.01$, meaning there is less than a 1% chance that the observed.

However, the magnitude of the impact is not ascertained, given that the result of *tvp_elstcy_capb* is found to be statistically insignificant. Column 2 of Table 6.23 shows the dynamic threshold with a negative coefficient value of 106.26. These results suggest that domestic government debts beyond the threshold of 106.26% have a negative impact on the gross domestic product per person. However, *tvp_elstcy_capb_tgr* fiscal consolidation achieved through the use of government revenue or tax increase is found to be statistically insignificant at p value of 1%, with a negative coefficient value of -0.128 . These results indicate that at the threshold of 106.26 of domestic government debt, fiscal consolidation will not be supportive of increasing gross domestic product per person. As such, a 1% increase in government revenue or tax would result in a 0.238% decrease in gross domestic product per person.

Table 6.23 column 1 reflects the dynamic threshold with a negative coefficient value of 92.626. These results suggest that domestic government debts beyond the threshold of 92.26 would result in a negative impact on the gross domestic product per person. The *tvp_elstcy_capb_g* fiscal consolidation achieved through both government expenditure cuts was found to have a negative impact on gross domestic product per person. Moreover, *tvp_elstcy_capb_g* was found to be statistically significant at p value of 5%, with a coefficient value of 0.00440. This indicates that a 1% increase in government expenditure cuts results in a 0.00440% decrease in gross domestic

product per person.

Table 6.24 summarizes the results of all estimations performed in the empirical work of this study. Table 6.24 shows that in state 1, the accumulative domestic government debt threshold of 30%, 50%, and 70% in the presence of tvp_elstcy_capb fiscal consolidation of using both government expenditure cuts and an increase in tax has a negative, positive, and positive impact on gross domestic product per person in the respective thresholds. A similar result is found in states 2 and 3, with accumulative domestic government debt thresholds of 30%, 50%, and 70% in the presence of tvp_elstcy_capb,gr fiscal government expenditure revenue, and $tvp_elstcy_capb_g$ fiscal government expenditure cuts only have a negative, positive, and positive impact on gross domestic product per person in the respective thresholds. The overall impact is a U-shape, reflecting that as the threshold increases, this fiscal consolidation will reduce domestic government debt and eventually result in an increase in domestic government debt at a high level of the domestic government debt threshold.

If fiscal consolidation is undertaken with the use of both government expenditure cuts and tax increases tvp_elstcy_capb and fiscal consolidation is undertaken, government expenditure cuts only $tvp_elstcy_capb_g$ are found to have a negative, positive, and negative impact on domestic government debt, respectively, in the range thresholds of 30% to 40%, 40% to 50%, and 50% to 60%. Fiscal consolidation undertaken with a tax increase is found to have a positive, positive, and negative impact on domestic government debt in the range thresholds of 30% to 40%, 40% to 50%, and 50% to 60%, respectively. 5

Table 6.24: Summary of threshold domestic government debt impact on *GDP* given fiscal consolidation

Threshold impact of <i>GD</i> on <i>GDP</i> in the present of <i>tv_pelstcy_{capb}</i>						
Threshold	30%	40%	50%	60%	70%	Overall impact on <i>GD</i>
Cumulative threshold state 1	-		+		+	<i>U</i>
Range threshold 30_40	-	-				
Range threshold 40_50		+	+			
Range threshold 50_60			-	-		
Positive impact %	0	50	33.33	0	100	
Negative impact %	100	50	67.67	100	0	
Sub overall impact	-	+:-	-	-	+	-
Threshold impact of <i>GD</i> on <i>GDP</i> in the present of <i>tv_pelstcy_{capb}tgr</i>						
Cumulative threshold state 2	-		+		+	<i>U</i>
Range threshold 30_40	+	+				
Range threshold 40_50		+	+			
Range threshold 50_60			-	-		
Positive impact %	0	50	33.33	0	100	
Negative impact %	100	50	67.67	100	0	
Sub overall impact	-	+:-	-	-	+	~
Threshold impact of <i>GD</i> on <i>GDP</i> in the present of <i>tv_pelstcy_{capb}g</i>						
Cumulative threshold state 3	-		+		+	<i>U</i>
Range threshold 30_40	-	-				
Range threshold 40_50		+	+			
Range threshold 50_60			-	-		
Positive impact %	0	50	33.33	0	100	
Negative impact %	100	50	67.67	100	0	
Sub overall impact	-	+:-	-	-	+	-
Threshold	<i>gd²</i>					
Dynamic threshold	-91.68	-106.26	-92.26			

6.7 Conclusion of chapter

This chapter investigates the problem of constant elasticity used by the IMF and OECD when calculating the cyclical adjusted primary balance (CAPB), and how it affects the measurement of fiscal consolidation episodes. The purpose was to use time-varying elasticity to calculate the CAPB and the time-varying parameter structural vector autoregression (TVP-VAR) model to find this time-varying elasticity. The economic variables used were domestic government debt, money supply, total government revenue, debt service ratio, and CAPB as a proxy for fiscal consolidation. The study finds that when time-varying elasticity is accounted for, there is significant variation in the CAPB, indicating different times of discretionary action by the fiscal authority in an effort to stabilize the economy. The study also found that fiscal consolidation is expected to occur in three to six years, resulting in a radical increase in domestic government debt in the first three years of implementation. This study recommends that fiscal consolidation be planned 3 years to six years in advance, and fiscal authorities need to critically examine the benefit of fiscal consolidation in the short run.

In the second part of the study, we investigate the thresholds that reflect the fiscal consolidation episodes in South Africa. This study uses the CAPB as an economic variable and adopts the threshold autoregressive regime (TAR) model and the deficit theoretical framework. The study finds different thresholds of -1.28168%, 1.9182%, and 1.9270% for the CAPB of the total government revenue increase, government expenditure cut, and the CAPB as a sum of both revenues and expenditures, respectively. These thresholds are different from the threshold of 1.5% advocated in the literature. The third part of the study investigates the impact of fiscal consolidation in different states of domestic government debt in South Africa. The authors used economic variables such as domestic government debt, government expenditure, total government revenue, M3 money supply, gross domestic product per person, debt service ratio, and the CAPB as a proxy for fiscal consolidation. The study adopts the government budget constraint theoretical framework and applies it to the Markov-switching dynamic regression (MSDR) model.

The fourth objective of the study is to show that the impact of the domestic government debt threshold on GDP per person varies depending on the level of debt and type of fiscal consolidation measure used. Specifically, when both government expenditure cuts and tax increases are used, a threshold of 30% has a negative impact on GDP per person, whereas thresholds of

50% and 70% have positive impacts. Similarly, when fiscal consolidation is achieved through either government expenditure cuts or tax increases, the impact of the domestic government debt threshold on GDP per person varies. For example, the range threshold of 30% to 40% has a negative impact on GDP per person when both government expenditure cuts and tax increases are used but has a positive impact when only tax increases are used. Overall, it appears that the relationship between domestic government debt thresholds and GDP per person is complex and depends on multiple factors, including the level of debt and type of fiscal consolidation measures used.

Chapter 7

Discussion of the author's views and analysis on the different objectives of this study

7.1 Introduction

This chapter provides a discussion of the author's views and an analysis of the study's different objectives. Firstly, the chapter discusses the author's views and analyses of objective one which is based on the elasticity of fiscal consolidation in South Africa. Secondly, the chapter outlines the author's discussion of objective two related to the threshold impact of government debt on economic growth in the presence of fiscal consolidation in South Africa. Thirdly, there is a discussion of the author's analysis of objective three of fiscal consolidation in different states of domestic government debt in South Africa. Fourthly, this chapter discusses four objectives related to the impact of fiscal consolidation on different states of domestic government debt in South Africa.

7.2 Authors discussion and view on restructure

The literature review noted that the impact of fiscal consolidation on output (GDP) is mixed. Some studies find contractionary effects, indicating that fiscal consolidation leads to a decrease in economic growth, while others find no significant impact or expansionary effects in the long run. The findings suggest that the relationship between fiscal consolidation and output is com-

plex and depends on various factors such as the composition of the consolidation measures (expenditure-based vs. tax-based), the size of the consolidation, and the economic conditions in which it is implemented. Fiscal consolidation is generally associated with a reduction in government debts. Successful episodes of consolidation led to a decrease in the debt-to-GDP ratio over time. However, the magnitude of debt reduction and the speed at which it occurs vary across different studies and depend on the specific fiscal measures implemented. In a composition of fiscal consolidation expenditure-based consolidations tend to be more successful than tax-based consolidations in reducing government debt and achieving fiscal goals. Spending cuts are generally associated with better outcomes in terms of debt reduction than tax increases.

The efficiency of public-sector spending plays a role in the success of fiscal consolidation. Countries with higher government efficiency are more likely to achieve successful fiscal adjustments and experience larger reductions in government debt. The relationship between fiscal consolidation and economic growth is complex. Expansionary fiscal adjustments can have a positive impact on economic growth in the short term, but their long-term effects are less clear. The size and duration of consolidation as well as the specific measures implemented can influence growth outcomes. Different studies employ various definitions and methodologies to analyze fiscal consolidation episodes, resulting in different findings. The choice of variables, periods, and identification strategies can affect the interpretation of the results.

This literature review highlights the importance of carefully designing and implementing fiscal consolidation measures tailored to the unique circumstances of each country. Successful fiscal consolidation requires a balanced approach, considering both expenditure cuts and tax increases and considering the stage of the economic cycle. Additionally, the level of government debt, political cycles, and external factors can significantly influence the effectiveness and sustainability of fiscal consolidation. Further research in this field is needed to develop a more comprehensive understanding of the dynamics and implications of fiscal consolidation and domestic government debts.

The literature review on the government debt threshold, economic growth, and fiscal consolidation provides valuable insights into the relationship between government debt levels and their impact on economic performance. Several studies have examined this relationship using different methodologies and data from various countries, thereby offering a comprehensive understanding of the topic. These findings consistently suggest the existence of a threshold beyond which gov-

ernment debt starts to have negative effects on economic growth. While the specific threshold varies across studies, ranging from 30% to 90% of the GDP, it is clear that high levels of government debt can hinder economic growth. Debt levels above this threshold are associated with adverse growth effects, increased risk premiums, and the need for fiscal consolidation.

Moreover, the literature emphasizes the importance of good policies, institutions, and debt management to mitigate the negative effects of government debt on economic performance. Countries with sound policies and institutions tend to experience adverse growth effects at lower debt levels than countries with weaker governance structures. This finding highlights the role of fiscal discipline and effective debt management strategies in maintaining stable and beneficial economic conditions. Additionally, the literature recognizes the significance of fiscal consolidation in controlling public debt. This suggests that beyond the identified threshold, fiscal consolidation measures are necessary to stabilize government debt and avoid further harm to economic growth. However, the exact threshold for implementing fiscal consolidation varies among studies and depends on the country-specific factors. In conclusion, the literature review provides compelling evidence of the existence of a government debt threshold beyond which economic growth is negatively affected. This underscores the importance of prudent fiscal policies, effective debt management, and the timely implementation of fiscal consolidation measures to ensure sustainable economic growth. Further research is needed to explore the specific mechanisms through which debt levels impact economic performance and to inform policymakers on optimal debt thresholds and consolidation strategies in different contexts.

7.3 Author's discussion on objective one related to new measure elasticity of fiscal consolidation in South Africa

The objective of this study is to develop a new measure for the elasticity of fiscal consolidation in South Africa. The objective was undertaken because there is an identified problem in which the IMF and OCED use constant elasticity when calculating the CAPB and not time-varying elasticity. The time-varying parameter structural vector auto-regression (TVP-VAR model) of [Nakajima et al. \(2011\)](#) is used to find time-varying elasticity. The objective was to find IMF data for the CAPB for over 23 years, but the one calculated in this study was 43 years. There is a 56.26% variation in the CAPB with time-varying elasticity and a 2.36% variation in the CAPB of the IMF data with time-varying elasticity. This suggests that policymakers should avoid relying

solely on static analysis and consider employing dynamic economic analysis to better capture the direction and magnitude of the economic changes associated with fiscal consolidation. By doing so, policymakers can make informed decisions and enhance the effectiveness of fiscal measures. From a policy perspective, the findings of this study emphasize the importance of incorporating time-varying elasticity into fiscal planning and budgeting processes. Policymakers should consider developing frameworks that allow for the assessment of changing economic conditions and corresponding adjustments in fiscal policies. This approach would enable a more proactive response to economic fluctuations, ensuring that fiscal measures align with the needs of different economic states.

It is the author's view that the constant elastic CAPB is limited in capturing the economic behavior of fiscal authorization through the use of government expenditure and tax. It is also confirmed that the CAPB with time-varying elasticity has 2.36% volatility. Constant elasticity fails to consider the elapsed time. The constant elasticity CAPB assumes that the response of fiscal authorization through the use of government expenditure and tax is constant. Moreover, the author's view is that time-varying elasticity is more dynamic. Using dynamic analysis or time-varying elasticity, one will be able to obtain the prospective economic change in the context of CAPB, which will be a discretionary action of government expenditure as well as tax. Moreover, time-varying elasticity reflects how fiscal authorities react to government expenditure and tax in the effort to implement fiscal consolidation. There is a significant difference of 53.9 % between constant and time-varying elasticities. The lack of a change route in the static analysis is another distinction between static and dynamic economics. It merely provides information on equilibrium conditions. On the other hand, dynamic economic analysis also demonstrates the direction of change. A dynamic economic analysis is more accurate. It is the author's view that time-varying elasticity is very complex, especially to find the dynamic economic analysis as well as economic variables in the CAPB.

This study highlights the need for further research and development of more sophisticated models and methodologies for analyzing fiscal consolidation. Although the TVP-VAR model used in this study is a step in the right direction, there is still room for improvement. Researchers should strive to refine and expand existing models to capture a broader range of economic variables and incorporate more comprehensive data sources. By continuously enhancing the analytical tools and techniques used in fiscal analysis, researchers can provide policymakers with more accurate and reliable information for decision making. Additionally, this study suggests the importance

of considering alternative measures and indicators of fiscal consolidation beyond the CAPB. Although the CAPB is widely used, its limitations in capturing the dynamic nature of fiscal policies necessitate the exploration of complementary measures. Policymakers should explore additional indicators that reflect the effectiveness, efficiency, and sustainability of fiscal consolidation. By adopting a multidimensional approach to fiscal analysis, policymakers can gain a more comprehensive understanding of the impacts of fiscal policies and identify areas for improvement.

Compared with other studies, this study contributes significantly to the understanding of fiscal consolidation. The findings of this study align with previous research that suggests that fiscal consolidation, particularly through government expenditure cuts, can lead to a reduction in government debt. This is consistent with the studies conducted by [Afonso \(2010\)](#) and [Afonso and Jalles \(2014\)](#), which highlight the positive effects of lower government expenditure on private consumption. This study builds upon this research by emphasizing the importance of accurately measuring and accounting for time-varying elasticity in the estimation of fiscal variables. Importance of time-varying elasticity: This study highlights the significance of incorporating time-varying elasticity when calculating the cyclically adjusted primary balance (CAPB) to capture variations in fiscal policy measures over time. Previous studies such as [Giavazzi and Pagano \(1995\)](#) and [Princen et al. \(2013\)](#) have also recognized the relevance of considering elasticities in estimating fiscal variables. This study adds to this understanding by demonstrating that a constant elasticity approach fails to accurately represent fiscal consolidation episodes and their impact on government debt.

Policy implications: This study's findings provide valuable insights for policymakers. By emphasizing the long-term impact of government expenditure cuts on reducing government debt, this study echoes the recommendations of previous research, such as [Mourre et al. \(2014\)](#) and [Price et al. \(2014\)](#), which underscore the importance of targeting inefficient spending. Moreover, the finding that tax increases can contribute to an increase in government debt aligns with the analysis of [Princen et al. \(2013\)](#), who examine the impact of discretionary tax measures on tax elasticities. These findings collectively suggest that fiscal authorities should prioritize expenditure reduction and focus on the productive sectors of the economy, rather than relying heavily on tax increases. Methodological advancements: This study applies a time-varying parameter structural vector autoregression (TVP-VAR) model to estimate the impact of fiscal consolidation on government debt. While previous studies, such as [Giorno et al. \(1995\)](#), [Van den Noord \(2000\)](#), [Bouthevillain et al. \(2001\)](#), [Fedelino et al. \(2009\)](#), and [Afonso and Jalles \(2014\)](#), have em-

ployed different methodologies, the TVP-VAR model offers a unique contribution by capturing the time-varying nature of fiscal policy actions. This methodological advancement can inspire future research exploring the dynamics of fiscal consolidation episodes and their implications for other macroeconomic variables.

7.4 Author's discussion on objective two on the threshold of the CAPB that can be attributed to fiscal consolidation episodes in South Africa

Objective two of this study is based on the threshold of CAPB, which can be attributed to fiscal consolidation episodes in South Africa. This objective forms part of the second imperial work of this study. The identified problem is that there is no specific rate or threshold for how much improvement in CAPB can be attributed to fiscal consolidation episodes. The literature defines fiscal consolidation episodes only by referring to large changes in the CAPB, without analyzing these values (Alesina and Perotti, 1997; Yang et al., 2015). The objective of this study is to bridge the gap in unexplained fiscal consolidation episodes by using the theoretical framework of fiscal deficit and the threshold autoregressive regime (TAR) model. There is an indication that there is a threshold of 1.2168% for *thre_g_tvp_elstcy_capb_tgr* reflecting fiscal consolidation episodes achieved through tax, a threshold of 1.9182% for *thre_g_tvp_elstcy_capb_g* reflecting fiscal consolidation achieved through government expenditure, and a threshold of 1.9270% *thre_g_tvp_elstcy_capb* reflecting fiscal consolidation episodes achieved by using both government expenditure and tax.

Given this result, it is the author's view that there should be an imposition of a threshold of 1.5% on the CAPB, as advocated by McDermott and Wescott (1996), Alesina and Ardagna (1998), Zaghini (2001), and Duperrut (1998). This stands only for institutions in which the rate of 1.5% is effective and sufficiently large to reflect fiscal consolidation episodes that are not associated with cyclical movement. Thus, a threshold of 1.5% can be used to identify the discretionary actions of fiscal authorities, which is equivalent to fiscal consolidation episodes that may not hold. This view of the author is supported by the findings of objective two, which found *thre_g_tvp_elstcy_capb* threshold of 1.9270%, which is higher by 0.427% and contra to that in the literature of Alesina and Ardagna (1998), Zaghini (2001), and Duperrut (1998) among others. Moreover, it is the author's view that there may be a fallacy of composition that the threshold

of 1.5% may be used in studies that are regionally based as well as those that are based at the country level. The results of this study suggest that a country-based threshold analysis is needed to identify fiscal consolidation episodes.

It is the author's view that objective two is critical and adds to the body of knowledge by further disaggregating the threshold of the CAPB by including the *thre_g_tvp_elstcy_capb_tgr* and *thre_g_tvp_elstcy_capb_g* on which the literature is silent.¹ The literature uses tax and government expenditure as economic variables for the CAPB or the assessment of each regarding the impact of these two economic variables on domestic government debt. To this end, it is, to the best knowledge of the author, that tax and government expenditure have not been used as a threshold that can be attributed to fiscal consolidation and calculated rather imposed.

Objective two reflects that there are four fiscal consolidations of *thre_g_tvp_elstcy_capb*, one of which is successful at 25.00%. The author believes that fiscal consolidation in South Africa may not be effective in reducing domestic government debt. The results suggest that 75.00% of synchronized fiscal consolidation episodes are achieved with the use of both government expenditure cuts and a tax increase that is not effective when using domestic government debt. As such, the contraction-expansionary fiscal policy advocated by the non-Keynesian approach (Mankiw, 2014) does not hold in the South African economy.

Objective two reflects that there is a 25% and 37.50% chance that the *thre_g_tvp_elstcy_capb_g* and *thre_g_tvp_elstcy_capb_tgr* fiscal consolidation episodes will result in the successful reduction of domestic government debt in South Africa. It is the author's view that this result has policy implications and that, the fiscal authority must be taken into consideration because the results indicate that fiscal consolidations based on tax increases are more often connected with expansionary effects and have more success in reducing domestic government debt and budget deficits in comparison with a reduction in government expenditure. This result is contrary to literature which advocates that government expenditure cuts are better than tax increases outlined by Blanchard (1990), Duperrut (1998), Afonso et al. (2006), Romer and Romer (2010), Guajardo et al. (2014), Mucka et al. (2016), and Varthalitis and Sakkas (2019) amongst others.

¹To the best ability and knowledge of the author (since working with fiscal consolidation from 2019) there is no imperial work that has to seek of finding the threshold of tax and government expenditure which can be attributed to fiscal consolidation episodes using the CAPB. The literature used the aggregate CAPB, while objective two also disaggregated the CAPB into two components to find *thre_g_tvp_elstcy_capb_tgr* and *thre_g_tvp_elstcy_capb_g*. If literature uses tax and government expenditure the rate only of these economic variables is considered based on intuition which may be biased, given that what is true for one economy may not be true for the other economy.

Nevertheless, fiscal authorities must consider the economic theory of the Laffer Curve (Mankiw, 2014) because a tax increase with the application of fiscal consolidation could be a time when it will start to be detrimental to the economy and result in increases in domestic government debt. It is the author's view that disputed tax is seemingly better than government expenditure cuts. Moreover, there is a need for willingness from firms as well as South Africa's fiscal authorities to work together in the economic decisions and planning of government activities. As such, with tax increases, the private sector will know what revenue for the government will be used for and what business opportunities firms have. Fiscal authorities must consider the trade between crowding-out investments and interest taxes as part of implementing fiscal consolidation.

With a tax increase and the application of fiscal consolidation, there could be a time when it will start to be detrimental to the economy and result in an increase in domestic government debt. It is the author's view that the disputed tax is seemingly better than the government expenditure cut. Moreover, there is a need for willingness from the firms as well as South Africa's fiscal authorities to work together in the economic decisions as well as planning of government activities. As such, with tax increases, the private sector will know what this revenue for the government will be used for and what business opportunities firms have. Fiscal authorities must consider the trade between crowding-out investment and interest tax as part of implementing fiscal consolidation ².

Fiscal consolidation *thre_g_tvp_elstcy_capb_g* reflects 25% success in reducing domestic government debt when there is a government expenditure cut. It is the author's view that if the government expenditure cut is implemented, it needs to be on government categories that will not limit the administration of the government and service delivery. Fiscal authorities must note that fiscal consolidation episodes of government expenditure cuts have a 75% chance of not being successful in domestic government debt.

²Such question is also explored in objective two of this study

7.5 Author's discussion of objective three on the impact of fiscal consolidation in different states of domestic government debt in South Africa

The objective on the impact of fiscal consolidation in different states of domestic government debt in South Africa is discussed in objective three. The objective is undertaken because of the identified problem of a fluctuation in domestic government debt from 1979 to 2022, reflecting instability and a rate above 70%. The objective uses the government budget constraint theoretical framework and the Markov-Switching Dynamic Regression (MSDR) model to identify different states of domestic government debt. We find that there are three states of domestic government debt characterized by means of 31.15%, 44.49%, and 72.39%, respectively.

The threshold of domestic government debt of 31.15% is in State 1, with an expected duration of 16 years and a transition probability of 92.262%. This state reflects a very stable rate of domestic government debt; however, fiscal consolidation was found to increase domestic government debt. It is the author's view that, at this lower rate of domestic government debt, fiscal consolidation needs not to be implemented as it increases domestic government debt. The cut in government expenditures will make fiscal authorities less flexible in responding to crises. If fiscal consolidation is applied to lower domestic government debt, it will result in less protection of the essential safety net, as the government will have insufficient resources for essential programmes.

In the threshold of domestic government debt of 44.49% in state 2, *thre_g_tvp_elstey_capb_tgr* fiscal consolidation of tax reduced domestic government debt, while government expenditure increased domestic government debt. It is the author's view that tax increases must be coupled with the credibility of fiscal authorities. However, in South Africa, there is no high-level credibility given the level of corruption in the country's administration. It is the author's view that fiscal authorities will not be able to give confidence to South Africans that the tax increase is going towards reducing domestic government debt. Moreover, we have seen objective three: even if fiscal consolidation of a tax increase is seen to be successful, the high rate of this fiscal consolidation is not successful. In this regard, it is the author's view that economic agents are highly responsive to tax increases. If a tax is applied, it must be implemented in non-elastic tax categories.

Fiscal consolidation of both government expenditure cuts and tax increases, as well as government expenditure only, is found to increase domestic government debt when the economy is in State 2, characterized by a mean value of 44.49% of domestic government debt. This reflects that the non-Keynesian view that fiscal consolidation reduces government debt does not hold, as all fiscal consolidation of *thre_g_tvp_elstcy_capb_tgr*, *thre_g_tvp_elstcy_capb_g*, and *thre_g_tvp_elstcy_capb* results in an increase in domestic government debt.

The threshold of domestic government debt of 72.39% in State 3 is above the 60% threshold in SADC countries (SADC, 2006). In this state, the fiscal consolidation of *thre_g_tvp_elstcy_capb_tgr*, *thre_g_tvp_elstcy_capb_g* and *thre_g_tvp_elstcy_capb* increases domestic government debt. It is the author's view that fiscal consolidation is ineffective at a higher level of domestic government debt. Fiscal authorities find it difficult to reduce government expenditures to reduce government debt. On the other hand, given the inability to cut government expenditures as fiscal consolidation, it is the author's view that this will increase the interest rate. Moreover, a higher state of domestic government debt fuels the expectation of a higher interest rate. This could result in a tax increase in the future, going toward paying off domestic government debt interests. This will reduce permanent income, lower national savings by the economic agent, lower consumption by economic agents, lower economic growth, and possibly a deep recession.

It is the author's view that fiscal authorities need to look at the rate of domestic government debt, which is about 60%, and try to reduce it because it poses the risk of an increase in the interest rate. It is also the author's view that the economic thinking of the classical monetarist may hold in the future of "crowding out" which outlines that the results from excessive amounts of government borrowing make loanable funds more expensive (an increase in instead of interest rate). As such, business activities in the economy will decrease Mankiw (2014). As economic activities fall, there is a probability that the economy will go into a technical recession ³.

Governments tend to take on too much debt because the benefits make it popular with voters. Increasing debt allows government leaders to increase their spending without increasing taxes. Investors usually measure the level of risk by comparing debt with a country's total economic output, which is measured by GDP. However, economic growth is lower in South Africa. This country is unable to achieve a rate of 5%, as outlined in the National Development Plan. It

³This is when economic activities of final goods produced in the economy fall for 3 consecutive quarters

is the author's view that future studies need to investigate how fiscal consolidation plans should work and what policies respond to shocks, such as slow growth.

Overall, it is the author's view that fiscal consolidation is not effective in reducing domestic government debt at a high level. Moreover, high domestic government debt could be another knock-on effect, such as lower national savings and income and higher interest payments, leading to large tax hikes and spending cuts and a decreased ability to respond to problems. The author proposes that with higher domestic government debt, there is a need for government expenditure in the strategic sector of the economy that will create business opportunities. Through business activities, governments receive taxes and repay debt.

Government expenditure is recommended as better than expenditure cuts. Government expenditure needs to be redirected to the key economic sector, which will generate more revenue for the government. The sooner the fiscal authority reacts to an increase in domestic government debt. The use of fiscal consolidation for tax increases requires critical attention. It is recommended that it be applied to sectors of the economy that are not responsive to tax increases. Moreover, there is a need to investigate why taxes seem to provide evidence of success in reducing domestic government debt rather than government expenditure cuts.

7.6 Author's discussion on objective four on the threshold impact of government debt on economic growth in the presence of fiscal consolidation

The objective was to investigate the threshold impact of government debt on economic growth in the presence of fiscal consolidation in South Africa. This study uses economic data from 1979 to 2022. The objective is to fill the gap in identifying the threshold of domestic government debt on economic growth in the presence of fiscal consolidation. autoregressive threshold regime (TAR) and two-stage least-squares (2SLS) models. The TAR provides evidence that a domestic threshold of 30.62%, 30.31%, and 30.62% resulted in an increase in the gross domestic product per person. It is the author's view that, at this lower level of government debt, South Africa needs to improve its manufacturing capacity and infrastructure to increase exports. This should increase investment resources, reduce reliance on debt, and allow the economy to grow to be debt-free.

Fiscal consolidation achieved through both government expenditure cuts and tax increases has a positive impact on gross domestic product per person at a threshold of 30.62%. Fiscal consolidation undertaken using both government expenditure cuts only harms the gross domestic product when the threshold is 30.31%. At the threshold of 30.31% fiscal thought, government expenditure cuts had a positive impact.

The results showed that the accumulative domestic government debt thresholds of 30%, 50%, and 70% in the presence of fiscal consolidation of using both government expenditure cuts and increases in tax simultaneously have negative, positive, and positive effects, respectively, on GDP per person. South Africa's fiscal consolidation should include measures that help improve the efficiency of public spending and increase output. Fiscal consolidation measures are also recommended to demonstrate the right mix of current spending and capital investment to overcome South Africa's domestic government debt and to support productivity growth. This study also suggests that political will and government commitment are needed to implement fiscal adjustment measures, including tightening public spending.

There is evidence that dynamic domestic government debt thresholds of 91.68%, 106.26%, and 92.26% result in an increase in the fall in gross domestic product per person. Considering fiscal consolidation, there is evidence of a U-shaped impact of domestic government debt on gross domestic product per person. The federal government needs to have guidelines for domestic government debt in terms of duration, moratorium requirements and commitments, and negotiation fees when it approves and guarantees domestic government debt. Moreover, South Africa must use domestic government debt for its catalytic projects. Fiscal consolidation has a negative impact on gross domestic product per capita at a high threshold of domestic government debt. It is recommended that South Africa move away from the policy of fiscal consolidation, both government expenditure cuts and tax increases when there is high domestic government debt. It recommended that an appropriate tax structure is needed to increase tax revenue. The increase in tax revenue is necessary because it can be the means to finance government spending.

It is recommended that future studies factor in the risk of variables associated with government debt in their econometrics analysis. It may be better in the future to include the model of a causal relationship, gravity model, and more of an open trade measure because the study is based on South Africa, which does not operate in isolation. This will also help find new

coefficients, which will bring about more dynamic behavior and interaction among the priority and control variables. It is recommended that studies concentrate on finding good instrumental variables to make the results more reliable and less biased.

7.7 Conclusion

In conclusion, this chapter provides a discussion of the authors' views and an analysis of the different objectives of the study. The first objective is based on a new measure of the elasticity of fiscal consolidation in South Africa. The study found that the constant elastic CAPB is limited in capturing the economic behavior of fiscal authorization through the use of government expenditure and tax. It is the author's view that time-varying elasticity is more dynamic and reflects how fiscal authorities will react to government expenditure and tax in the effort to implement fiscal consolidation. The second objective is related to the threshold of the CAPB, which can be attributed to fiscal consolidation episodes in South Africa. The study found specific rates or thresholds for fiscal consolidation episodes achieved through taxes, government expenditures, and both. The author's view is that a threshold of 1.5% of the CAPB should be imposed to identify discretionary actions of fiscal authorities equivalent to fiscal consolidation episodes.

The third objective is based on fiscal consolidation in different states of domestic government debt in South Africa. The study found that the fiscal authorities' reaction is not the same in different states of domestic government debt, and the constant elasticity rationale does not hold. The fourth objective is related to the impact of fiscal consolidation in different states of domestic government debt in South Africa. The study found that fiscal consolidation policies that do not consider the state of domestic government debt can lead to a reduction in economic growth.

Based on the findings presented in different objectives, it is recommended that policymakers in South Africa implement time-varying elasticity measures for fiscal consolidation instead of relying on constant elastic CAPB. This would provide a more dynamic and accurate reflection on how fiscal authorities react to government expenditures and taxes. Additionally, it is recommended that a threshold of 1.5% of the CAPB be imposed to identify the discretionary actions of fiscal authorities, which is equivalent to fiscal consolidation. This would allow for a more targeted approach to fiscal consolidation policies and help prevent unintended negative effects on economic growth. Policymakers should also consider the state of domestic government debt when implementing fiscal consolidation policies. Failure to do so could lead to a reduction in

economic growth, as shown in this study's findings. Careful consideration and monitoring of the state of domestic government debt is necessary to ensure that fiscal consolidation policies are effective and sustainable in the long term.

Chapter 8

Conclusion of this study

8.1 Introduction

This chapter presents the conclusions of the study, including all empirical studies that have been conducted. First, ¹ of the study is discussed in relation to the various empirical studies conducted. Secondly, the limitations of this study are discussed. In addition, there is an outline of the recommendations for this study based on the empirical findings. The final section concludes the paper.

8.2 Importance of the study

The significance of the empirical work is based on the objective outlined in Section 6.3. Empirical work has been added to the body of knowledge concerning the data of the CAPB with time-varying elasticity. This is in contrast to the data contracted by the IMF with constant elasticity. Empirical work has extended the CAPB from a 23-year time series to a 43-year time series, which provides evidence of fiscal consolidation using the CAPB. Empirical work has cre-

¹This study makes several significant contributions to the fields of economics and public finance. First, it improves the measurement of the cyclically adjusted primary balance (CAPB) by incorporating time-varying elasticity, which provides more accurate information for policymakers to make informed decisions regarding fiscal consolidation. Second, the study identifies a threshold in the CAPB that can be attributed to fiscal consolidation episodes, providing a more nuanced understanding of the relationship between fiscal consolidation and CAPB. This finding is particularly important because it contrasts with previous studies that focused only on large changes in CAPB. Third, the study provides evidence of the impact of fiscal consolidation in different states of government debt, which contributes to the detailed mapping of the transmission mechanism of domestic government debt in South Africa. This information is valuable for policymakers when designing appropriate fiscal consolidation policies that consider the impact on different sectors of the economy. Finally, the study broadens the investigation to include the impact of the domestic government debt threshold on gross domestic product per person in the presence of fiscal consolidation in South Africa. This finding provides insights into the broader implications of domestic government debt thresholds and fiscal consolidation policies on economic growth, which can inform policymaking. This study's contributions to the fields of economics and public finance are significant and can provide valuable insights for policymakers and researchers in designing and evaluating fiscal consolidation policies.

ated and improved the CAPB measurements.

The significance of the empirical work based on objective two outlined in section 6.4 is that there is an identification of the threshold in the CAPB that can be attributed to fiscal consolidation episodes. This is contrary to the literature that only outlines a large change in the CAPB, which can be attributed to fiscal consolidation episodes. Moreover, the threshold is determined using time-varying elasticity data, which is found in the objective one outlined in Section 6.3. The sources of fiscal consolidation are in line with reduced domestic government debt and the growth rate in domestic government debt.

The significance of the empirical work based on objective three outlined in section 6.5 provides evidence of the impact of fiscal consolidation in different states of government debt. This study's contribution to mapping the transmission mechanism of domestic government debt in South Africa is significant. By analyzing the effects of government expenditure and tax on different levels of domestic government debt, this study provides policymakers with valuable insights into the impacts of fiscal consolidation policies on different sectors of the economy. Specifically, this study disaggregates fiscal consolidation into government expenditure and tax for different levels of domestic government debt, which allows for a more nuanced understanding of the transmission mechanism of government debt. This approach enables policymakers to identify the most effective policies for reducing government debt, without compromising economic growth and social welfare. Additionally, the findings highlight the importance of considering the state of domestic government debt when designing fiscal consolidation policies. This study's disaggregation of fiscal consolidation into government expenditure and tax for different levels of domestic government debt provides policymakers with a comprehensive view of the impacts of these policies on the economy, which can inform more effective policy-making decisions.

The significance of the empirical work, based on objective four outlined in section 6.6, is that it provides a broader investigation of the impact of the domestic government debt threshold on gross domestic product (GDP) per person in the presence of fiscal consolidation in South Africa. This investigation is significant because it sheds light on the complex relationship between domestic government debt thresholds and GDP per person, which can inform policymaking decisions regarding fiscal consolidation. The findings suggest that the impact of fiscal consolidation on GDP per person is conditional on the level of domestic government debt. Furthermore, this study highlights the importance of identifying the optimal threshold for domestic government

debt to maximize GDP per person, which can inform policymakers in designing fiscal consolidation policies that balance the need for debt reduction with the goal of promoting economic growth. Comprehensive, objective four outlined in section 6.6 contribution is based on the investigation of the impact of the domestic government debt threshold on GDP per person in the presence of fiscal consolidation in South Africa, which is a significant step towards a more comprehensive understanding of the relationship between fiscal consolidation, domestic government debt, and economic growth.

8.3 Limitations of the study

The limitation of the empirical work that is based on the objective one outlined in section 6.3 is that the CAPB reflects non-policy changes brought on by other events that have an impact on economic activity, such as a stock market boom, which can be taken into account. The CAPB technique is likely to disregard the rationale behind fiscal changes. For instance, the rise of the CAPB may be intended to control economic overheating rather than to close the budget deficit. Additionally, it may exclude some instances of fiscal adjustment, negative shock, and optional fiscal stimulus. CAPB statistics cannot completely rule out instances of positive improvements.

The limitations of the empirical work that is based on the objective one outlined in section 6.4 are that relating to CAPB the potential or trends in economic activity are not visible, and current assessments of where the economy stands about those levels mostly depend on projections for the future and are not captured. The identification of fiscal consolidation episodes is on the threshold and not on the study of government documents and policies that outline fiscal consolidation adoption, as advocated by Romer and Romer (2010) and Devries et al. (2011a) among others.

The limitations of the empirical work that is based on objective three outlined in section 6.5 is that there is no consideration and incorporation of monetary policy, financial crisis, and political state, which is critical in a different state of domestic government debt.

The limitation of the empirical work based on objective four outlined in section 6.6 is that the study did not factor in macroeconomic indicators such as international shocks and financial crises. This is because of the lack of numerical data, and when it was available, it was insufficient to conduct an econometric analysis. The instrumental variables used in this study were weak.

This was beyond the author's control despite trying other variable instruments that were found to be weak. Despite this, the study disaggregated CAPB into government expenditures and taxes.

8.4 Summary and conclusion of the thesis

This study investigates the impact of fiscal consolidation and domestic government debt, as well as economic growth, by using new measures and thresholds in South Africa. This paper first outlines the background and problem statements in Chapter 1. The study also outlined a review of the different definitions and measures of fiscal consolidation used in the effort to find fiscal consolidation episodes. There is an outline of the fiscal consolidation descriptive definition, cyclically adjusted primary balance definitions, and narrative approach found in chapter 2. There is no clear consensus on the best measure of fiscal consolidation. However, these measures reflect extensive developments and improvements in the measure of fiscal consolidation. This study discusses the theory related to fiscal consolidation, government debt, and economic growth. Among other theories discussed are classical (which outlines less government invitation in the economy), standard Keynesian (which promotes the use of government expenditure, which is the opposite of fiscal consolidation), and non-Keynesian schools of thought (outlines the use of fiscal consolidation in the effort to reduce government debt). On the other hand, the study discussed economic growth, namely Harrod-Domar (which promotes savings in the effort to achieve economic growth), Solow growth (advocates for effective key factors of production among other labor and capital in the effort to achieve economic growth), and endogenous growth models (stress the aspect of human capital in the effort to achieve economic growth). This is described in Section 2.

The study further discusses the relevant policies and government interventions that have been undertaken to implement fiscal consolidation in South Africa. Some of the key measures and policies that have been implemented include the cyclically adjusted primary balance, reconstruction and development program (RDP), Growth Employment and Redistribution (GEAR), medium-term expenditure framework (MTEF), Public Finance Management Act and Protocol on Finance and Investment (PFI). All discussions of the policies in South Africa that are related to fiscal consolidation are found in chapter 2. There is also a discussion of fiscal variables concerning fiscal policy and consolidation in South Africa. Moreover, we discuss the cyclically adjusted primary balance in South Africa as a measure of fiscal consolidation.

The first objective was related to new measures of fiscal consolidation episodes using the cyclical adjusted primary balance (CAPB), taking into account time-varying elasticity. The problem statement of this objective is reflected in chapter 1 and section 1.3, with the result of the objective statement presented in chapter 4 reflected in section 6.3. This investigation is based on the fact that the IMF and OECD use constant elasticity when calculating the CAPB and not time-varying elasticity. The key finding is that there is greater variation in the CAPB when time-varying elasticity is considered. This reflects that the discretionary action of fiscal authorities (fiscal consolidation) can be better captured using time-varying elasticity, as discussed in section 4 and reflected in section 6.3. The result of the investigation was that using time-varying elasticity to calculate the cyclical adjusted primary balance (CAPB) can better capture the discretionary actions of fiscal authorities, such as fiscal consolidation measures, and lead to a more accurate representation of a country's underlying fiscal position. This finding is presented in Chapter 4 of the investigation, specifically in Section 6.3. The investigation highlights the importance of using appropriate elasticity to calculate the CAPB to ensure an accurate assessment of a country's fiscal policy.

The second objective was to investigate the thresholds that reflect fiscal consolidation episodes in South Africa. The problem statement of this objective is reflected in chapter 1 and section 1.3, with the result of the objective statement presented in chapter 4 reflected in section 6.4. This second objective is undertaken because of the identified problem that there is no clear explanation for the threshold that can be attributed to fiscal consolidation. There were 1.28168%, 1.9182%, and 1.9270% for the CAPB of total government revenue increase, government expenditure cut, and the CAPB as a sum of both revenues and expenditures, respectively. Given this threshold, it was found that there is a high rate of no success in fiscal consolidation, as discussed in Chapter 4 reflected in Section 6.4. The findings of the study suggest that, while thresholds can be identified to determine fiscal consolidation episodes in South Africa, there is a high rate of failure in achieving fiscal consolidation. This implies that there are underlying factors that impede the success of fiscal consolidation efforts in the country, which require further research and policy attention. This study highlights the importance of understanding and addressing these underlying factors to achieve sustainable fiscal consolidation in South Africa.

The third objective is to investigate the impact of fiscal consolidation in different states on domestic government debt in South Africa. The problem statement of this objective is reflected in chapter 1 and section 1.3, with the result of the objective statement presented in chapter 4

reflected in section 6.5. This third objective is undertaken because of the identified problem of a fluctuation in domestic government debt from 1979 to 2022, reflecting no stability and a rate above 70%. This rate is above the 60 % threshold rate advocated by SADC countries, of which South Africa is a member [SADC \(2006\)](#); [Buthelezi and Nyatanga \(2018\)](#). As such, it is critical to investigate the effect of fiscal consolidation in different states of domestic government debt. It is found that there are three states of domestic government debt characterized by means of 31.15%, 44.49%, and 72.39%, respectively. Fiscal consolidation was found to be effective in a state with a lower mean domestic government debt rate; however, with a higher mean, fiscal consolidation was not successful. Such a discussion is presented in Chapter 4 reflected in Section 6.5. This study finds that fiscal consolidation has both positive and negative impacts on domestic government debt and economic growth in South Africa, depending on the level of debt and the methods used for consolidation. The study identified three states of domestic government debt with different mean rates of debt and found that fiscal consolidation was effective in the state with a lower mean domestic government debt rate, but not in a state with a higher mean. The study also identifies a threshold of domestic government debt on economic growth in the presence of fiscal consolidation, with a positive impact on gross domestic product per person at a threshold of 30.62%. The study provides recommendations for future research and fiscal policymakers to investigate the short-term and long-term effects of fiscal consolidation and to plan for consolidation over three to six years in advance.

Fourth, this study investigates the threshold impact of government debt on economic growth (peroxide by gross domestic product per person) in the presence of fiscal consolidation in South Africa. The problem statement of this objective is reflected in chapter 1 and section 1.3, with the result of the objective statement presented in chapter 4 reflected in section 6.6. The fourth objective is to fill the gap in the identification of the threshold of domestic government debt on economic growth in the presence of fiscal consolidation. It was found that thresholds of 30.62% 30.31% and 30.62% resulted in an increase in the gross domestic product per person. Fiscal consolidation achieved through both government expenditure cuts and tax increases has a positive impact on gross domestic product per person at a threshold of 30.62%. Fiscal consolidation undertaken through the use of both government expenditure cuts only has a negative impact on the gross domestic product when the threshold is 30.31%. At the threshold of 30.31% fiscal thought, government expenditure cuts have a positive impact, as discussed in Chapter 4 and reflected in section 6.6. The findings show that government debt and fiscal consolidation have a significant impact on economic growth in South Africa. The study found that there is a threshold level of

government debt beyond which increasing debt levels can have a negative impact on economic growth. However, the study also finds that fiscal consolidation can have a positive impact on economic growth if implemented at the appropriate threshold level of government debt. Specifically, the study found that a combination of government expenditure cuts and tax increases can be an effective approach to achieve fiscal consolidation and promote economic growth at a threshold level of 30.62% of the government debt to GDP ratio in South Africa. This study highlights the importance of managing government debt levels and implementing appropriate fiscal policies to promote sustainable economic growth in South Africa.

8.5 Recommendations

Recommendations of the empirical work that is based on objective work in section 6.3 are that future studies need to factor in and disaggregate the components of the CAPB concerning government expenditure (investment and wages, among others) and tax (income tax, value added tax, etc.). On the other hand, it is recommended that the IMF, fiscal policymakers in South Africa, and scholars move away from the use of constant elasticity and use time-varying elasticity when modelling CAPB. This is because the empirical evidence shows that constant elasticity captures fewer variables than time-varying elasticity in the CAPB, which can be attributed to fiscal consolidation. The empirical work concludes that fiscal consolidation increases domestic government debt in South Africa. However, fiscal authorities should investigate the short- and long-term effects of fiscal consolidation. Moreover, it is recommended that fiscal consolidation should be a plan of three to six years in advance.

The recommendations of the empirical work based on objective two in section 6.4, scholars need to move away from adopting one threshold of 1.5%, which has no econometrics base. It is recommended that a country-based threshold be identified to identify fiscal consolidation episodes. The success rate of fiscal consolidation is much lower than the rates of 37.5%, 52.00%, and 25.00% for *thre_g_tvp_elstcy_capb_tgr*, *thre_g_tvp_elstcy_capb_g* and *thre_g_tvp_elstcy_capb*, respectively. Given this lower success rate, it is recommended that fiscal consolidation not be implemented in South Africa. As such, alternative ways of reducing domestic government debt must be investigated. In addition to using the CAPB threshold to identify fiscal consolidation episodes, there is a need to investigate fiscal consolidation episodes using the narrative approach as outlined by Romer and Romer (2010) and Devries et al. (2011a) which indicates that fiscal consolidation episodes need to be identified by looking at government documents that indicate

government expenditure cuts and tax increases.

The recommendation of the empirical work that is based on objective three in section 6.5 is that there is a need for the South African government fiscal authorities to formulate an appropriate domestic government debt policy that can apply to different states of domestic government debt. Fiscal consolidation is not recommended in South Africa as it increases domestic government debt. As per the findings of the objective, two-tax fiscal consolidation is successful only in reducing government debt. However, there is a higher risk of failure, as fiscal consolidation achieved through tax is not recommended. Two fiscal consolidations indicate that it can reduce the domestic government in the second state, which has a mean value of 44.89%. However, this result was statistically insignificant. Fiscal consolidation is risky and has a high rate of failure. Therefore, fiscal authorities do not need to use taxes.

Future studies should consider the risk of variables associated with domestic government debt in their econometric analysis to determine the impact of fiscal consolidation of domestic government debt in different states. A national treasury in South Africa needs to create a strong financial department that can negotiate interest rates with lenders. This can assist in curbing the accumulation of domestic government debts. However, this interest negotiation may be under the control of fiscal authorities given international factors. As such, it is important to have credible government control over government expenditure and reduce corruption. Financial resources must be redirected to business activities that can generate revenue through taxes other than increasing taxes. Fiscal authorities need to have guidelines for external loans in terms of duration, moratorium requirements and commitments, and negotiation fees when the government approves and guarantees debt in a different state of government debt.

The recommendations of the empirical work are based on objective four in section 6.3. At a policy level, it is recommended that South Africa not implement fiscal consolidation programs aimed at achieving debt sustainability and reduction in the medium to long term to achieve economic growth. In terms of government debt thresholds, the results of the study show that the South African domestic government debt share threshold of 60% has a positive impact on gross domestic product per person. Therefore, it is recommended that South Africa maintain a domestic government debt threshold of 60% or less, as stipulated in PFI policy Annexure 2. However, it is recommended that the rate be revised downwards on an annual basis or after five years. This was done to reduce the risk of government debt accumulation.

The threshold of domestic government debt from 91.65% to 106.26% has a negative impact on the gross domestic product per person. Moreover, fiscal consolidation at this threshold has a negative impact on gross domestic product per person. As such, it is recommended that South African fiscal authorities need to make ensure that domestic government debt does not reach between 91.65% and 106.26%. Policies to improve funds and government debt structures should aim to diversify sources of funds instead of relying too much on government debt. Moreover, policies need to have a risk management framework that will enable the identification and management of trade-offs between the expected cost and the risk of the government debt portfolio. The development of a model of financial cost and government fiscal position is recommended to measure the impact of debt and debt servicing on economic growth in the short and long terms.

The relationship between government debt and economic growth depends on several factors such as labour and gross fixed capital formation. Labour in this study, labor was found to be the highest contributing factor to economic growth. However, in South Africa, there is a high level of unemployment, which poses the risk of weakening economic growth. Therefore, to maintain and further accelerate the positive impact of labour on economic growth, it is recommended that South Africa's natural resources, manufacturing, and agriculture sectors be labour-absorbed. Moreover, it is recommended that there be a need to develop a 10-year plan to reform these sectors and ensure massive economic participation and employment.

It is recommended that South Africa use domestic government debt only for catalytic projects, which are of the highest priority. This is because domestic government debt is associated with a high risk. Therefore, it is recommended that South Africa take government debt for projects that yield a higher return than the interest that needs to be paid. Moreover, strict project implementation, transparency, and monitoring are recommended for government debt. At an operational level, it is recommended that government debt in South Africa be analyzed in the medium-term expenditure framework. The medium-term expenditure framework must reflect the imperative steps of budgeting and expenditure priorities financed by government debt. Budgets should be based on realistic macroeconomic assumptions. Moreover, it is recommended that public audits, accounting officers, and auditor generals employ human resources within the country.

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Ethical clearance



9 Nov 2022

Mr Eugene Msizi Buthelezi (210542387)
School Of Acc Economics&Fin
Pietermaritzburg

Dear Mr Eugene Msizi Buthelezi,

Original application number: 00019959
Project title: Impact of fiscal consolidation on domestic government debt in South Africa 1979 to 2022

Exemption from Ethics Review

In response to your application received on 8 Nov 2022, 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,

A black rectangular redaction box covering the signature of Prof. Josue Mbonigaba.

Prof Josue Mbonigaba
Academic Leader Research
School Of Acc Economics&Fin

UKZN Research Ethics Office
Westville Campus, Govan Mbeki Building
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