ANALYSIS OF THE SOUTH AFRICAN UNDERGROUND ECONOMY: AN ECONOMETRIC ESTIMATION FROM THE CURRENCY DEMAND APPROACH

by

MASIPA OSCAR MASIPA

Dissertation submitted for the requirements for the degree of

MASTER OF COMMERCE IN ECONOMICS

in

FACULTY OF MANAGEMENT & LAW

(School of Economics and Management)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: Prof IP Mongale

2024

DECLARATION

I declare that "**ANALYSIS OF THE SOUTH AFRICAN UNDERGROUND ECONOMY: AN ECONOMETRIC ESTIMATION FROM THE CURRENCY DEMAND APPROACH"** is my work. All the sources that I have used or quoted have been indicated and acknowledged using complete references and this work has not been submitted before for any other degree at any other institution.

Full names **Date**

Masipa Oscar Masipa

ACKNOWLEDGEMENTS

First, I thank Almighty God for being with me in times of weakness and joy. This dissertation would not have been possible without him. In addition, I would like to thank the following:

• My Family: I thank my family for their continued patience, love, and support.

• My supervisor: I would like to express my sincere appreciation and gratitude to my supervisor, Professor IP Mongale. It is because of his patience, advice, and continuous support that I was able to complete this work. I thank him for allowing me to follow my curiosity and passion.

• University of Limpopo: I would like to express my deepest gratitude to all the committee members of the School of Economics and Management. Also, the Faculty of Management and Law of the University of Limpopo. Their comments, corrections and useful suggestions were very helpful throughout this project.

ABSTRACT

The study aimed to investigate the South African underground economy from 2000-2022 by conducting an impact analysis between the selected independent variables and the demand for currency. The study was concerned with increased unlawful and informal economic activity, which has effects of preventing the South African government from receiving prospective tax money. Since the phenomenon of the underground economy cannot be observed directly, the study employed the currency demand approach (CDA) by Tanzi (1983). The study used a time series from the South African Reserve Bank (SARB) for analysis by the EViews 9 statistical package. The study discovered that, in the long-run, an increased tax burden and rising unemployment rates influence the underground economic activities in South Africa. However, an increase in GDP will not reduce underground economic activity in the long-run. An acceleration of the inflation rate acts as a tax, as it negatively affects agents of the underground economy in the short- and long-run. Its long-run effects are not significant. The outcomes showed that the dynamics of the underground economy could matter for economic policymaking purposes. The study contributes to the research gap and knowledge of academia about using underground economy estimates in analysis and policy design.

KEY CONCEPTS: Underground economy, Demand for Currency, South Africa, Tax burden, GDP, Unemployment rate, Inflation rate.

TABLE OF CONTENTS

ACRONYMS

Term	Description
ADF	Augmented Dicky-Fuller
AIC	Akaike information criterion
AR	Auto Regressive
ARIMA	Auto-Regressive Integrated Moving Average
ARMA	Auto-Regressive Moving Average
ATM	Automated Teller Machines
BATSA	British American Tobacco South Africa
BER	Bureau for Economic Research
BIC	Bayesian information criterion
BLUE	Best Linear Unbiased Estimator
BRICS	Brazil, Russia, India, China, South Africa
CDA	Currency Demand Approach
CISs	Collective Investment Schemes
CPI	Consumer Price Index
ECM	Error Correction Model
ETFs	Exchange Traded Funds
FATF	Financial Action Task Force
FIC	Financial Intelligence Centre
FinCEN	Financial Crimes Enforcement Network
FPE	Final Prediction Error
FSCA	Financial Sector Conduct Authority

GDP	Gross Domestic Product
GEAR	Growth, Employment and Redistribution
GNP	Gross National Product
HQC	Hannan-Quinn criterion
IFFs	Illicit Financial Flows
ILO	International Labour Organization
LFS	Labour Force Survey
LOS	Level of Significant
M0	Cash (Notes + coins)
M1	Narrow Money (M0 + demand deposits)
M2	M1 + other type of deposits
M3	Broad Money (M2 + money market funds)
MCDR	Modified-Cash-Deposit-Ratio
MIMIC	Multiple Indicator Multiple Cause
MMFs	Money-Market Funds
MVTS	Money Value Transfer Systems
NDP	National Development Plan
OECD	Economic Co-Operation and Development
OLS	Ordinary Least Square
PASA	Payments Association of South Africa
PP	Phillips- Perron
PTP	Peer-to-Peer
PwC	Price Waterhouse Coopers
RDP	Reconstruction and Development Programme
RESET	Regression Equation Specification Error Test
RNSF	Research, Network and Support Facility

ROSCAs	Rotating Savings and Credit Associations
SALGA	South African Local Government Association
SARB	South African Reserve Bank
SARS	South African Revenue Service
SASSA	South African Social Security Agency
SDGs	Sustainable Development Goals
SEDA	Small Enterprise Development Agency
SIC	Schwarz Information Criterion
SVAR	Structural Vector Auto-Regressive
SMMEs	small, medium, and micro enterprises
Stats SA	Statistics South Africa
TBML	Trade Based Money Laundering
TIPS	Trade and Industrial Policy Strategy
UNECA	United Nations Economic Commission for Africa
UNRISD	United Nations Research Institute for Social Development
USA	United States of America
USD	United States of America's currency
VAR	Vector Auto-Regression
VAR	Vector Auto-Regressive
VECM	Vector error correction model
WAEMU	West African Economic and Monetary Union
WEF	World Economic Forum

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

The gross domestic product (GDP) in terms of monetary expenditures is a metric used to assess economic growth. Typically, these include consumer spending, investment spending, government expenditures at all levels, and net exports (Lippert and Walker, 1997). However, this measurement methodology has weaknesses because it does not account for unrecorded and undetected economic activities. Therefore, the official GDP statistics cannot reflect the true value of economic transactions (Marhamah and Zulaikha, 2021). Economic theory relating to national income suggests that all methods of calculating GDP, which essentially measures the same thing at different points in the circular flow, must be balanced (van Zyl et al., 2002). However, that is not often the case. When the income approach results in a smaller GDP than the expenditure approach, this discrepancy, for example, begs the question, “Where does this additional money come from”? This question raises the issue of the likelihood of unobserved economic activities. The concept of “underground economy” is frequently used to describe these activities (Schneider and Buehn, 2013).

Research on the underground economy has grown in importance. After reportedly taking the form of great networks, the underground economy was first discussed in developed countries in the 1960s because of the type of labour practices and production taking place at that time. By the mid-1960s, development specialists and national authorities reflected on their conclusions that the traditional forms of labour and production would soon fade away because of economy-rebuilding strategies, as was the case in some European countries. However, that did not yield the same results in colonized countries since unemployment rates in registered jobs were beginning to grow. During the 1970s, government revenues as a proportion of the Gross National Product (GNP) in the United States of America (USA) repeatedly fell short of projections while spending outpaced income. Thus, increasing the deficit.

Some said that structural changes were the cause of the issue, while others cited the underground economy as evidence that unemployment was lower and earnings higher than the official numbers indicated. Hence, the underground economy appeared to explain the budgetary abnormality. Additionally, during this period, the claws of the underground economy were discovered in Africa. The International Labour Organization (ILO) report on Kenya found that informal work is not only growing, but it is doing so in an economic and profit-making manner. Following the 1980s fast trend of globalization, the underground economy expanded swiftly once more and has since become a significant economic issue worldwide (ILO, 1972; Naylor, 2005; Kabatas and Turkler, 2012; Rosaldo et al., 2012).

Nyong (2018) defined economic activities as concealed, irregular, parallel, visible, or invisible and not subject to government control. Several worldwide economic forums, the ILO, World Bank, and European Commission, have given the underground economy attention. The explanation is simple: there is a need for a nuanced understanding of economic performance. For example, if the debt-to-GDP ratio is overestimated, government data will be inaccurate. This means that monetary and fiscal policies will be based on flawed information. As a result, the country's ability to manage its public debt will be compromised (Ahumada et al., 2006). This notion assumes that official statistics do not capture underground economic activity (Caridi and Passerini, 2001).

There are various names for the underground economy phenomenon, including the shadow economy (Frey and Schneider, 2000), the informal economy (Portes et al., 1989), and many of which are studied in the literature. Though it appears the terms indicate the same things, it depends on the context (Hassan and Schneider, 2016). The underground economy is often associated with criminal activities. This is because the term underground has a negative connotation. This is most evident concerning the illicit sector (Fleming et al., 2019). It goes way beyond that however as it includes any income or sales transactions that are unreported (Laguta, 2018). This is where the informal sector plays a role. The informal sector refers to a variety of activities which are an everyday fixture for developing and less developed economies. To show the undesirable conduct that occurs in these economies, many researchers in Western countries choose to utilize this terminology (Tsenkwo, 2013).

Studies that investigated the underground economy are many. Because it covers so many activities, many of which are not strictly economic, authors in this field of research struggle to define it. Thus, it is one of the most complex phenomena in modern reality (Andreev et al., 2018). Although there is still disagreement about what constitutes the underground economy, many scholars are now concentrating on its causes, while others are looking at how it affects the surrounding social and economic environment. These scholars reached the same conclusion, which links taxation and the underground economy. Research continues to show that underground economic activity is a reality across the world, and there are signs that it is growing (Schneider and Enste, 2000).

A stronger underground market may make it more difficult for the government to respond to its shortfall. In other words, the government may need to raise tax rates or find new revenue sources to pay for public expenditure. Inflation is one potential contributing element. According to Mazhar and Meon (2017), the underground economy may be taxed using inflation. In line with the public finance motivation of inflation, the authors test and demonstrate that this claim is accurate only if the government had authority over monetary policy. Actors of the underground economy can avoid taxes on labour and capital but cannot avoid inflation tax since they need cash to carry out transactions (Ercolani, 2000).

It is widely acknowledged that underground economic activity is rising faster in developing economies than in wealthy economies, simply because their government systems are not efficient enough to account for every single transaction taking place in the economy (Giles, 1998; Mulinge and Munyae, 1998; Schneider, 2006; Medina and Schneider, 2018; Marwan and Chore, 2019). According to Etim and Daramola (2020), the underground economy is a vital component of sub-Saharan African economies since it is crucial to the growth of their monetary development. Governments in developing countries have great difficulty collecting taxes, leading to a gap between what they can collect and what they collect.

According to the research requested by the development committee of the European Parliament, developing countries receive a lower proportion of their GDP in the form of taxes: 10 to 20% instead of 30 to 40% (Mascagni et al., 2014). As a result, the government's estimate of GDP in developing economies can be considered "small"

because it does not consider the large underground economy. Zimbabwe and Bolivia have the largest underground sectors in the world, accounting for approximately 60.6% and 62.3% of GDP respectively (Medina and Schneider, 2018).

Given the nature of the underground economy, it can be said that GDP estimates for these countries may be underestimated. While national accounts are a useful tool for learning about the various facets of the country's economy, Frey and Schneider (2000) point out that depending solely on government data will lead to judgments that are biased. Macroeconomic policies will therefore probably be overly expansionary, while social measures will probably be overly drastic. For instance, official unemployment figures could conceal jobless people who are participating in paid labour unofficially.

In certain nations, official national account data need to pass either explicit or, more typically, an implicit political criterion, as estimates from statistical agencies must have the approval of political authorities before being released as official statistics (Tanzi, 1999). According to Ogunc and Yilmaz (2000), economic policy decisions based on official macroeconomic data, such as unemployment rate and GDP, are likely to be ineffective given that statistics on the underground economy are intentionally disregarded. For example, this may be because some people are unwilling to work formally because of the benefits of informality. The Growth, Employment and Redistribution (GEAR) program's failure in South Africa as a job-creation and redistribution approach may serve as evidence in this instance (see Visser, 2004; du Toit and Neves, 2007).

The underground economy in South Africa has seen the informal sector play a critical role in job creation, poverty reduction, and free trade. High unemployment and poverty levels in South Africa provide a compelling justification for the necessity of the underground economy (Petersen, 2011). Therefore, the underground economy is a significant component of the South African economy in terms of job creation (Ligthelm, 2008). It offers a substitute and often a long-term source of income for thousands of unemployed individuals (Blaauw, 2017). However, these are signs of inefficiencies in the formal economy (Kelmanson et al., 2019).

There have been several efforts to calculate the South African underground economy's size. According to the available data, between 1966 and 2002, South

Africa's underground economy produced an average of 9.5 percent of GDP (Saunders, 2005). In addition, it accounted for an average of 22.47 to 25.45 percent of the country's GDP from 2000 to 2019 (Makananisa et al., 2020). According to estimations from 2003 to 2020, this ranged from 25.4 to 32.3 percent of GDP (Koloane and Bodhlyera, 2022). By 2020, it was projected that the country's underground economy would grow to 24.19 percent of GDP (Fin24, 2017).

By monitoring the changes in the money supply, this study hopes to provide additional light on the subject. In doing so, an increase in the demand for currency is used as an indicator of the underground economy. This is because there is a great link between the usage of cash and the underground economy (Giammatteo et al., 2021). Few studies that target the underground economy in South Africa use M3 as a dependent variable. This is because M3 is considered the highest broad money balance in monetary policy targeting (Niyimbanira, 2013). Distinct from those studies, this study attempts to use narrow money (M1) because it reflects the public's spending intentions (Roth, 1984).

1.2 PROBLEM STATEMENT

The burden of the underground economy can surface in many forms. Recently, the World Economic Forum (WEF) (2022) global risks report details the major concerns facing the formal economy of South Africa. These concerns include extended economic stagnation, job and livelihood crises, state breakdown, public infrastructure failure, and the expansion of illicit activities. Additionally, as the COVID-19 pandemic spread, its economic impact threw South Africa's formal economy into disarray. Empirical analysis from a labour market survey by Verick (2020) revealed the loss of 2 million jobs in the formal economy during the pandemic. Forecasts by Strauss et al. (2020) showed that this number is expected to grow as jobs in private sectors (e.g., Agriculture) are at risk of permanent loss.

During the COVID-19 the unemployment and inflation rates skyrocketed, but so did unlawful and informal economic behaviour. For instance, Times Live (2020) reported that millions of cigarettes intended for legitimate export, were sold on the country's illegal market at exorbitant prices. According to the Daily Maverick (2021), the prohibition on tobacco sales resulted in a daily revenue loss of R35 million for the

government. British American Tobacco South Africa (BATSA) (2021) discovered that 75% of retail locations sold illegal cigarettes in various areas. Additionally, the number of travellers arrested at South African airports with substantial undeclared currency has increased (ENCA, 2016; IOL, 2018; news24, 2021).

These are some of the signs that unobserved economic activity is expanding in South Africa and has the effect of preventing the state from receiving prospective tax money. A load that is difficult to handle is also placed on the state by this. The issue of the growing official unemployment figures could further worsen the problem of tax compliance. According to Stats SA (2024), there were 7.9 million persons during the fourth quarter of 2023. In addition, job loss in construction, agriculture, community and social services, trade, and manufacturing sectors contributed to the growth of informal sector employment in the same quarter.

There are gaps emanating from existing studies. Koloane and Bodhlyera (2022) undertook a related study in the South African context, but their analysis omitted price movement considerations. This study extends theirs by employing an alternative model to investigate trends in South Africa's underground economy. Notably, the study addresses this limitation by integrating real GDP, income and wealth taxation, and inflation into the analytical framework. In summary, the present study highlights the issues of the underground economy's expansion, which is the context of this investigation.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim of the study

The study aims to make an econometric analysis of the South African underground economy through the currency demand approach (CDA) model. The study will construct the empirical model where an increase in the demand for currency represents the underground economy. As a result, the objectives as follows.

1.3.2 Objectives of the study

- To investigate the relationship between economic growth and the demand for currency
- To determine the impact of the tax burden on the demand for currency

- To determine the impact of the unemployment rate and inflation rate on the demand for currency

1.4 RESEARCH QUESTIONS

The following questions will be answered in this study,

- What is the relationship between economic growth and the demand for currency?
- What is the impact of the tax burden on the demand for currency?
- How does unemployment rate and inflation rate impact the demand for currency?

1.5 DEFINITION OF KEY CONCEPTS

This section presents the concepts identified as key concepts and they are defined to communicate the exact meaning in the context of this dissertation.

- **Underground Economy**

One of the major concerns in economics is that there is a broad disagreement about the definition of the underground economy. According to Frey and Schneider (2000), the definition of the underground economy varies, and it depends on the purpose. For instance, Nyong (2018) defines the underground economy as economic operations that are irregular, parallel, concealed, and apparent yet fall beyond the scope of governmental control. Smith (1994) defines it as economic activities that are not included in the official GDP. Boitano (2019) defines it as illicit activities that are not antisocial. Nonetheless, although the meaning of the phrase "underground economy" is unclear in the economic literature, the current research primarily uses it to refer to the informal sector and the illicit sector, as defined by Stats SA and South African Revenue Service (SARS). The informal sector definition is employment-based, and the illicit sector definition is tax-based. A clear picture of these activities is highlighted in Chapter 2.

- **Currency**

M1 is used to proxy currency demand in the study. This is the amount of money in the form of banknotes and coins circulating in the public (Marhamah and Zulaikha, 2021). Theoretically, M1 is made up almost entirely of funds that can be used

immediately, such as banknotes, coins, and demand deposits (Roth, 1984). In addition, M1 is used for transactions and precautionary motives (Ouma et al., 2007).

- **Economic growth**

In this study, GDP is used as a proxy for economic growth. GDP measures the monetary value of finished products and services produced in a nation over a specific period. Only finished products and services are taken into consideration to avoid double counting (van Zyl et al., 2002). Therefore, if a nation's GDP increases over time, that nation's economy is increasing (Masoga, 2018).

- **Tax Burden**

In this study, tax revenue is used as a proxy for tax burden. According to the Organization for Economic Co-Operation and Development (OECD) definition, the ratio of tax revenue to GDP represents the tax burden (OECD, 2023). The tax burden in this study is the current income and wealth taxes as a proportion of GDP, based on the data gathered.

- **Unemployment rate**

It refers to the fraction of the labour force that is unemployed (Abel, Bernanke, and Croushore, 2014). This includes ages 15-64 of the South African population (OECD, 2023).

- **Inflation rate**

CPI (Headline) is used to proxy inflation in this study. It refers to a circumstance in which most products and services see gradual price increases (Abel, Bernanke, and Croushore, 2014).

1.6 ETHICAL CONSIDERATIONS

This study follows relevant protocol and ethics as per the University of Limpopo plagiarism policy and all sources used are acknowledged with appropriate references. Data was obtained from the South African Reserve Bank websites which are freely available to the public.

1.7 SIGNIFICANCE OF THE STUDY

Even though the literature review has revealed that contemporary economies such as South Africa are vulnerable to the dimensions of the underground economy, there

is limited research in this field. Research continues to show that this phenomenon is growing worldwide and has some effects on economic growth. An underground economy assumes an indispensable part in the monetary framework, not just from an economic but also from a regulatory standpoint. Considering that most economic activity takes place in the name of survival, greed, and self-interest, the presence of the so-called underground economy has become an ill-defined situation which is of great interest to policymakers, legislators, and economists (Kabatas & Turkler, 2012 and Hoang, 2020).

Apart from Asiedu and Stengos (2014) and Koloane and Bodhlyera (2022), the literature review has revealed that literature in developing economies is limited in this area. Most research on the underground economy has focused on its magnitude, which has become a contentious issue. However, a comprehensive empirical analysis of its causes is overlooked; this work aims to fill this knowledge vacuum.
The current study is the first to incorporate the role of inflation into the currency demand model used to examine the South African underground economy. This study offers a distinctive addition to the growth of the underground economy in this regard. The study also aims to contribute knowledge to academia about the use of underground economy estimates in economic analysis and policymaking purposes. Policy makers may use the study to construct evidenced-based policies to address tax evasion, and other underground economic activity. Businesses may identify market opportunities and minimize unfair competition. In addition, the South African Revenue Service (SARS) may enhance tax revenue collection and tax compliance.

1.8 STRUCTURE OF THE STUDY

The research report is presented as follows:

Chapter 1: Examines the study's direction. This comprises an introduction and background, problem description, goals and research objectives, research questions, definitions of important terms, ethical considerations, and the study's importance. The study report's format is also covered in this chapter. Chapter 2: Presents a summary of South Africa's black-market economy. The chapter covers a few socioeconomic issues, the underground economy's organisational framework, and the elements that support it.

Chapter 3: Explores the literature review on the underground economy. This chapter looks at theoretical definitions, causes, and recommendations from various schools of thought. In addition, the chapter provides a theoretical background of the CDA. Empirical studies that target the underground economy using different methods are provided.

Chapter 4: Present the research methodology. This chapter discusses the rationale behind each variable used to construct the empirical model. In addition, the prior expectation of the research questions is highlighted. Chapter 5 presents the discussion and interpretation of the findings and Chapter 6 gives an overview of the study's shortcomings, conclusions, and recommendations for more research.

CHAPTER 2

OVERVIEW OF THE SOUTH AFRICAN UNDERGROUND ECONOMY

2.1 Introduction

This chapter presents an overview of the South African underground economy. In doing so, socio-economic challenges, the structure of the underground economy, and factors promoting the underground economic activity, are explored. This chapter is essential to the analysis since it supports the theoretical framework and the justification for the technique that was selected for the study.

2.2 Socio-economic challenges

The formal economy and the underground economy are said to be directly linked (Geidigh, Schneider and Blum, 2016). Depending on the indicator like falling tax revenue, and growing use of cash (Naylor, 2005). Some believe that the state of the underground economy is reflected in the formal economy (Florenzano and Paolo, 2018). In addition, literature suggests that underground economic activity can be influenced by public policy and public administration, as these factors have become more important for the underground economy (Ferwerda, Deleanu, and Unger, 2010). Devey, Skinner, and Valodia (2006) found that in South Africa the two economies are linked. It is therefore crucial to comprehend South Africa's historical backdrop to comprehend the country's entire economy.

During the apartheid and colonial regimes, policies were created with the specific intention of forcing the bulk of the population to labour in low-skilled and poorly compensated employment. These regimes left behind the legacy that one's skin colour determined one's access to credit, education, land, operating a company, and saving money (Brockerhoff, 2013). Additionally, there were no official social security programs in operation during this time, therefore social security depended on informal social arrangements (van der Berg, 1997; Visser, 2004; Schmitt, 2018).

Howak and Ricci (2005) indicate that the government that came to power in 1994 inherited the economic and social legacies of apartheid, with most of the population

inheriting the disadvantages brought by it. The government faced challenges including a sizable labour pool of untrained and jobless workers, high rates of poverty, and restricted access to essential public services like education and health care. Weak public finances, chronically rising inflation, and capital flight were all harming the economy. However, this government made some significant changes by enacting several policies aimed at righting historical wrongs and enlarging the social system. The newly adopted policies (i.e., GEAR and RDP) affected millions of South Africans' lives, either directly or indirectly, by influencing the labour market (Bhorat and Oosthuizen, 2005).

2.2.1 Effects of apartheid practices

Racial footprints have a major role in the long and notorious history of excessive inequality in South Africa. Many believe that the main unifying feature of the nation's economic history in the 20th century has been the rise and endurance of this disparity (Leibbrandt et al., 2007; World Bank, 2019). National Treasury (2020) highlight that inequality and poverty levels are reinforced by slow economic growth rates. According to the Department of Justice (2020), some people continue to live with the effects of the political and economic choices made during the apartheid era in many schools and communities.

As a result, a child's education in South Africa still heavily depends on their environmental background, their family's level of income, and race. According to Blaauw (2017), “race” plays an important characteristic in the South African underground economy. While apartheid laws prevented black people from participating in the underground economy (Rogerson, 2000), informal employment has been a key area of employment growth post-1994 (Skinner, 2007). However, with a Gini coefficient score of about 65 (Anand et al., 2016), the nation is still home to one of the world's most unequal societies. Elevated Gini coefficient values signify disparities and hence, an expanding underground market (Bojnec, 2008). It is debatable what the causes are because, since 1994, government interventions have not been able to stop the decline in formal employment and inequality (Wittenberg, 2017).

Regardless of social assistance provisions, most of the poor in South Africa rely on the underground economy to survive. Although the relationship between income inequality and the underground economy is often neglected on empirical grounds, few authors have found that the two are linked positively (see Rosser et al. 2003; Valentini, 2007). It is reasonable to claim that the reason why the country is still divided in terms of redistribution of income and wealth, is not because of the politics of today, despite what some may contend, but rather because of the effects of apartheid practices. Petersen (2011) emphasizes that even if South Africa has achieved political independence, the effects of apartheid are still very much evident from an economic standpoint. Apartheid policies have led to a wider socioeconomic gap between the affluent and the poor. Black people have been migrating increasingly from rural to urban regions in pursuit of employment since the early 1990s. Growing patterns in rural-urban migration are a result of the rural-urban divide's lack of development, which also exacerbates socioeconomic inequality (Hopkins, 2006). The booming underground economy is one of the many economic risks brought on by this fast urbanization. Research shows that poor living circumstances, as well as social and economic isolation, characterize informality (SERI, 2018).

2.2.2 Policy response

Since the adoption of the 2015 ILO's Recommendation 204, governments have been giving more emphasis to social policies (RSNF, 2017). Social policies are often in place to complement labour market policies. According to Section 27 of the constitution, the South African government is required by law to provide for social security. The ILO's declaration of Philadelphia (1944) defines social security as a fundamental human right (Nkepe, 2008). Social insurance and social assistance are the two parts of social security that are typically mentioned. Social insurance refers to programs that businesses and workers are required to enrol in to safeguard against unforeseen events that may occur in life, such as sickness or unemployment. Social assistance involves giving money or goods to the less fortunate members of society, and it is paid for by the general fund with no involvement from the recipients. This is so that those who are most in need and unable to help themselves or their family can benefit from social security (Govender, 2011).

The South African Social Security Agency (SASSA) is primarily responsible for managing the social assistance program, which provides aid to elderly, disabled, and underprivileged individuals. According to the Department of Social Development (2023), social grants include old age grants, disability grants, war veterans' grants, foster child grants, care dependency grants, child support grants, grant in aid, and social relief of distress. All grants are subject to means tests. One of this policy's primary goals is the eradication of poverty and inequality.

A sizable portion of the population in South Africa receives social welfare payments as a major source of income. Between 2000 and 2006, the government rapidly boosted its social security spending, which had a significant impact on the battle against poverty (Pauw and Mncube, 2007). Greater social grant expenditure has been viewed in Keynesian terms as a growth stimulant, raising the purchasing power of the lowest socioeconomic groups. Moreover, social grants encourage household cohesiveness and the creation of micro-businesses (Lund, 2002). According to Leibbrandt et al. (2010), social grants indirectly help to lower unemployment by subsidizing relocation, job searches, and company formation.

There is a different perspective, however, on contributions made by social security policies. According to Armstrong (2009), social grants have a negligible impact towards the issue of inequality. Rambau (2004) claims that the official employment-based social security system in South Africa is racially biased. Those who do not match the definition of "employee," such as the self-employed or those who work informally, are excluded from several aspects of the social insurance system. This includes compensation for workplace injuries and diseases, and unemployment insurance. The South African constitution uses the wider term "worker", rather than employee (Goldman, 2003).

The fact that certain participants in the underground economy, such as independent contractors and self-employed people, are explicitly left out of the definitions of employee and employer is a fundamental flaw in labour legislation enacted after 1994. While informal self-employed people are likely to be unregistered for any type of taxes, these so-called workers are likely to have no sort of social safety or security (Petersen, 2011). Additionally, persons not in possession of South African citizenship are also excluded from the social security policy. It is not clear if the South African

social security policy is effective. The income of SASSA recipients, such as the basic income grant, may not be enough to help people escape the poverty trap. Hence, this may explain why most of the poor are seeking help from the underground economy. Leibbrandt et al. (2011) shows that majority of those who live in the poorest areas relatively receive lower wages and they depend heavily on government support, and not the labour market as employment opportunities are denied to them. Thus, South African poverty levels and inequality are directly linked with the labour market.

2.3 Structure of the Underground Economy

Considering that economic activity takes place in the name of survival, greed, and/or self-interest, the presence of the so-called underground economy has become an ill-defined situation which is of great interest to policymakers, legislators, and economists (Kabatas and Turkler, 2012; Hoang, 2020). There are many differences on this topic, however, the study hopes to bring out an accurate image of the underground economy. It is important therefore, when comparing studies that target the underground economy, to have in mind what the underground economy is - which may vary from country to country because the empirical results may have different meanings (Caridi and Passerini, 2001). For this reason, the structure of the underground economy is given by the following activities. Note that concepts outlined in each sub-section below have been summarized, as a thorough discussion of each of them cannot be outlined in one chapter.

2.3.1 Small businesses

It has long been believed that the government's solution to its issues with development and jobs is to support small businesses (Devey, Skinner, and Valodia, 2006). In general, businesses with less than 40 workers fall within the definition of "small business" (Bojnec, 2006). Small, Medium, and Micro Enterprises (SMMEs) are common terms used to describe small businesses. According to Olla (2006), SMMEs encompass a variety of organizations, from well-established companies with over 100 employees (medium-sized enterprises) to tiny independent contractors (informal micro-enterprises).

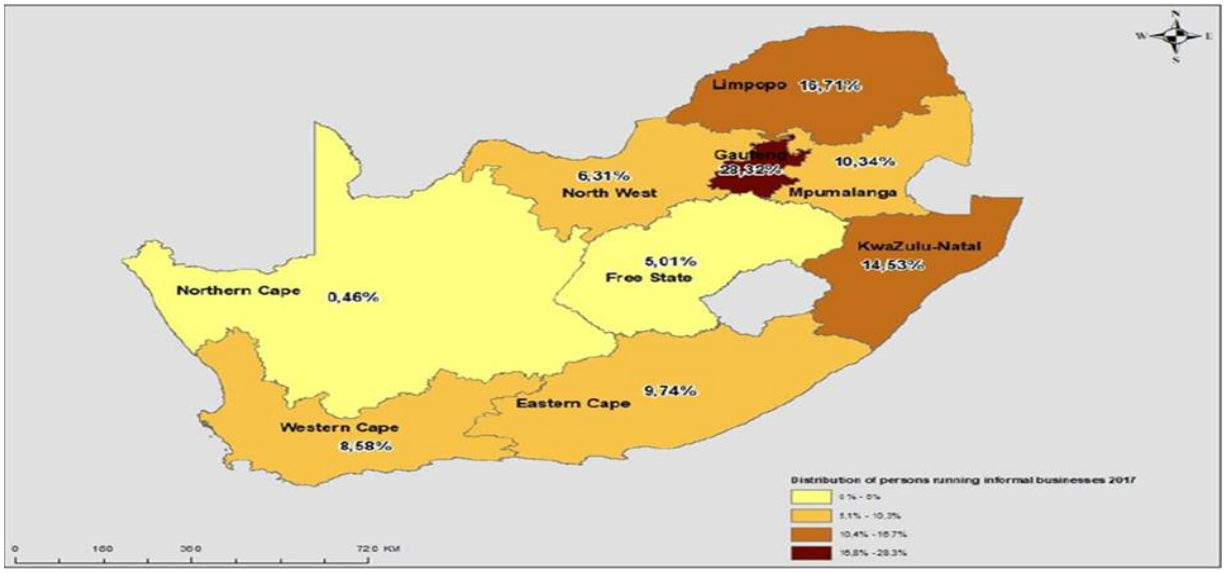
SMMEs are believed to have the ability to increase production and create jobs, at least in theory. Additionally, SMMEs may be a significant source of economic activity for many economies, contributing significantly to the creation of jobs, eradication of poverty, and the promotion of economic progress. This is consistent with the claims by Bartlett et al. (2005) that Central and Eastern European emerging market countries view the growth of small businesses as a critical component. The South African government values this sector of the economy enough that a new Ministry of Small Business Development was created in 2014 (BER, 2016).

The National Development Plan (NDP) envisioned that by 2030, “small businesses will contribute 60-80% to GDP increase and generate 90% of the 11 million new jobs in the country” (Vuba, 2019). However, high levels of informality in South Africa undermine the potentiality of SMMEs.

2.3.1.1 Estimates of SMMEs

Given the nature of the underground economy, it is without a doubt that the following estimates are not solid. Thus, they cannot be regarded as absolutely accurate. However, the evidence provides a broad picture of the economic trends of informal businesses in South Africa, and it is useful for this. The South African map below demonstrates informal businesses by province in 2017.

Figure 2.1: Informal businesses in South Africa



Source: Stats SA (2021)

Figure 2.1 shows a significant percentage of informal businesses operating in Gauteng (28.32%) than in other provinces in South Africa. This trend is followed by Limpopo with 16.71%, and KwaZulu-Natal with 14.53%. Based on the data, Northern Cape has the least underground economy with informal businesses accounting for 0.46%. Table 2.1 presents a percentage of distributions of persons running informal businesses who were paying income taxes by sex, in 2013 and 2017.

Table 2.1: Percentage of persons running informal businesses

SEX	YEAR	NON-TAXPAYER	TAX-PAYER
Female	2013	93.6	6.5
Male	2013	96.1	3.9
Female	2017	88.4	11.6
Male	2017	94.7	5.3

Source: Stats SA (2021)

In comparison to firms managed by males, Table 2.1 suggest that women's informal businesses follow tax laws (either directly or indirectly). Since 2013, more enterprises from the underground sector have been drawn to the formal economy. According to BER (2016), 69.2% of an estimated 2.25 million SMMEs were found operating in the underground economy in 2015. Small Enterprise Development Agency (SEDA) counted during quarter one of 2020 that, out of 2.6 million SMMEs in South Africa, 1 748 031 were informal, and 755 265 were formal (Schirmer and Visser, 2021).

The National Treasury and SARS jointly released the 2021 Tax Statistics report, which showed that 812 306 companies were assessed for the 2019 tax year. Of those, 158 818 were small businesses that paid income tax at a special progressive rate (SARS, 2021).

Makgetla et al. (2023) discovered that in 2022, there were 710,000 formal small businesses in South Africa. After declining during the COVID-19 epidemic, the number increased from 590 000 in 2010 to 680 000 in 2019. Additionally, 1.75 million informal firms existed in the last quarter of 2022, indicating that the epidemic's initial sharp decline had been fully reversed.

2.3.1.2 Arguments against SMMEs

Practically, it is difficult to comprehend how SMMEs affect economic growth because the official GDP may only account for formal activities while the bulk of SMMEs are engaged in the underground economy. It is therefore logical to presume that only registered firms may be included in the government's data regarding SMMEs. Empirical evidence as suggested by Berry et al. (2002) indicates that South Africa's small businesses are contributing very little to employment and economic growth when compared to its comparable countries. In addition, Koloane and Bodhlyera (2022) cite that when it comes to SMMEs, the risk of tax evasion is significant in South Africa given that there are individuals who are unknown and working in the shadows.

Stats SA (2021) has found that the creation of informal SMMEs in the South African economy is mostly motivated by people who are either seeking to get out of the miserable situation of being unemployed or are looking to augment their income. Since most SMMEs operate in the underground economy (BER, 2016), the government has the delusion that these small enterprises would expand and eventually transition to the formal economy despite their helpful function. The path ahead is not simple, though. The researcher draws attention to the fact that this claim is debatable.

SMMEs are more vulnerable to bureaucratic burdens than larger firms because of their tiny size. Some studies in South Africa have confirmed that tax compliance is one area of regulation which is an issue for SMMEs (Chamberlain and Smith, 2006). In addition, according to Vuba (2019), 70% of newly established SMMEs in South Africa fail within two years of being in operation. Suggesting that access to funding, among other challenges, is a fundamental issue for many SMMEs.

FIAS (2011) has found that SMMEs carry a relatively higher tax burden, especially if they are not registered for Value Added Tax (VAT), either through choice or because the size of the business is too small. Most informal entrepreneurs in South Africa, according to Mlambo (2020), are opposed to formalization, citing the unavoidable financial expenses and restrictions on company flexibility.

2.3.2 Cash-in-hand employment

Street trading predominates in the unregulated market setting of South Africa. This is obvious because it happens in public areas. Street trading is regulated by local municipalities under the Business Act 72 of 1991 (Ntuli, 2020). There is much urban informal economic research in South Africa focusing specifically on street traders, with Caroline Skinner dominating the South African literature. Although street traders do play a part in the distribution of goods and services, Ngcobo (2021) cites that street traders continue to be ill-treated by local authorities and municipalities. This includes using force to evict them, constantly seizing their belongings, and engaging in illicit bribery to get authorization to operate in certain areas.

Another sector of unreported work which operates entirely using cash is the minibus taxi industry. The industry consists not only of drivers and taxi owners, but also queue marshals, car washers, and in some areas fare collectors. In 2002 it was estimated that more than 150 000 jobs were indirectly linked with the industry (Barrett, 2003). Despite its economic importance, the media have shown that the industry is under-declaring income, as a result, they evade paying taxes. The government has revealed that the R90 billion worth of taxi-industry, only pay approximately R5 million in taxes (Lewis, 2021; SA People News, 2021).

The 2007 Labour Force Survey (LFS), which is a survey used by Stats SA to measure informal sector employment, suggest that there were approximately 1.2 million home-based workers, with the informal sector accounting for 75% of them (Wills, 2009). This includes domestic employment which has legal status, though it could also include unethical practices like unreported payments. Business Tech (2023) reports that there are 797 000 domestic employees, of which 67 000 have lost their employment. Note that activities of the LFS could be included in the national statistics because they may be in the formal service sector of the official economy. This also includes elements of informal activity in the agricultural sector.

The concept of "cash-in-hand employment" is wide and complicated, and it can refer to a spectrum of activities that people engage in daily for money. This includes babysitters, tutors, landlords who do not disclose their rental income to SARS, bartenders who do not report their tips as part of their income, traditional healers, etc. Even though many of these operations go unreported, it can be challenging to

determine whether some transactions should be classified as underground activity or as "ordinary" wealth transfers. A good example is the case of donation. Consider voluntary work that is frequently seen in churches. In certain cases, this service is recognized with presents that have monetary worth. However, one could be tempted to contend that a contribution is equivalent to income/revenue. Thus, there is a difficulty in understanding what constitutes an underground economy as it is highlighted in the literature.

Nonetheless, some think the informal sector is mistaken for the underground economy. In their article titled “In Defence of South Africa’s Informal Economy”, Rogan and Skinner (2019) argue that the underground economy, which is theoretically attached to tax evasion, is not the same as the informal sector. They highlight that based on Stats SA’s LFS results, the majority of those who are in the informal sector (73%) earn less than the annual R79 000 income tax threshold set by SARS. If this is true, then individuals presumably do not engage in informality to escape paying taxes, but they do so to survive.

In line with Rogan and Skinner (2019), it seems inaccurate to characterise the informal sector as the underground economy. However, Rogan and Skinner (2019) seem to miss that the incomes generated by these survivalists may be of illicit component. Hence, it may be why the informal sector is considered a subset of the underground economy. For example, smuggled products such as illegal cigarettes in South Africa are often sold in informal businesses (Times Live, 2020). A close link between the informal sector and smuggling networks has also been proven on empirical grounds by Trabelssi (2011). In any case, undeclared income is a form of tax evasion, hence the informal sector is an appropriate target for the tax authorities (Naylor, 2005).

The survey method that Rogan and Skinner (2019) rely on, is not sufficient to support their argument. Economic literature has shown that the quantity of underground activity drawn from surveys is often not reliable. They depend on the willingness of the respondents to answer honestly. In addition, individuals often do not disclose income earned from their fraudulent behaviour (Schneider and Enste,

2013). However, some oppose this view, citing that individuals may not be as secretive about their illicit income (Williams and Windebank, 2001).

2.3.3 The financial market

Most people who work in the underground economy cannot obtain credit from the traditional banking system. The reason for this is that potential borrowers from the underground economy might not have enough money to pay the fixed expenses associated with making individual loans. Additionally, these economic actors are unable to develop a solid reputation within the official financing institutions. Therefore, these actors are compelled to go to other sources and institutions as commercial banks do not offer loans (Thomas, 1992).

First, there are rotating savings and credit associations (ROSCAs), which are often small groups (10 to 40 members) who decide to contribute a certain amount to a kitty regularly for a predetermined length of time. Once all members have received their share of the purse, the ROSCA either disbands or embarks on a new cycle. These schemes are normally known as “stokvels” in South Africa and they have a legal status (Saunders, 2005). It should be noted, that stokvels are a tool for encouraging discipline and motivation among savers, including those who have official savings accounts. They are not the equivalent of savings accounts in a commercial bank for the poor (Aliber, 2015).

Secondly, there is a peer-to-peer (PTP) lending platform. This consists of a borrower in need of financial aid and an unofficial lender. Based on relationships and trust, the transactions are tailored. Since they are unregulated, informal finance is distinguished by high interest rates. Because they are unable to obtain loans through the official sector, borrowers who seek informal lenders are frequently seen as being stuck; as a result, lenders have an edge when it comes to negotiation (Mpofu and Sibindi, 2022).

There is also the concept of shadow banking, which is also known as non-bank financial intermediaries. Because the study defines the underground economy in terms of the informal sector and the illicit sector, this concept is acknowledged due to its similarity with informal finance. Shadow banking includes official and informal lending operations that take place outside of the mainstream banking industry. The

majority of shadow banks are regulated; however, they are not regulated to the same extent as banks. Shadow banks, which include both innovative investment vehicles and more conventional funds, might provide investors and savers with greater returns and options for risk diversification. They aid in completing the markets (Jokivuolle, 2018).

In South Africa, shadow banking is beneficial since it offers a substitute source of credit to sustain economic activity (Ilesanmi and Tewari, 2019). Collective investment schemes (CISs), money-market funds (MMFs), hedge funds, exchange-traded funds (ETFs), participation bond schemes, finance companies, insurance corporations, securitization schemes, trust companies, stokvels, real-estate investment trusts, and certain broker activities comprise shadow banks (Kemp, 2017 and 2022). While shadow banking benefits non-financial companies and measures of total firm profitability, it has a detrimental influence on regular banks' profits (Zhou and Tewari, 2018). This does appear to suggest that the growth of these activities is advantageous for non-financial firms. Furthermore, the South African economy's financial inclusion has been aided by shadow banking operations (Narendrecumar, 2019).

2.3.4 Illicit trade

Illicit economic activity includes any type of operation that does not adhere to the established regulatory frameworks of governments (Devex, 2020). The underground economy transactions are deemed illegal because they disregard the government's reporting procedures and provide illicit goods or services. In line with the scope of the SARS, illicit trade is divided into the following,

Table 2.2: Illicit Trade in South Africa

• Fraud
• Illicit imports – cross-border smuggling
• Illicit domestic production – evading associated taxes
• Trade mispricing – intentional under-declaration
• Phoenixism, abusive liquidation and business rescue practices
• Syndicated refund fraud

Source: Kieswetter (2020)

Illicit trade is a major problem that abuses the global economic system and threatens the multilateral legal order (SARS, 2023). Illicit traders produce a significant amount of cash that is laundered by transitioning it into instruments that allow the transfer of funds into the global electronic financial systems (Nicolaou-Manias, 2015). The socio-economic impact related to this problem presents significant challenges towards achieving the nation's Vision 2030 agenda and Sustainable Development Goals (SDGs). For instance, SDGs 1, 2, 3, 4, and 8 – economic targets for poverty reduction, decent employment, and economic growth – are all harmed by illicit trade (TRACIT, 2019).

According to TRACIT (2023), South Africa is ranked first among its BRICS members, indicating its lack of capability to address this problem. Moreover, the report finds that illicit trade has been booming because of structural changes caused by inflation, unemployment, and the effects of the COVID-19 pandemic. This challenge is evident from multiple fronts. For example, there is a body of knowledge which points to certain individuals who are living in modern slavery in South Africa, of which the majority are trafficked for sexual exploitation (Minderoo Foundation, 2019). Moreover, the country is a major destination for human trafficking in the Southern African region (TRACIT, 2019).

PubMed (2015) found that between 0.76 and 1% of adult females in South Africa are in unlawful economic activity related to commercial sex work. The country has seen an increase in the availability and use of illicit tobacco since the early 1990s (Atkins, 1997). To date, it is anticipated that SARS will lose approximately R19 billion per annum from the problem of illicit cigarette sales alone (Daily Maverick, 2022). Heroin trade for example is dominant in the shadows. It is estimated that suppliers make about R4, 000 per day from the sale of this narcotic (Business Tech, 2019).

Van de Zee et al. (2019) draw inspiration from the national income dynamic study conducted in 2017 to investigate the market for illicit cigarettes in South Africa. Their study finds that in 2017, out of all cigarettes found geographically, approximately 30% of the market was illicit, thus undermining the tobacco tax policy. In line with the above, illicit economic activity reduces the amount of money that can be collected through taxation because it shifts funds from the balance sheets of normal

enterprises to those that are illegal (Mashiri and Sebele-Mpofu, 2015). Van Walbeek (2020) have presented that the growth of illicit trade in South Africa is not related to taxation. The author draws attention to the fact that between 2002 and 2018, the excise tax increase of 10% per year in real terms has been negatively associated with illicit trade, as the illicit market was at insignificant levels during this period.

2.3.5 Illicit financial flows (IFFs)

When funds are collected, moved, and/or utilized unlawfully, this is referred to as an IFF. IFFs are the unlawful movement of money or capital from one country to another (UNECA, 2021).

Table 2.3: Activities related to IFFs

Tax evasion
Money laundering
Bribery
Corruption
Smuggling

Source: Kieswetter (2020)

The activities in Table 2.3 are considered illicit because they violate the laws in their origin (African Union, 2013). According to Ayodele and Bamidele (2017), IFFs give individuals involved in organized crime, corruption, and rent-seeking the chance to realize and shift their unlawful earnings. Hunter (2019) claims that there are many ways for illegal profits to be moved and spent in Africa. One of these ways is through the usage of shell firms. Along with the expansion of such firms in Africa, IFFs also cover trade-based money laundering (TBML), and money value transfer systems (MVTS). TBML involves over and under-invoicing of the value of products. The author cites investigations that showed the Gupta family used TBML to hide payments from a state-owned company, Transnet, as an example of IFFs in South Africa. In estimating TBML, Nikolaou-Manias and Wu (2016) revealed that IFFs account for approximately 7.6% of the South African GDP. MVTS includes remittances and an underground banking system (Fin CEN, 2002).

It has been claimed that IFFs cause South Africa to lose more than 1% of its GDP per year (Courtney, 2022). The work of Ndikumana (2013), as cited by African Monitor (2017) adds that illegal money flows result in the depletion of local savings. In addition, the report provides an econometric estimate for South Africa, demonstrating that the country might have seen 0.9 percent more annual growth had the country's illegal outflows have been stopped from 2000 to 2010. Although some taxpayers have come forward to declare their wealth, a joint report by the OECD and the South African National Treasury, highlights that the amount declared are small relative to the size of estimated IFFs (OECD, 2023).

In analysing the effects of IFFs in the mining sector in South Africa, Leshoele and Gumede (2018) argue against the unsubstantiated narrative often peddled by the Western media that Africa cannot self-sustain without foreign aid. The authors argue that Africa can survive and grow without foreign aid if IFFs were not depriving it of the much-needed financial resources to use for its development agenda. In line with Makananisa et al.'s (2020) analysis, the CDA model predicts that as the government sector expands, more activities in the underground economy will appear because government employees are more susceptible to bribery and corruption. Signe, Sow, and Madden (2020) found that the illicit outflow of capital has increased between Africa and other developing countries such as China, as trade between the countries has evolved. The authors find that the drivers for these financial outflows are increased real GDP, higher taxes, and higher inflation.

In addition to criminalizing the actions that make up IFFs, South African law includes a variety of control mechanisms designed to make it easier to spot and investigate a variety of crimes including money laundering. The Financial Intelligence Centre (FIC) Act 38 of 2001, which established the control measures, requires institutions to establish and verify the identity of their clients, maintain specific records, report specific information, and put into practice measures to help them comply with the law. The responsible and reporting institutions are required by section 28 of the FIC Act to record cash transactions that exceed the established threshold. This means that all cash transactions exceeding R24 999.99 must be reported to the Centre in terms of this section. Hence, commercial banks are required by law to report clients who are withdrawing R25 000 or more (FIC, 2020).

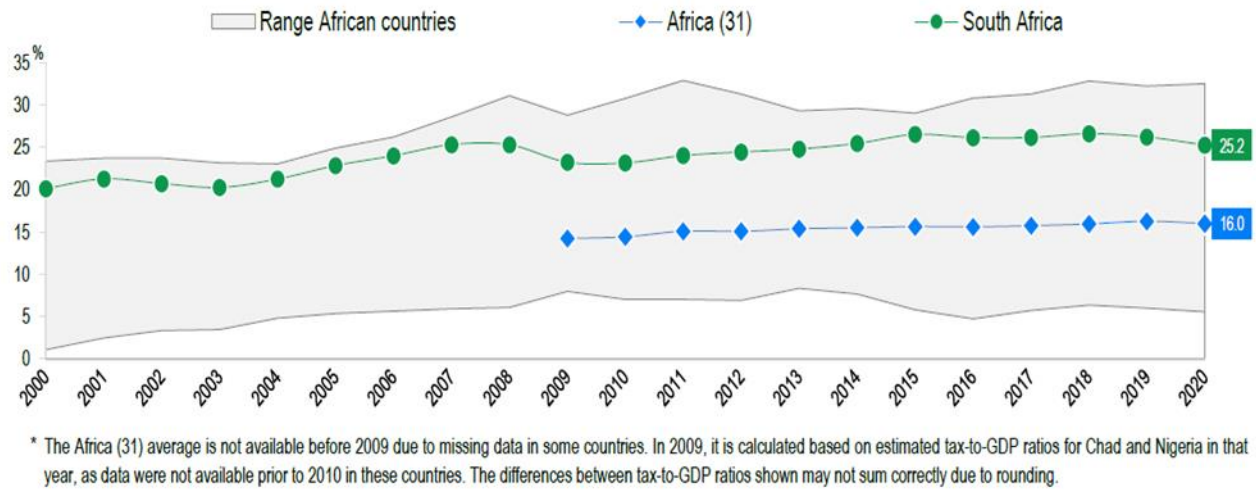
2.4 Factors Promoting the Underground Economic Activity

Based on the underground economic literature, there are several factors which affect the underground economic activity. They include,

2.4.1 Tax Burden

South Africa is considered a 'labour reserve economy', meaning that its economy relies more on direct taxes (Mkandawire, 2016). According to Steenekamp (2008), there is extensive use of corporate (CIT) and personal (PIT) income taxes, but VAT rates are relatively low, thus indicating a high tax burden. When compared to selected emerging and developed countries, Steenekamp (2012) further concludes that the tax burden is high, which is an abuse of the tax system for financial gain. South Africa's tax-to-GDP ratio is comparatively low by both global and developing country standards (van Niekerk, 2002). According to DTC (2016), the South African tax burden ratio increased from the 1960s to 2007/08, when it reached 26.4%. Due to the financial crisis, the rate fell to 23.5% in 2009/10, leading to a decline in corporate tax revenue.

Figure 2.1: Tax-to-GDP ratio over time



* The Africa (31) average is not available before 2009 due to missing data in some countries. In 2009, it is calculated based on estimated tax-to-GDP ratios for Chad and Nigeria in that year, as data were not available prior to 2010 in these countries. The differences between tax-to-GDP ratios shown may not sum correctly due to rounding.

Source: OECD (2022)

From 2010, Figure 2.2 shows that there has been some improvement in revenue collection, with a slight decrease of 0.9 percent from 2019 to 2020 (OECD, 2019).

The tax burden in South Africa increased from 20.6% in the 2017 tax year to 21.3% in 2018. This was the result of the increase from 41- 45% in higher tax brackets. Moreover, it further increased to 22.4% for the 2020 tax year (SARS, 2022). The argument over whether it is helpful or detrimental to have a high tax-to-GDP ratio is currently open. According to Stats SA (2022), the answer depends on the country in question. A high tax burden might not be that bad if a country has a high ratio and its inhabitants are getting good returns for their money. Such nations often record the highest levels of economic progress in terms of the standard of living. As an illustration, Sweden and Denmark have high tax burdens and good standards of living. On the other side, a low tax-to-GDP ratio might be problematic since it could be seen as a sign of an ineffective tax system. Frey and Schneider (2000) have shown that taxpayers who are unsatisfied with public services in certain nations, seek to re-stress the balance by evading the underground economy.

2.4.2 The supply and demand of currency

The supply side of the level of currency in circulation is determined by the government, involving the central bank, and the national treasury (Khiaonarong and Humphrey, 2023). The central bank must make sure there is adequate currency in circulation. After currency is released through industrial cash centres, it is transferred to the public via several channels, such as bank branches, merchants, and other stakeholders, until dirty banknotes return to the reserve bank for destruction (De Beer and Shikwane, 2021). The SARB controls the monetary base by either establishing an inflation rate goal or an interest rate target to maintain price stability and currency dependency (Florenzano and Paolo, 2018).

The demand side of the level of currency in circulation concerns how the public chooses to spread the currency. In other words, the demand for currency is determined by the needs of trade. In theory, households often need cash for three reasons: transactions, holding as a store of value, and precautions. The demand for currency varies among countries that may even be similar in terms of economic and social characteristics (Beck et al. 2018; Gabezas and Jara, 2021).

2.4.2.1 Effects of Demand Deposits on M1

In this study, monetary aggregate M1 is used to represent the demand for currency. Theoretically, this includes cash and bank money, therefore:

$$M1 = C + D \tag{2.1}$$

Where C represent cash and D represent demand deposits, which is also known as bank money. Demand deposits are nevertheless regarded as money even if they make up a non-currency portion of the money supply. This is because clients who open demand deposits at commercial banks are paid out in cash. A different bank or account holder may also receive the deposit. The bank will become insolvent if it is unable to repay a depositor for his demand deposit. However, banks frequently get around this by employing several business strategies, such as providing long-term loans or setting up credit lines with SARB. Nonetheless, a demand deposit is created by depositors, but it does not affect any change in money supply. For example, a change in money supply can be expressed as follows:

$$\Delta M1 = \Delta C + \Delta D \tag{2.2}$$

Suppose a person deposits R5 000 in a savings account, the money supply formula will be as follows:

$$\Delta M1 = -R5000 + R5000 = R0 \tag{2.3}$$

In this case, a decline in currency was represented by an increase in deposits, therefore the bank did not create any new money. The creation of a demand deposit because of an overdraft facility may have an impact on changes in the money supply. Suppose there is a R5 000 overdraft that will be extended to a client. Keep in mind that the client can be an individual or a business. The following is how demand deposit can influence a change in money supply:

$$\Delta M1 = R0 + R5000 = R5000 \tag{2.4}$$

In this instance, a credit has been created as the bank has deliberately lent money to a client. As a result, there is now more money available in the nation. As a result, the demand for M1 may rise as the bank creates money (Bouhail, 2020).

2.4.2.2 The usage of cash in South Africa

Bank deposits are often redeemable on demand. This means, they can be substituted by cash, as they can be withdrawn at any time. Automated Teller Machine (ATM) cash withdrawals are typically a good indicator of cash use in the economy. ATM withdrawals are used for transactions which are normally known. However, this also includes some unknown amount which is used for hidden transactions involving corruption, tax avoidance, and other underground economic activity (Khiaonarong and Humphrey, 2023). According to Krstic and Schneider (2015), cash transactions refer to off-account payments made in cash, frequently informally and in foreign currencies. The authors also demonstrate that the underground economy is far less prevalent in nations where the use of electronic money is more pervasive. The volumes in such countries can be attributed to the competitiveness of cash in the presence of credit cards, debit cards, and online payments.

The current study argues that cash is the most preferred method of payment for everyday transactions in South Africa. However, because it is not traceable, in line with Seitz et al. (2018), it is difficult to tell exactly where it circulates, who holds it and for what purpose. South Africa is known to be heavily dependent on the primary sector. A report requested by the National Treasury and SARS has found that the agricultural industry and the mining industry receive generous tax treatment (FIAS, 2011). Thus, demand for currency may be growing alongside these industries. For instance, it is well known that workers in agriculture are often paid informally - in the form of cash.

PwC (2019) claims that cash is the predominant form of payment in South Africa, with coins and notes accounting for more than 50% of all consumer transactions. Moreover, cash is anticipated to be used in 89% of economic transactions overall (PASA, 2017; FSCA, 2022). According to a MasterCard (2019) survey, 90% of South Africa's 51% of informal businesses only accept cash. Additionally, there is proof that at least 90% of SASSA beneficiaries immediately remove all their funds from their accounts as they become accessible.

Makananisa et al. (2020) conclude that South Africans will continue to transact in cash despite the increase in interest rates. In other words, this increase does not stop people from engaging in underground economic activity. Mercier (2021) found that policy stimulus has led to an unusual rise in money supply since the start of the Covid-19 pandemic. As the domestic economy entered the period of recovery from the pandemic, the general public's need for banknotes surged since then (De Beer and Shikwane, 2021). The SARB's statistics show that between March 2020 and March 2021, the volume of cash in circulation increased by 8.23%. Most of this rise resulted from the expansion of notes rather than coins in circulation, as described in the SARB Annual Report 2020/21 (Cash Essentials, 2021).

2.4.2.3 The Use of the South African Currency in foreign nations

Most remittances enter the nation through unofficial means in large amounts. In the Southern African Development Community (SADC) area, where there is a substantial underground economy and extensive usage of cash, up to 70% of cross-border remittances are informal and frequently entail moving physical amounts of cash. Furthermore, there is the largest movement of undeclared currency through OR Tambo International Airport with centres such as Dubai and Hong Kong as major hotspots (FATF, 2021).

Although there is no reliable evidence that foreign currency (e.g., US Dollar) is being used inside South Africa, the same cannot be said for the rand in other countries. The rand has been used extensively as legal tender in other countries within the SADC area, such as Lesotho, Namibia, and Swaziland. This is because the economy of these countries is too small, and they heavily depend on South Africa for trade. However, there are no reliable statistics to verify the extent to which the currency is used in such countries (van Zyl, 2003).

2.4.2.4 Financial Inclusion

Financial inclusion is a word that is frequently misunderstood. Financial inclusion is more about moving away from cash than it is about getting individuals to have bank accounts or access to financial services (MasterCard, 2019). Although the introduction of digital technology is playing a big part in facilitating transactions of

goods and services, most consumers still rely on informal channels, and they continue to transact in cash. Key sectors of the economy, i.e., transport, remain largely cash-based in almost all developing countries (Awasthi and Engelschalk, 2018). In assessing the South African financial sector, Khamis and Selassie (2022) have found that there has not been much progress in recent years in moving away from cash. Additionally, access to funding has stalled since SMMEs have trouble getting financing and account use is low. Despite the developed financial services sector, financial inclusion is lacking in South Africa. According to Vos et al. (2018), financial education is encouraged as it is an instrumental driver towards improved levels of financial security and inclusion.

2.5 Summary of the chapter

This chapter was divided into five sections. The first section was the introduction. The second section discussed problems associated with the South African formal economy, such as inequality and the history of apartheid. Section three outlined the activities of the underground economy. A brief cost-benefit analysis was highlighted on each concept. In line with the statement of the problem outlined in Chapter One, this section showed how potential taxes are lost because of the informal sector and illicit sector.

Section four outlined some macroeconomic concepts that have influence on the production of illegal and unreported income. In addition, money supply in terms of M1 in South Africa was also explored, along with the use of the Rand in foreign countries. Payment methods of consumer spending behaviour were also highlighted under section 2.4. Section five summarizes the chapter.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

The literature review is divided into two theoretical and empirical literature reviews.

3.2 Theoretical Framework

For this study, various economic development theories are discussed, and they are organized into four major schools of thought. Additionally, the study discusses the Currency Demand Approach as a measurement theory.

3.2.1 The Dualist School

In the 1970s, dualistic schools had enormous popularity. The first dualistic school viewpoints on Ghana's economy were presented by Hart (1973). The so-called "informal sector" was first discussed by him in the scholarly literature. According to him, the informal sector is the working population that is not actively participating in the formal labour market (Sabra, 2015). Sethuraman (1976) and Tokman (1978), who both contributed to this school of thinking, increased attention on the topic of the "informal sector." According to supporters of this school, the underground economy consists of niche activities distinct from and unrelated to those found in the formal economy. Additionally, this economy provides the income of the poor, as well as a safety net in the crisis of those who cannot work in the formal economy.

Individuals work in the underground economy because they are barred from modern economic prospects due to an imbalance between population and modern industrial employment growth rates. The premise is that because the population is increasing faster than the formal sector, the economy would be unable to provide new jobs. Furthermore, due to a mismatch between people's skills and the structure of current economic prospects, these agents are excluded. This refers to workers' limited flexibility, which creates a gap between their professional training and skills and the demands of their employers in the informal sector (Marinescu and Valimereanu,

2019). Besides the role played by the population growth, Chen (2012) cites that individuals are pushed into the underground economy because of slow economic growth rates.

This theory describes how the dual labour market, which separates the market into four divisions, operates. Specifically, the primary, secondary, informal, and illicit sectors. The primary sector consists of conventional pay occupations subject to regulations and taxes. The secondary sector includes employment that is frequently poorly regulated and have less security, e.g., poorly compensated employment in the tertiary sector. The informal sector is composed of people who work informally. It includes those who run small enterprises on an unregulated basis, as well as those who work for employers but under the table. The illicit sector encompasses every unlawful conduct that generates a profit. As a policy response, dualists suggest that governments should increase the number of formal employments they generate and provide finance, business development programmes, and social protection services to informal economic players (Koufopoulou et al., 2019).

3.2.2 The Structuralist School

According to supporters of this school, microbusinesses and employees who serve to lower input and labour costs should be used to study the informal sector. As a result, boosts the huge capitalist enterprises' competitiveness (Koufopoulou et al., 2019). The theory behind this school of thinking, as explicitly stated by Castells and Portes (1989), is that some structures are more likely to be believable than others due to the way the economy is structured, which is determined by its institutions, history, and political environment. Capitalism and capitalist expansion are to blame for informality. Formal businesses' efforts to boost competitiveness and lower labour costs, their response to organised labour's strength, and government regulation (Chen, 2012).

According to Sassen (1994), informality is caused by advanced capitalist development in major cities. Sassen (1994) contends that the rise in income disparity among customers and the widening gap in profit-making potential between businesses operating in various urban economic sectors have encouraged the growth of the informal economy. Hence, immigrants and locals are in a favourable

position to seize such opportunities. Structuralists think that formal and informal modes of production are linked and that the underground economy's rise is attributable to the structure of capitalist development, not a lack of economic progress. They claim that by subordinating tiny informal producers and traders, capitalists in the formal sector may lower their labour and capital expenses, making them more competitive (Saunders, 2005). As a result, informality is caused by several reasons in addition to an overabundance of labour or excessive regulation in economies (Mupanhanzi, 2019). As a recommendation, advocates of structuralism contend that to rectify the imbalanced connection between large corporations and subservient producers and labourers, governments must regulate both corporate and labour relations (Chen, 2012).

3.2.3 The Legalist School

The underground economy, as defined by De Soto (1989), is made up of unregistered business owners who opt to operate this way to save money, time, and effort on official registration. The legalist school gained popularity during neoliberalism economic policies (Alderslade et al., 2006). According to supporters of this school, complicated and time-consuming government restrictions, and processes force businesses to operate in the underground economy. This step will lower costs and promote wealth development for businesses operating underground (Chen, 2012). A noteworthy aspect of this school is the growth delay brought on by poor production, insufficient funding, and an inadequate and ineffective tax structure. Also, there are difficulties in macroeconomic policy and a low degree of technology advancement implementation (Koufopoulou et al., 2019). Legalists contend that to unleash the productive potential of informal enterprises and turn their assets into real capital, governments should simplify bureaucratic procedures and encourage them to register and extend legal property rights for the assets they hold (Chen, 2012).

3.2.4 The Voluntarist School

Maloney (2004) was the founder of the Voluntarist School of thought. They maintained the underground economy consists of economic agents who choose to operate underground (informally and even criminally) to escape state fiscal, financial, and commercial rules. Unlike the legalist school, as defined by De Soto, this school

believes that informality is a conscious choice made by entrepreneurs to take advantage of the benefits of informality. These benefits consist of the way income is earned while avoiding the costs of formality, which includes payroll taxes and social protection contributions. Entrepreneurs base their decision on the fact that access to the formal economy is essentially barred because of high entry costs and entry barriers. Hence, these people may turn to illegal methods, not to act against society, but as a means of survival. In addition, Voluntarists argue that the rising tax burden is the cause of the underground economy. These mean individuals operate in the underground economy to escape paying taxes. Huynh and Nguyen (2019) contribute to the extension of this school. They argue that government spending can reduce the size of the underground economy because of its contribution to the growth of the formal economy. By studying how fiscal policy affects the underground economy through taxation and government spending, they found that the underground economy is negatively associated with expansionary fiscal policies, and it is positively associated with contractionary fiscal policies. According to Chen (2012), governments ought to include informal businesses into the formal legal framework to broaden their revenue base and curb unfair competition from these businesses.

3.2.5 The Currency Demand Approach (CDA) Theory

There are alternative ways to investigate the extent and expansion of the underground economy, even though some people might be reluctant to acknowledge their involvement. In the currency approach, demand for money in circulation is used as an indicator of the underground economy (Alkhdour, 2011). The currency demand approach, which is used to estimate black market activity, may be traced back to Cagan (1958), whose monetarist approach examines the relationship between M0 (circulating currency) and M1 (or nominal/reserve currency).

Cagan’s work is motivated by the increased demand for money during and after World War II due to the significant increase in marginal tax rates. In his essay, Cagan goes thoroughly into the elements that, starting in the year 1930, significantly increased the currency ratio over time. He emphasizes that the preferred level of the currency ratio depends on people's choices for cash or deposits considering the benefits and drawbacks of holding these assets. He goes on to say that the expected cost of keeping currency in place of deposits is likely to be one of the key

determinants of the desired ratio, according to the economic theory of demand. The intended ratio will then reflect the relative benefits of retaining currency and deposits considering the cost of doing so.

Although well-known characteristics, such as real income, that are advantageous to individuals when they own cash, as stated by economic theory, may have been the cause of the growth, their benefits are quite small, according to his observations. His argument is that the elements that encouraged tax evasion during the war may have been the proposed ones that caused the unusual rise in currency demand. As money is viewed as an "exclusive means of trade" that can evade taxes, it made economists more aware of how the underground economy had developed.

Gutmann (1977) and Feige (1979) utilise a similar approach to provide an analysis of the dynamics of the underground economy but without statistical methods. Their idea was to investigate how much cash is used to produce irregular income. In Gutmann's analysis, he notices that currency in circulation in the United States economy has been growing more rapidly than demand deposits. He makes an argument that "currency is the only form of cash suitable for transactions that go unrecorded and untaxed". The idea is that, since individuals won't pay more money in the form of taxes, they opt to use cash to support underground economic activities (Geidigh, Schneider and Blum, 2016). However, their monetary approach relies on two key assumptions. First, it assumes that there is a monetary ratio that is constant over time if it was not for the effects of the underground economy. Secondly, there was a period when the underground economy did not exist. Tanzi (1980; 1983), in what he refers to as the "fixed-ratio variant", shows how weak these assumptions are in his examination.

Tanzi (1983) refined this methodology and applied it to analyse the underground economy of the United States of America using regression analysis. In addition to providing information about underground economic activities, his idea was to estimate its size as a percentage of GDP. Tanzi's (1983) strategy involves defining "a demand-for currency equation to be able to infer the effect of a change in the tax level on that demand". Tanzi's monetarist approach, which is an indirect method, uses an econometric regression model to assess the magnitude of the underground economy.

The amount of currency in the transmission is the function of variables that have influenced people's desire to hold money. The following is a representation of the functional demand for money model,

$$Currency\ holding = f(GDP\ per\ capita, wages\ and\ salaries, interest\ rate, income\ tax) \quad (3.1)$$

A detailed explanation of the prior expectations is found in Tanzi (1980). In summary, a negative sign is expected for GDP per capita and interest rate. GDP per capita, which is used to proxy economic development, is assumed to lead to the replacement of currency by other payment methods such as cheques. Meaning, that a rise in interest rate increases the opportunity cost of holding currency. A positive sign is expected for the ratio of income tax and wages and salaries. When the level of taxation increases, individuals have more incentives to engage in the underground economy, where they will leave no trace by using currency. Since wages are often paid in currency, an increase will require more currency.

After the total currency (C), which is the currency that circulates in both economies to conduct both hidden and recorded transactions, has been estimated using a straight-forward linear regression model from equation 3.1, a new equation that represents currency used in the official economy (C_O) is estimated with taxes equal to zero, ceteris paribus. Ahumada, Alvaredo and Canavese (2006) state that the goal of doing this is to "obtain an estimate of the amount of cash needed under no motive to hide transactions." The money from the underground economy (C_u) is what makes the difference between the two currencies. Moreover, the underground economy is estimated by using the standard quantity theory of money supply. By multiplying the calculated velocity by the value of the currency held in the underground economy, one can estimate its size by assuming that both economies have an equal income velocity of money, which is determined by dividing observed GDP (Y_o) by (C_o).

$$C_u * V_u = Y_u\% \quad (3.2)$$

Where,

V_u = Velocity of money in the underground economy, and

Y_u = Size of the underground economy as a percentage of GDP.

Tanzi (1983) provides a thorough analysis and implementation of this monetarist strategy. There are three main assumptions in this modelling approach:

- Cash is predominantly used as a source for underground economic transactions (e.g., wages/salaries). Cash is mainly used to avoid leaving any observable traces with the authorities.

- Higher taxes and a strict regulatory framework for business are important sources of informality. If the tax burden increases, ceteris paribus, then the monetary claim becomes noticeable. Then this rise in money demand reflects a surge in the underground economy

- The speed of money (velocity) is the same in both the formal economy and the underground economy (Alkhdour, 2011).

However, there are many critics of this modelling technique.

- The assumption that the velocity is the same for both economies. In the real world, this assumption is very difficult to verify (Lafleche, 1994). However, Ahumada et al. (2006) claim that this assumption holds if the long-run income elasticity is equal to one.
- Tax burden is the only determinant of the underground economy (Nchor and Konderla, 2016). The MIMIC model is considered superior to Tanzi's method since it considers multiple causes and indicators (see Frey and Weck-Hannemann, 1984).
- Not all underground economic activities are conducted in cash. Therefore, the method may underestimate the size of the underground economy because it does not consider technological innovations.
- Increase in the demand for currency may be because of a decrease in demand deposits, and not because of an increase in underground economic activity (Asaminev, 2010). Moreover, Gramley (1982) highlights that Tanzi (1980) ignores the growing use of the US dollar outside the USA.
- The method produces strange and inconclusive results in other countries (Mirus et al., 1994).

Nonetheless, this methodology is still appropriate since it is commonly applied in the literature. In addition, the currency demand method fits the South African context as was shown in the previous chapter. According to Ahumada, Alvaredo, and Canavese (2006), this approach recognizes that underground economic activity does not only depend on taxes, but also on income and the opportunity cost of holding currency. Because currency in circulation is a subset of the demand for currency, this demand is modelled as a function of a scale variable to account for transaction demand, the opportunity cost of holding currency and any additional variables that might influence the behaviour of currency holding (Tan, Habibullah, and Yiew, 2016). The currency demand model is appropriate in explaining key relationships. In Addition, Saunders (2005) highlights on the question of *what* is being measure with the CDA. He emphasizes the fact that this methodology can only detect those who operate in the underground economy using cash. The CDA show how much currency in circulation is used for underground economic activity.

3.3 Empirical literature

To remain relevant to the empirical literature relating to the analysis of the underground economy through the currency demand approach (CDA) model, this section is structured to be in line with the objectives of the study. It is worth mentioning, that the discussion of the following relationships is mostly based on studies that investigate the underground economy. Therefore, the demand for currency and the underground economy are used interchangeably.

3.3.1 Economy Growth and the Demand for Currency

Keynesians argue that changes in the amount of currency lead to raising money demand for transactions (El-Seoud, 2014). The relationship between monetary measures and GDP is not a new one in macroeconomics. For example, El-Seoud (2014) argues that while changes in GDP in Bahrain's economy clearly explain changes in money supply, the latter do not assist in explaining changes in the former. This suggests that by offering cash balances without causing inflation, the Central Bank of Bahrain might fulfil the aim of economic expansion. This is still true,

though, if they manage the demand for money and adjust the money supply to accommodate the need for cash balances.

Marshal (2016) finds that in Nigeria, money demand and GDP are causally related. The author concludes from this that variations in the money supply contribute to the understanding of variations in real GDP. In other African states, Bambujijumugisha (2015) found that the demand for currency has been significantly influencing the GDP in Rwanda. Buthelezi (2023) finds that from 1990 to 2021, South Africa's GDP is shown to be negatively impacted by shocks to the official money supply and has a major influence on economic growth.

The studies mentioned above are related in that they base their analyses on the conventional Keynesian and Monetarist ideas. These hypotheses have not yet been able to fully explain the phenomenon of the underground economy. Economists are now obliged to view fluctuations in the money supply from a different perspective due to the development of the underground economy. It has been determined that there is a positive and statistically significant association between the amount of cash held by the public and the underground economy (Geidigh et al., 2016). However, economic analysts dispute their estimates of the underground economy's size, but they all agree that the underground economy has an impact on GDP and other major economic indicators.

Using discrepancies method to evaluate illicit financial flows in Africa, Signe, Sow, and Madden (2020) find that increased GDP is associated with higher IFFs due to increased opportunities to channel illicit resources abroad generated by higher economic activity. For instance, Ogbonnaya and Umudike (2015) found that this has been the case in Nigeria for the period 1980-2015. Nicholas and Umeh (2020) investigate how unreported income from the underground economy affects economic growth in Nigeria, as well as how the country's economic progress is impacted by tax evasion from the underground economy. The error correction procedure was used to analyse the data. Because most of the factors studied were statistically significant, the research concluded that the underground economy has a considerable beneficial impact on Nigeria's economic progress.

Yasmin and Rauf (2003) find that the size of the underground economy has been growing faster than GDP in Pakistan due to changes in the political and economic

scenario of the country. The authors find that the existence of such a large underground economy depresses economic growth, and thus raises socio-economic issues. The study follows the monetary approach of Tanzi (1983), using data from 1974-2002. More than a decade later, Mughel and Schneider (2018) use the same approach and find that Pakistan's underground economy has a long-term significant influence on GDP while having a short-term negative influence. This positive long run relationship is also complimented by Khuong et al. (2020).

According to Koloane and Bodhlyera (2022), the CDA find that economic growth has a negative impact on currency demand over the long-run. This was discovered to be consistent with Schneider's (2005) finding that the official economy and the underground economy interact negatively in developing economies.

A study by Tribicka (2014) has led to the same conclusion. The study revealed that the demand for money will rise as the underground economy expands. The rate of involvement in the official labour force will decline as the size of the underground economy increases from a labour force perspective. As the workforce of the underground economy grows, fewer people are employed in the traditional industry. There will also be a decline in working hours in the official economy. The growth of the underground economy encourages the transfer of resources from the nominally organized economy to the disorganized one regarding the goods market. However, as indicated by the official rate of growth, this circumstance will lower productivity in the formal sector. The growth in production in the underground economy will be reflected in the official growth rate.

However, other research on the connection between currency demand and economic growth has come to different conclusions. Awad and Alazzeh (2012) utilized the same method as Tanzi (1983) to estimate Palestine's subterranean economy from 2008 to 2017. The authors employed a range of econometric techniques, and their empirical results show that the underground economy contributed USD 2676.227 million, or 28.6 percent of the GDP in 2010. Nyong (2018) discovered the integration between formal GDP and GDP from the underground economy in Sierra Leone. An analysis of the connection between the official and unofficial economy reveals bi-directional causality, with flows in both ways.

3.3.2 A Tax Burden and the Demand for Currency

The study of informality is considered incomplete without the mention of taxes. Giles (1998) has drawn attention to the widespread international evidence which suggests that the underground economy is partially sensitive to fiscal instruments in most countries. The burden of direct and indirect taxes on individuals is among the major contributors to the underground economy, but the complexity of the tax code is another crucial element that could affect its size (Shima, 2004). One of the fundamental presumptions underlying the demand for currency approach to modelling the underground economy is that the burden of taxes drives the underground economy. This is the most prevalent and significant reason for informality (Hassan and Schneider, 2016). Thus, taxes are believed to be the primary cause of people engaging in informal activities, which results in tax evasion. This is because, the higher the tax burden, the greater the difference between the cost of labour in the official economy and the after-tax earnings from the workplace. Therefore, an increase in the tax burden increases the supply of labour in the underground economy (Dell'Anno and Solomon, 2008).

According to Cagan's (1958), investigation on the determinants of currency to M2 ratio, taxpayers like using cash over alternative payment methods like cheques. As a result, tax evasion rises along with the tax burden, which raises the demand for currency relative to the total amount of money supply (M2). Amoh and Adafula (2019) claim that the weight of taxes in Ghana is what sparks informality. They draw attention to the fact that people are more motivated to labour illegally to avoid paying taxes when the burden is increased.

Sameti and AlBooSoveilem (2009) studied the effects of the underground economy on the labour market and tax system via panel data for 17 developed OECD countries between 1994 and 2008. As findings show, the tax burden variable has a positive and significant coefficient of 0.12, indicating a direct relation between itself and the underground economy. Thiao (2020) investigate the effects of IFFs on government revenues of the West African Economic and Monetary Union (WAEMU) countries. The author finds that IFFs are negatively related to government revenues. This effect was tied among others to per capita income and corruption over the

period 1996-2013. Analysis of Indonesia's underground economy from 2016 to 2019 shows that factors that have a significant influence are tax burden, financial innovation, and GDP. The study shows the potentially lost taxes in Indonesia are estimated at around one billion dollars, which indicates that government revenue is down due to underground economic activity (Marhamah & Zulaikha, 2021).

3.3.3 Unemployment Rate and the Demand for Currency

The connection between the unemployment rate and the underground economy yields no obvious effect. The reason is the income effect and the substitution effect. An increase in the unemployment rate may have positive effects on the underground economy because the formal economy may force people to look for other alternatives in the underground labour market, rather than being jobless. This has been the case in the Jordanian economy for the period 1980 to 2018. Meanwhile, an increase in unemployment rates may lead to lower incomes, and therefore less demand for goods and services in both the formal and underground economy (Alfoul et al. 2022).

Shima (2004) employs the CDA to analyse Norway's underground economy in the presence of a presumably declining currency in circulation and an increasing electronic payment. Shima challenges Schneider's (2001) variable of intensity of regulations by replacing it with the unemployment rate in the econometric model. The hypothesis is that a country that has high levels of unemployment rates is expected to have a high level of underground economic activity. More jobs and incomes will be supplied to the underground economy, and therefore less income tax declared to the government. Unlike Schneider who used the OLS procedure, Shima proves this hypothesis by estimating the currency demand model using the Prais-Winsten estimator. The results, however, are robust to heteroscedasticity.

Pickhardt and Sarda (2012) provide an analysis of the Spanish underground economy looking at previous studies, to provide new evidence from the modified-cash-deposit-ratio (MCDR) approach. In their correlation analysis, concerning the unemployment rate, the authors cite that there is no clear theoretical prediction of this variable in Spain. Nevertheless, the study finds unemployment rate is statistically

significant and positive, suggesting that an increase in the unemployment rate would lead to more underground economic activity in the long-run.

Davidescu and Dobre (2013) use structural vector autoregressive (SVAR) approach to examine the relationship between the USA's underground economy and the unemployment rate. The impulse response function generated by this methodology suggests that when the unemployment rate rises in the formal economy, it leads to more people working in the shadows. Under the extreme conditions of the Covid-19 pandemic, Remeikiene and Gaspareniene (2021) find that unemployed individuals not only increase underground economic activity, but they also justify the consumption of illegal goods and unreported income in Lithuania. Piraee and Rajaee (2015) show strong evidence of unidirectional causality from the level of the unemployment rate and underground economy in Iran between 1973 and 2013.

Tran (2021) investigated this relationship with Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam from 2000-2017. The results reveal that the size of the underground economy is boosted by unemployment in these economies.

According to Abada et al. (2021), Nigeria's failure to fulfil its employment goals has encouraged the active labour force to look for other means of income. Therefore, there is a positive relationship between the unemployment rate and the underground economy. This relationship is affirmed by 0.89 as an estimated coefficient of determination. Using a simultaneous-equation model to study this relationship for the period 2000-2015, Marwa and Chokri (2019) find that the unemployment rate affects the underground economy through various channels. Increase in unemployment rate increases the underground economy in developing countries, and it reduces the underground economy in developed countries.

3.3.4 Inflation Rate and the Demand for Currency

Cao (2015) studied the correlation between money supply and inflation in the "new era". He makes an argument that "in the relatively wealthy society, inflation is no longer a monetary phenomenon; it is a wealth allocation phenomenon". To prove that inflation and money supply are no longer correlated, the author adopts the Lucas' method and recursive estimation, chow test and F-test for advanced

economies from the 1990s period. The author finds that it is certain that there are other factors which lead to inflation rather than an increase in the money supply. Among other studies, this is in line with Us (2004) who find that the increased rate of inflation in Turkey has been a result of the weakness in the nation's currency and the increase of prices in the public sector.

Moreover, Batarseh (2021) employed the Johansen technique and Granger causality to test the relationship between money supply and inflation in Jordan between 1980 and 2019. The study results show that there is no causal link between M1 and inflation in the long term. The causality test demonstrates that M1 cause inflation in the short run, and not vice versa. Cadamuro and Papadia (2021) find that the growth of money does not help to forecast inflation over the 1999-2021 period in the USA. This is true when inflation is close to stable, in line with the stability target of the central bank. However, the authors highlight that if inflation is volatile, money helps in forecasting. Celasun and Goswami (2002) examine money demand and inflation in the Islamic Republic of Iran using quarterly data from 1990 to 2001. Their results suggest that stabilization of the exchange rate on account of strong oil revenues buoyed the demand for the domestic currency and thus contributed to the decline in inflation.

A marketplace has a critical role in determining appropriate inflation based on the scope and development of the underground economy. To produce this result, a crowded market environment is necessary. In line with this statement, Stephen (2006) creates a theoretical framework that investigates the optimal rate of theft in a bilaterally traded economy and an underground economy that evades taxes in Peru. The analysis produced some important conclusions. The author acknowledges that there may be regional differences in the consumer congestion of the formal and informal marketplaces, depending on whether the relationship between the underground economy and inflation is positive or negative. Inflation makes households compromise on the quality of the things they consume and diverts more cash and consumers to the underground economy when the legitimate market is more congested/crowded for buyers, and vice versa.

According to Asfuroglu and Elgin (2016), higher inflation affects the underground economy to a higher degree because it is heavily reliant on cash. As a result,

households and businesses have more incentives to go formal because inflation will act as a tax in the underground economy. Inflation creates more incentives for households to give up informal labour and devote more time to formal labour, taming the adverse effects of inflation on economic growth. Moreover, when the rate of inflation increases, it becomes worthwhile to use other modes of payments to avoid the costs related to the use of a depreciating currency (Barro, 1970). Alfoul, Khatatbeh, and Jamaani (2022) examined the extreme bounds analysis to study the causes of the underground economy in 132 countries. The authors show that price increase (inflation) leads to more individuals involved in the underground economy.

Following the respective literature cited in the work of Cziraky and Gillman (2004), the higher the inflation rate, the lower the consumption spending in the underground economy. This is because inflation causes substitution to the formal market from the underground market, because the formal market allows credit use. Nevertheless, the authors employ the MIMIC model to test this hypothesized negative connection between inflation rate and the underground economy in three countries. Their study find that the hypothesis holds for Bulgaria and Romania, but it does not hold for Croatia as inflation affect output growth in the underground economy positively.

According to Florenzano (2018), the estimate of the inflation variable is frequently regarded as being exaggerated. This is because it is anticipated that prices in the underground economy will increase at a slower rate than those in the mainstream sector. Additionally, this incident illustrates why people are drawn to the informal economy, particularly in industries where the underground and official economies are competing. Moreover, the author finds that the inflation rate in Korea between 2016 and 2018 is fluctuating mainly due to underground economic activity. However, the fluctuations according to the study, are not as big as the ones in Colombia, where the underground economy is extremely large.

A comprehensive comparison of the economies of South Africa and Nigeria reveals significant differences. In these two countries, the underground economy is primarily driven by unemployment, income inequality among citizens, excessive tax obligations, bureaucratic burdens imposed by the government, tendencies toward inflation, poorly controlled corruption, GDP per capita, and survival tendencies lacking in social protection (Etim and Daramola, 2020).

Goel, Saunoris and Schneider (2017) investigate the drivers of the underground economy in the US from the year 1870 to 2014. Their study adopts the currency demand approach for analysis. According to their findings, the long-run impact of inflation on the underground economy is negligible. The short-run coefficients indicate that there will be a negative and statistically significant impact on the underground economy. Moreover, Sanusi and Meyer (2018) have demonstrated that long-term inflation rates have detrimental and severe effects on how money is demanded.

3.4 Summary of the chapter

This chapter explored the theoretical framework that is related to the underground economy. The theoretical framework covered theories of economic development in connection with the underground economy and the theoretical literature on the currency demand approach. Debates relating to the informality of the underground economy are categorised into four schools of thought. The viewpoints of each school depend on the connection between the formal and the underground economy.

The dualistic school argue that underground agents are excluded due to an imbalance between population and modern industrial employment growth rates. Structuralists think that the underground economy's rise is due to the structure of capitalist development and not a lack of economic progress. The legalists cite that the underground economy consists of unregistered business owners who operate this way to save money, time, and effort on official registration. Voluntarists maintain that the underground economy consists of economic agents who operate underground (informally and even criminally) to escape state fiscal, financial, and commercial rules. The adoption of these theories is significant since they focused on less developed and developing economies such as South Africa.

Measuring the underground economy with absolute accuracy is almost an impossible task. The reason is clearly because of its hidden and complex nature. This phenomenon is subject to many activities, many of which may not be economic and such activities make forecasting difficult. However, this measurement problem does not preclude the analysis.

The empirical literature highlighted in this section is based on previous studies on the underground economy. The chapter showed that the underground economy responds differently to structural changes in countries that may even have similar characteristics in terms of international standards.

Most of the development theories underlined in section 3.2 advocates for formalization. Meanwhile, the South African economic conditions, highlighted in Chapter 2, shows a growing pattern of the underground economy phenomenon. Few empirical models used to study the underground economy are concentrated on its size and development. However, the role of the rising cost of living towards achieving the goal of formalization is overlooked. This study hopes to close this gap by understanding the role of real GDP, taxes on income and wealth, and inflation. These variables may help identify the opportunities for formalization in South Africa.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter discusses the methodology approach of the study. To analyse the South African underground economy, the study follows the currency demand method employed by Tanzi (1983) and expands it with several time series variables. The chapter is divided into five sections. Section 4.2 identifies the data used in the study and their relevant sources. Section 4.3 discusses the model specification which is divided into the sub-sections. The currency demand model, and the prior expectations. Section 4.4 discusses the estimation techniques. Finally, section 4.5 summarizes the chapter.

4.2 Data

The study used quarterly time-series data obtained from the SARB from 2000 quarter 3 to 2022 quarter 4. Therefore, the total number of observations under study are 90. The macroeconomic variables include, M1, real GDP, current income and wealth taxes as a proportion of GDP, unemployment rate, and inflation rate. The unit of measure of the data are in percentage form and millions of Rands. As an advantage, the quarterly data enabled the phenomena of interest to extinguish accurate estimates due to a reasonable number of observations.

4.3 Model Specification

The model specification assumes the existence of relationships between the dependent variable and independent variables. To accomplish the main goal of this study, the currency-demand model is presented as follows,

4.3.1 The Currency Demand Approach (CDA) Model

While drawing inspiration from Tanzi's (1980, 1983) model, the currency demand function of this study has been modified to reflect the South African economic

conditions. The subsequent model is built to capture the long-run relationships using the following equation:

$$Currency\ demand = f(economic\ growth, tax\ burden, unemployment\ rate, inflation\ rate) \quad (4.1)$$

Moreover, the model is presented in a linear form as follows,

$$LC_t = \beta_0 + \beta_1 LY_t + \beta_2 T_t + \beta_3 U_t + \beta_4 I_t + \mu_t \quad (4.2)$$

With $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, and $\beta_4 < 0$

Where:

L = indicates that the variable is converted to a natural logarithm to improve the fit of the data.

C_t = represent the currency in circulation normalized by GDP (observed cash balance)

β_0 = the constant term,

Y_t = the official real GDP (used as a scale variable, is the official GDP which exclude hidden GDP),

T_t = the tax burden (also known as tax revenue as % of GDP, which is employed as a proxy for modifications in the scale of the underground economy),

U_t = the unemployment rate (used as an additional variable that might explain the reason behind informality or currency demand),

I_t = inflation rate (used to account for the potential cost of retaining money), and

μ_t = the stochastic error term (used to represent variables that might influence currency in circulation, but not included in the model).

In regression modelling, estimates of the error terms are known as a residual which is the difference between the observed and predicted value of the dependent variable (Draper and Smith, 1998). In addition, the linear models are accompanied

by various assumptions that must hold for them to produce accurate estimates. In the absence of any distributional assumption for μ_t, one can use ordinary least square (OLS) to estimate the parameters (Spanos, 1995). The OLS method is widely used for regression analysis because it is much simpler and attractive (Mustafa et al., 2014). Following the linear model presented in Equation 4.2, β_1, β_2, β_3 and β_4 represent regression coefficients of each independent variable. The presence of a natural logarithm in Equation 4.2 indicates that the coefficients are interpreted as partial elasticities (Rathore, 2020). The word "partial" suggests that, for instance, β_1 measures the elasticity of C_t concerningY_t, holding the influence of T_t, U_t, and I_t constant.

4.3.2 The Prior Expectations

The prior expectations of the study are that there should be a positive influence on demand for currency for GDP $(\beta_1 > 0)$, because an improvement in the economic environment should be reflected by an increase in the need for trade, hence, an increase in the demand for currency. The study expects a positive influence on demand for currency for tax burden, ($\beta_2 > 0$). Since the underground economic activity is more cash intensive, when the tax burden increase, the demand for currency should also increase. Unemployment rate is another variable which has an influence on the demand for currency. Although this variable is not included in Tanzi's (1983) original model, there should be a positive influence on the demand for currency, because many unemployed people are assumed to be employed in the "cash-only" underground economy ($\beta_3 > 0$). Lastly, there should be a negative influence on demand for currency from the inflation rate, ($\beta_4 < 0$). This is because when the opportunity cost of holding money increases, it should reduce the demand for currency.

4.4 Estimation techniques

Time-series analysis will be used in the study due to its attractiveness in forecasting performance. This includes trend-recognition and parameter estimation (Deng et al. 2017). The fundamental research aims and objectives in section 1.3 justify the use of

this approach. The underlying objectives in sub-section 1.3.2 are typically not addressed by alternative statistical methods. Therefore, the study makes use of stationarity tests, lag length criteria, Johansen technique, VECM, normality test, heteroscedasticity, serial correlation, CUSUM test, CUSUM of the square test, Inverse roots, Ramsey's RESET test, to analyse the association between macroeconomic variables under consideration and the underground economy. To achieve that, the study performs the following econometric tests.

4.4.1 Stationarity/Unit root test

Stationarity tests are used to determine if the underlying empirical model has a component that can be described by a random walk (Zhong, 2015). There are significant consequences of choosing whether to include a unit root in an autoregressive operator. Analysts receive unbiased advice on this decision from formal tests for the presence of unit roots (Dickey, Bell, and Miller, 1986). The study conducted unit root tests because failure to do so could lead to spurious regression. As an advantage, the study avoids accepting or reaching false conclusions. Because of this, the literature suggests utilizing differencing to address the existence of unit roots in a series. According to Said and Dickey (1984), differencing variables to transform them to stationary has progressed towards being a solution to the problem of unit roots that macroeconomic data exhibit.

There are two principal methods of detecting unit roots. This includes visual inspection of the time series through a line graph or its correlogram. This is useful in checking the randomness of the data-generating process. Theoretically, if the correlogram, for example, of the data-generating process degrades slowly, it may suggest the presence of a unit root or a trend. Another method of detecting unit roots is formal statistical tests. The main idea is that there is an inclusion of appropriate deterministic regressors which is a constant and a trend (Traore and Diop, 2022).

4.4.1.1 The Augmented Dicky-Fuller (ADF) unit roots test

Statistical analysis offers several formal methods of testing for stationarity. Augmented Dickey-Fuller test has become popular among researchers in both

academic and international bodies. The number of times a series is differenced is denoted by *I(d)* where *d* is the order of integration necessary to make a series stationary. As such, the original model is known as ARMA whereby the idea is to capture autocorrelation in the series. ARMA models are popular for modelling time series data, however, the ADF is most preferred because it tests the significance of Auto-Regressive (denoted by p) and Moving-Average (denoted by q) in ARMA models. Consider the following model whereby Y_t is fixed and e_t is a sequence of normal independent random variables with a mean value of 0 and variance, and so on:

$$Y_t = \alpha + pY_{t-1} + e_t \qquad \text{(t = 1, 2, 3… n)} \qquad (4.3)$$

Equation 4.3 suggests that the value of Y at time t depends on its value in the previous period, and a random term (e). The null hypothesis suggests the existence of unit roots in the data versus the alternative hypothesis which states the opposite, as follows,

$$H_0: p = 1 \qquad \text{(Null hypothesis)} \qquad (4.4)$$

$$H_1: p < 1 \qquad \text{(Alternative hypothesis)} \qquad (4.5)$$

The rule of thumb is that the probability value should be less than 1%, 5% and 10% levels of significance (L.O.S) for a variable to be stationary. This test is used to correct for serial correlation by adding higher-ordered lagged terms to the regression model (Dickey and Fuller, 1979; Brooks, 2008).

4.4.1.2 Phillip-Perron (PP) unit roots test

The Phillip-Perron test often complements the results of the Dickey-Fuller unit roots test (Mashamaite, 2019). One of the reasons both these tests are preferred is because the decision of the ADF test can often be verified using the PP test since they have the same null hypothesis (Brooks, 2008). However, theoretical calculations by Leybourne and Newbold (1999) suggest that the probability of rejecting the null hypothesis may differ when the series is integrated at *I(2).* Though the ADF test uses higher-ordered lagged terms for autocorrelation, the PP test does not consider extra terms in the model. However, it includes a non-parametric

correlation to the t-statistic by considering the presence of autocorrelation. The Phillips-Perron unit roots test allows for a wide class of weakly dependent and possibly heterogeneously distributed data (Phillips and Perron, 1988).

4.4.2 Lag Length Criteria

A significant feature of the Vector Autoregressive (VAR) model is the selection of a lag length since all inferences in the model hang on to the correct model specification (Gutierrez, Souza, and Guillen, 2007). Knowing that the autoregressive (AR) model, which is typically represented by p, is an extension of VAR is useful information. When estimating a VAR methodology, the first step is to choose the optimal lag length of the VAR. Brooks (2008) defines optimal lag length as the appropriate number of lags for each variable included in the model.

Liew (2004) cites that “the lag length p is always unknown and therefore it has to be estimated via various lag length selection criteria such as the Akaike's information criterion (AIC), Schwarz information criterion (SIC), Hannan-Quinn criterion (HQC), final prediction error (FPE), and Bayesian information criterion (BIC)”. In addition, the author highlights that it is often quite common to obtain results which contradict each other after running this methodology, therefore a decision must be made. Usually, longer lags produce appealing results. According to Hall and Asteriou (2007), a criterion which outperforms others is generally preferred.

4.4.3 Cointegration analysis

Cointegration is applied to overcome limitations presented by unit root tests (Bhaskara, 2007). Cointegration is used to investigate the correlation in non-stationary variables and the long run impact of explanatory variables on the dependent variable. Unlike unit root tests, most cointegration tests investigate the null hypothesis of no cointegration. Under this hypothesis, the asymptotic distribution theory does not apply. This is against the alternative hypothesis of the existence of cointegration (Ssekuma, 2011, Kremers et al., 1992). Cointegration relationship(s) mean the disequilibrium errors fluctuate around the zero mean (Dickey et al., 1991; Andrei and Andrei, 2015).

There are several methods for testing cointegrating relationships. The first one was pioneered by Engle and Granger (1987), who propose a two-step approach. This method creates residuals based on the static regression and tests them for unit root. However, its shortcoming is that it only tests for one cointegrating relationship (Stigler, 2010). The second one is the Johansen (1988, 1991) maximum likelihood estimator. This test provides asymptotically efficient estimates of the cointegrating vectors and the fitting parameters (Sorensen, 2019).

The study analysed the long-run equilibrium relationship(s) using properties of Johansen's maximum eigenvalue and trace tests, over the Engle and Granger methodology for integration. This is because the Johansen technique considers the short-run dynamics of the system when estimating the cointegrating vectors (Dolado et al., 1999). This technique for it to work requires a large sample size and all variables to be integrated at $i\,(1)$. The trace and maximum eigenvalue tests of the Johansen technique are calculated as follows,

$$J_{trace} = -\mathrm{T}\sum_{i=r+1}^{N} In(1-\lambda_i) \tag{4.6}$$

$$J_{max} = -T\ \mathrm{In}(1-\lambda_{r+1}) \tag{4.7}$$

A full description of this procedure can be found in (Hjalmarsson and Osterholm, 2007). Moreover, the Johansen technique is the most appropriate method since it has all the desirable statistical properties, and it allows for more than 1 cointegrating relationship. For it to produce accurate estimates, the sample size must be large.

4.4.4 Vector Error Correction Model

The VECM was employed to assess the short-run characteristics of the integrated series because it is known that if cointegration has been discovered, there is a long-run relationship between the variables (Asari, et al., 2011). The VECM is an appropriate model to use if all the variables are I(1) and there is integration. According to Enders (2010), this technique is defined as a model that shows how the system adjusts each period to reach its long-term equilibrium state. Although there are other systematic methods for estimating cointegrating parameters such as the

constrained maximum-likelihood approach as proposed by Phillips (1991), this study employs the VECM methodology as developed by Engle and Granger. In VECM, “a negative and significant coefficient of the error correction model (ECM) indicates that any short-term fluctuations between the dependent variable and independent variables will give rise to a stable long run relationship between the variables”, as per Engle and Granger (1987).

The general form of the VECM dynamic model is,

$$\Delta Y = a_1 + a_2 ec_{t1} + a_3 \Delta Y_{t1} + a_4 \Delta X_{t1} + e_t \quad (4.8)$$

Using this equation, ΔY is the dependent variable and the value ΔX is determined by external factors, which makes it an independent variable. In addition, ec_{t1} represent the error correction term (ECT). This equation helps to establish a short- and long-run connection between the variables. Andrei and Andrei (2015) have a detailed discussion of Equation 4.8. According to Ncanywa and Makhanyane (2016), if the ECT of the cointegrating equation is negative and statistically significant, it means variables adjust to long-run shocks, and that there exists a short-run influence in the series. However, one disadvantage of VECM is that the interpretation of its long run results is done in reverse (Kenny, 2019).

4.4.5 Diagnostic testing

Checking whether any assumptions made in the estimation of the model have been violated is particularly important in time series modelling. To ensure the goodness of fit of the model, diagnostic tests are conducted to examine the Jargue-Bera normality test, Heteroscedasticity, and serial correlation test.

4.4.5.1 Normality test

Studies have shown that the goodness of fit tests plays a key role in statistical application. Normality simply refers to the distribution of the error terms (residuals), and not the independent variables themselves. This is a confusion that is often found

in the academic literature. According to Thadewald and Buning (2007), the Jargue-Bera test is defined by:

$$JB = \frac{n}{6}(S^2 + \frac{(k-3)^2}{4}) \quad (4.9)$$

Where the sample skewness $S = \mu_3/\mu_2^{\frac{3}{2}}$ is an estimator of $\beta_1 = \mu_3/\mu_2^{\frac{3}{2}}$ and the sample Kurtosis $K = \mu_4/\mu_2^2$ an estimator of $\beta_2 = \mu_4/\mu_2^2$, μ_2 and μ_3 are the theoretical second and third central moments, respectively with their estimates $\mu_j = \frac{1}{n}\sum_{i=1}^{n}(x_i - x)^j$ where $j = 2,3,4.$ According to Yap and Sim (2011), the Jargue-Bera test has optimum asymptotic power properties and good finite sample performance. Moreover, due to its simplicity, Jarque and Bera's (1987) methodology proves to be a useful tool. According to Jarque and Bera (1987), if the distribution of the residuals is strongly skewed and the Kurtosis value is greater than three, it leads to the rejection of the null hypothesis which states normality in the distribution.

4.4.5.2 Serial correlation

The problem of a serial correlation occurs when the residuals from time series periods are correlated (Ratombo, 2019). The issue of serial correlation was brought to the attention of most statisticians in 1921 (Anderson, 1942). The Breusch-Godfrey LM test is employed to analyse the behaviour in the error distribution. This test considers the null hypothesis of no serial correlated errors against the alternative hypothesis which states that there is a serial correlation in the model up to a chosen lag order (Baum, 2015). There exists extensive literature as proposed by Breusch and Godfrey (1978), which explains the properties of this test in the linear regression model.

4.4.5.3 Heteroskedasticity

The study proposed the Goldfeld-Quandt and White's heteroscedasticity tests. Both these tests seek to investigate heteroscedasticity in the sample data. If the model detects no heteroscedasticity, the ordinary least square (OLS) estimator test for $H_0: \beta = 0$ at the $\propto = 0.05$ level of significance. According to the Goldfeld-Quandt test, its power depends upon the value of n_2, and the number of omitted observations

which depends on the precision of the measurements carried out and based on their distribution (Budka, Kachlicka and Kozlowska 2008). The study also takes into consideration White's general test for heteroscedasticity. This test is heavily used in most research papers due to its power in the inferences of applied economics.

4.4.6 Stability testing

In time series modelling, testing for structural stability is of the utmost significance. Zeileis et al. (2005) claim that econometric tests are available in the literature to address issues brought on by structural changes. The F-tests and Fluctuation tests are some of these tests. F-tests exhibit poor characteristics despite being developed for a single shift in an uncertain time. Regression OLS residuals serve as the foundation for the Fluctuation tests. Therefore, the following stability tests are used in the study.

4.4.6.1 CUSUM and CUSUM of Squares tests

These tests are proposed by the seminal work of Brown, Durbin, and Evans (1975). Taking into consideration several assumptions as cited in Ploberger and Kramer (1992), a normal alternative when using these tests is when the critical lines are parallel to the horizontal axis. However, even if a huge structural shift occurs, the cumulated residuals will eventually return to their origin. According to Boughton (1981), these tests are suitable for detecting single-point shifts. In addition, they ask whether prediction errors from a set of recursive regressions cumulate at an approximately constant rate.

Studies have shown that one of the major drawbacks of both these tests is their poor power for early and late structural change (Zeileis, 2002). These tests often produce contradictory results. Turner (2009) argues that the power of these tests "depends on the nature of the structural change. However, if the break is in the intercept of the regression equation, then the CUSUM test has more power. Additionally, if the structural change involves a slope coefficient or the variance of the error term, then the CUSUM of the square test has more power." Johnson and Bagshaw (1974) highlight that sometimes a significant structural shift occurs due to the presence of serial correlation.

4.4.6.2 Inverse roots

The stationary VAR model's stability is examined using the autoregressive characteristics polynomial. No root outside the unit circle will result in a positive test result, satisfying the stationary requirement of the VAR model (Masoga, 2018; Molele, 2019).

4.4.6.3 Ramsey's RESET test

The regression models are deemed valid if the ordinary least square (OLS) assumptions are not violated. If one of the assumptions fails either test of OLS, then the regression model is assumed misspecified and any conclusion drawn from the model can be misleading. To remedy this problem, econometric theory suggests the addition of a potentially relevant regressor in the set of X variables. As misspecification indicates that the model is missing a significant variable to influence Y. In addition, one may consider using other model selections, instead of OLS. Zaman (2017) cites that if a violation of assumptions is taken seriously, then nearly all regressions being run today are invalid. This is because the application of misspecification analysis is routinely ignored, and those who pass all tests of OLS assume their models are correctly specified, without checking if this is true (Zaman, 2017).

The study employed Ramsey's RESET test to detect error misspecification. In the case of error misspecification, the model will not adequately account for the connection between reliant and autonomous factors (Mulaudzi, 2018). It must be noted that RESET has no power to detect omitted variables whenever they have linear expectations. Furthermore, this test lacks power in sensing heteroscedasticity. Hence, this test only verifies if the estimated model is correctly specified or not. Thus, it does not detect omitted variables (Wooldridge, 2013).

4.5 Summary of the chapter

The essence this chapter was to introduce and discuss the model specification, and the techniques used to carry out the analysis. The chapter highlighted the rationale behind each variable used to formulate the linear model. In addition, expectations of the behaviour of the variables were predicted. In this study, a VECM approach was

proposed for the establishment of the long-run relationships among the demand for currency and its independent variables. Several diagnostic tests were proposed to test the assumptions of the OLS estimates. The stability tests, inverse roots and Ramsey's RESET test were also proposed.

CHAPTER 5

DISCUSSION / PRESENTATION / INTERPRETATION OF FINDINGS

5.1 Introduction

Chapter 5 presents the findings and discussion of economic growth, tax burden, inflation, and unemployment rate in the underground economy (as indicated by an increase in the demand for currency). This is in line with the methodology discussed in Chapter 4.

5.2 Empirical test results

This section presents the outcomes of all the empirical tests performed in the study.

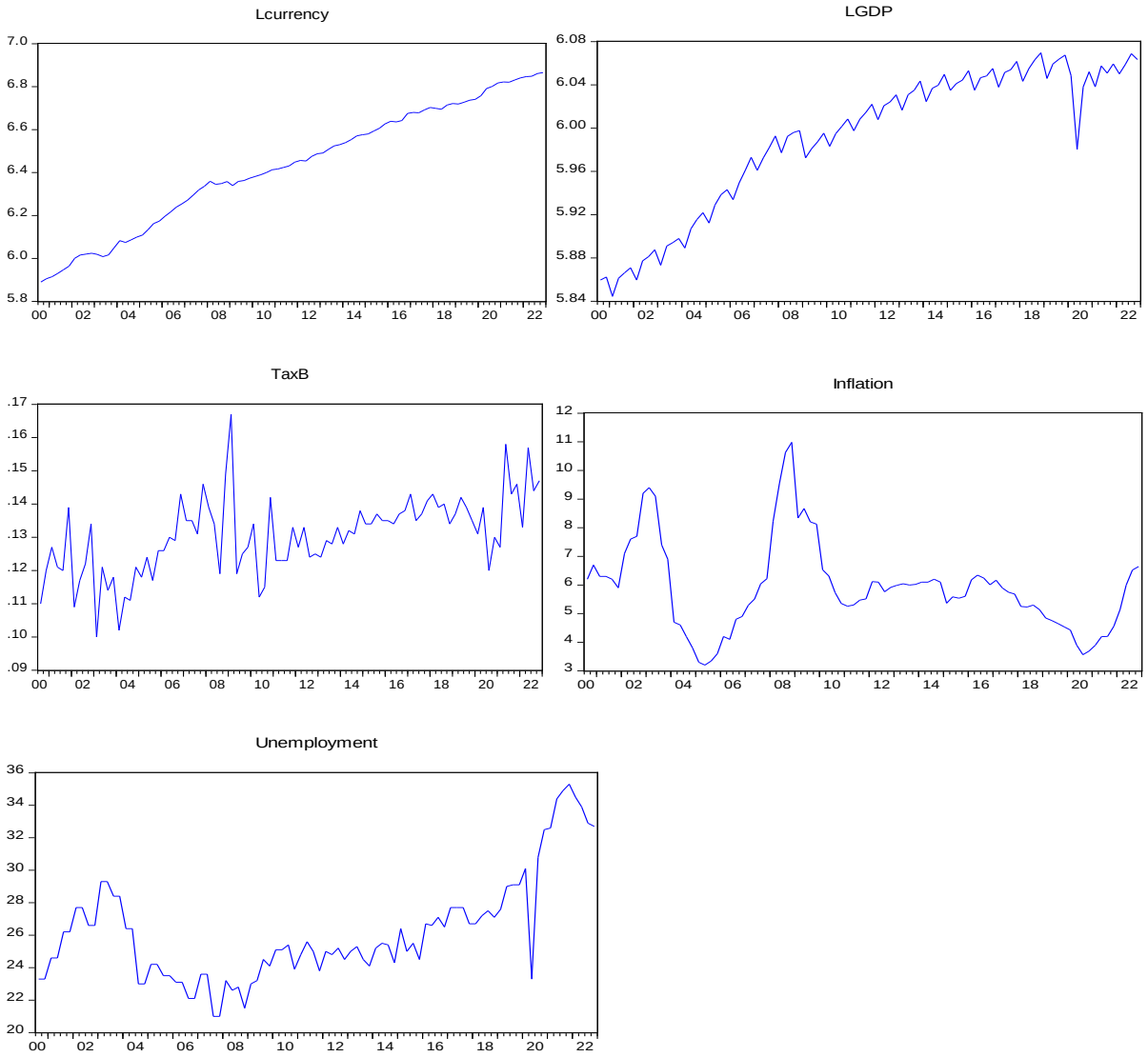
5.2.1 Stationarity/Unit root tests results

The unit root analysis was carried through the informal and formal processes and the results are presented in subsections 5.2.1.1 and 5.2.1.2.

5.2.1.1 Informal unit root test results

A graphical representation of the data to predict the behaviour of variables through visual inspection is presented in Figures 5.1 to 5.2 as follows,

Figure 5.1: Informal unit roots test: Level form

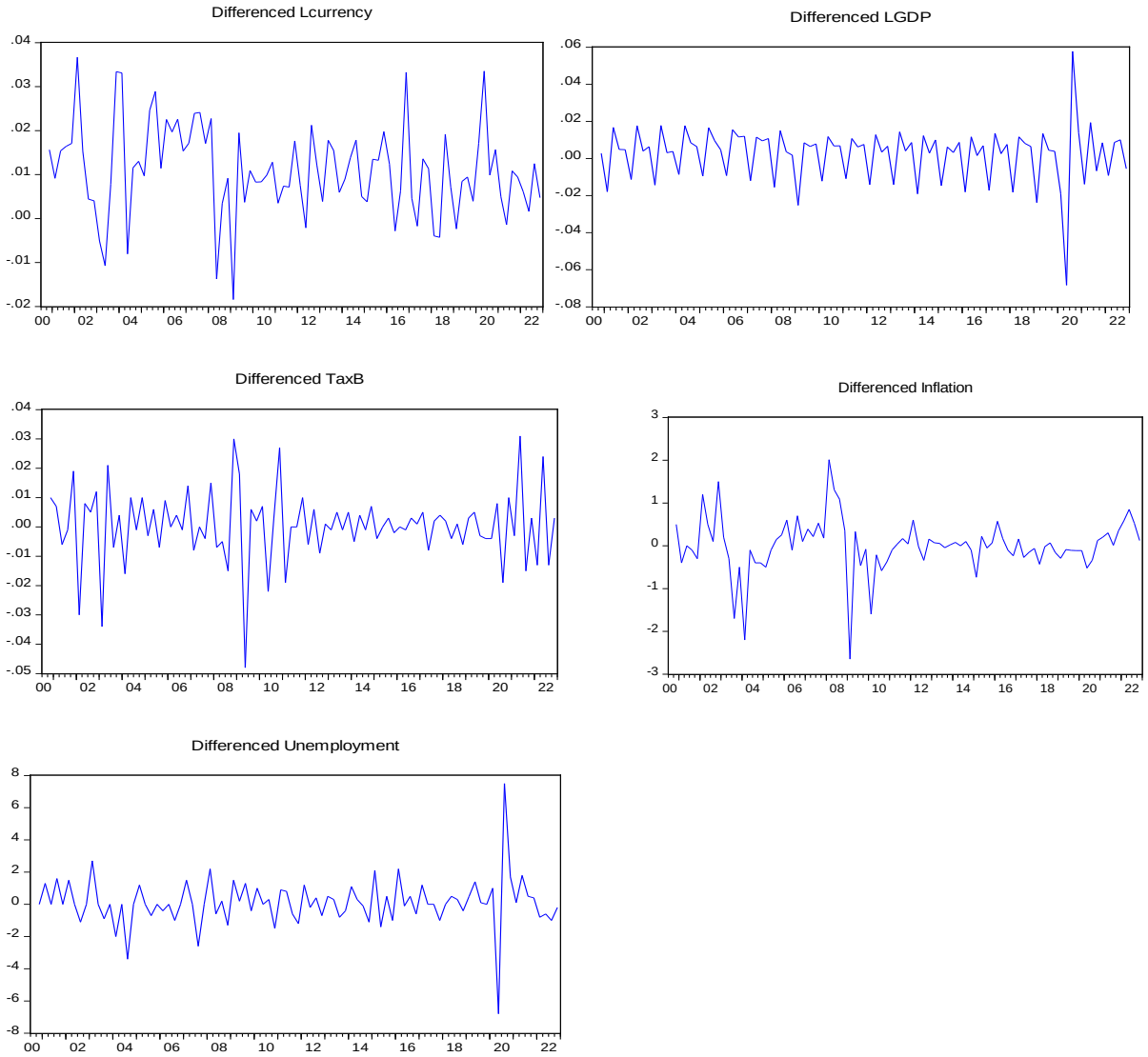


Source: Author's compilation

The line graph of demand for currency and GDP in Figure 5.1 is trending away from the mean value of zero, constant variance, or both. Each series has a positive trending characteristic which is smoothly growing upward over time, reflecting minor shocks. This is known as a deterministic trend and often it is predictable (Lyocsa et al., 2011). However, with the inflation rate, tax burden, and unemployment rate, the case seems a little different as the error terms are cumulating. But clearly, the series exhibits random walk like behaviour with no obvious positive or negative runs.

The behavioural pattern of these variables indicates that there are significant shocks which are slowing down the growth path of each variable. According to Gujarati (2002), this is known as a stochastic trend. In summary, the pattern displayed in Figure 5.1 indicate the non-stationary of all variables in their level form.

Figure 5.2: Informal unit roots test: First difference



Source: Author's compilation

Figure 5.2 illustrates the first difference form of demand for currency, GDP, tax burden, inflation rate, and unemployment rate. Based on the results, the pattern of fluctuations by all variables suggests that the time series seem to satisfy all conditions of the white noise process. This is because, the series fluctuate around the zero mean and constant, finite variance frequently. However, in the case of demand for currency and inflation rate, the series gives an impression of weak

stationarity. Concerning the demand for currency, the zero mean white noise condition within the study sample seems unsatisfactory. For example, between 2005 and 2008 the condition of the error terms fluctuating around the zero mean is not met. Similarly, the Inflation rate seem to lose its memory temporarily as the errors fluctuate slowly around the zero mean. The two series still fulfil all requirements of the white noise process, however, perhaps only asymptotically. These cases of stationarity are like those shown in the work of Lyocsa et al. (2011).

5.2.1.2 Formal unit root test results

The results in Figures 5.1 and 5.2 were verified by using the ADF and PP tests, as they hold more power and accuracy than the informal ones. The results are summarized in Table 5.1 and Table 5.2 as follows,

5.2.1.1 Augmented Dickey-Fuller unit roots test

Table 5.1 presents a summary of the ADF unit roots test results for both level form ($\boldsymbol{I(0)}$) and first difference ($\boldsymbol{I(1)}$) at 1%, 5%, and 10% level of significance.

Table 5.1: Augmented Dickey-Fuller test results

Variables	Augmented Dickey-Fuller (ADF)			Decision
	Model specification			
	None	Intercept	Intercept & trend	
Demand for Currency (at $I(0)$)	1.0000	0.2924	0.7277	Non-Stationary
Demand for Currency (at $I(1)$)	0.0276	0.0000	0.0000	Stationary
GDP (at $I(0)$)	1.0000	0.0546	0.9276	Non-Stationary
GDP (at $I(1)$)	0.0000	0.0000	0.0000	Stationary
Tax Burden (at $I(0)$)	0.8933	0.6604	0.4805	Non-Stationary
Tax Burden (at $I(1)$)	0.0000	0.0001	0.0000	Stationary
Inflation (at$I(0)$)	0.3924	0.0104	0.0319	Non-Stationary
Inflation (at$I(1)$)	0.0000	0.0008	0.0054	Stationary
Unemployment (at $I(0)$)	0.8792	0.7141	0.6936	Non-Stationary
Unemployment (at $I(1)$)	0.0000	0.0001	0.0000	Stationary

Source: Author's compilation

The results in Table 5.1 show that demand for currency, GDP, tax burden, inflation rate, and unemployment rate are stationary after $I(1)$ since the probability values are all at a 1% level of significance. Thus, the null hypothesis is rejected.

5.2.1.2 Phillips-Perron unit roots test

The PP unit root test was performed to verify the outcomes of the ADF unit root results and the outcomes are summarized in Table 5.2 as follows,

Table 4.2: Phillips-Perron test results

Variables	Phillips-Perron (PP)			Decision
	Model specification			
	None	Intercept	Intercept & trend	
Demand for Currency (at $I(0)$)	1.0000	0.3200	0.6916	Non-Stationary
Demand for Currency (at $I(1)$)	0.0000	0.0000	0.0000	Stationary
GDP (at $I(0)$)	0.9988	0.3175	0.1679	Non-Stationary
GDP (at $I(1)$)	0.0000	0.0001	0.0001	Stationary
Tax Burden (at $I(0)$)	0.8824	0.0000	0.0000	Non-Stationary
Tax Burden (at $I(1)$)	0.0000	0.0001	0.0001	Stationary
Inflation (at$I(0)$)	0.4526	0.0969	0.2519	Non-Stationary
Inflation (at$I(1)$)	0.0000	0.0000	0.0000	Stationary
Unemployment (at $I(0)$)	0.8999	0.5295	0.4253	Non-Stationary
Unemployment (at $I(1)$)	0.0000	0.0001	0.0000	Stationary

Source: Author's compilation

The results in Table 5.2 indicate that in level form, the currency demand model fails to reject the null hypothesis, therefore all variables are non-stationary. At $I(1)$ the results show beyond doubt that demand for currency, GDP, tax burden, inflation rate, and unemployment rate are stationary since the probability values are all at a 1% level of significance. Therefore, the null hypothesis is rejected. Therefore, because

this test compliments the results found in Table 5.1, the currency demand model of the study is viable.

5.2.2 Cointegration analysis test results

The Johansen cointegration test was conducted to determine if there is a long run relationship between the demand for currency and its regressors. The first step of the Johansen technique was to determine the appropriate lag length for cointegration analysis, and the results are presented in Table 5.3.

Table 5.3: Summary of VAR lag order selection criteria

Endogenous variables: LM1 TAXB UNEMP LGDP INFL
Exogenous variables: C
Sample: 2000Q3 2022Q4
Included observation: 82

Lag	LogL	LR	FPE	AIC	SC	HQ
0	142.5604	NA	2.40e-08	-3.355131	-3.208380	-3.296213
1	580.1621	811.1642	1.02e-12	-13.41859	-12.53808*	-13.06508
2	603.9274	41.15447	1.06e-12	-13.38847	-11.77421	-12.74037
3	639.2963	56.93535	8.40e-13	-13.64137	-11.29335	-12.69868
4	700.5612	91.15021	3.58e-13	-14.52588	-11.44411	-13.28860
5	750.0166	67.54889*	2.09e-13*	-15.12236*	-11.30683	-13.59048*

Note: *Signifies the appropriate lag order

Source: Author's compilation

In lag length determinisation, a criterion which outperforms others is generally preferred. Based on the results of Table 5.3, four criteria suggest the use of lag order 5. In this view, because the AIC is also included, the study chooses the optimal lag length 5 as also complimented by LR, FPE, and HQ. This decision is based on the power of the AIC as previously discussed in Chapter 4. Moreover, according to Liew (2004), when the FPE and AIC indicate the same lag, they minimise the chances of under estimation while maximising the chance of recovering the true lag length. The adjustments in the model were done since the selection of the lag order was drawn from a maximum of 8 lags since the study utilises quarterly data to attain an appropriate behaved residual.

The following Johansen cointegration test results are based on the Trace and the Maximum Eigenvalue tests which are known of being two main test statistics of the Johansen technique.

The Johansen cointegration analysis was conducted under the assumption of allowing for the linear deterministic trend in the data, with the lag length of 5 for the VAR. The results are summarised in Table 5.4 as follows,

Table 5.4: Johansen cointegration test results

Unrestricted cointegration rank test (Trace)				
Hypothesized no. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.575497	138.7029	69.81889	0.0000
At most 1 *	0.290546	66.72867	47.85613	0.0003
At most 2 *	0.271793	37.89490	29.79707	0.0047
At most 3	0.086176	11.25266	15.49471	0.1964
Unrestricted cointegration rant test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.575497	71.97421	33.87687	0.0000
At most 1 *	0.290546	28.83377	27.58434	0.0344
At most 2 *	0.271793	26.64224	21.13162	0.0076
At most 3	0.086176	7.569841	14.26460	0.4241
* Denotes rejection of the hypothesis at the 0.05 level				

Source: Author's compilation

The table presents the outcomes of both the trace and Maximum eigenvalue tests. Starting with the Trace test, the rule of thumb holds since the test statistic of 138.71 is greater than the 5% critical value of 69.82. Hence, the null hypothesis of no cointegrating vectors is rejected. In the same manner, the null hypothesis that there are at most 1 cointegrating vectors is also rejected since 66.73 t-statistic is greater than the 5% critical value of 47.86. At most 2, the *t*-statistic of 37.89 is greater than the 5% critical value of 29.80. Thus, the null hypothesis is rejected. But at most 3,

the null hypothesis cannot be rejected because the t-statistic is less than the critical value. Therefore, the trace test indicates 3 cointegrating relationships at a 5% level of significance.

The results of the trace test are supported by the results given by the Maximum Eigenvalue test. The Maximum Eigenvalue test also reject the null hypothesis of no cointegrating vectors at a 5% level of significance. The results of this test also suggest that there are 3 cointegrating relationships in our currency demand model since the test statistic of 71.97 is greater than the critical value of 33.88 at a 5% significance level at none. At most one, the Max-Eigen statistic of 28.83 is greater than the 27.58 critical value. At most 2, the Max-Eigen statistic of 26.64 is greater than the 21.13 critical value. Where there is a cointegration relationship, the probability values of both the Trace and Maximum Eigenvalue tests are less than 5% significance level. The probability approach also confirms cointegration. Therefore, both tests indicate long run relationships among the variables used in the currency demand model. Moreover, the tests suggest that the model have an error-correction representation, which reflects the long run adjustment mechanism.

Table 5.5: Estimates of the normalised cointegration coefficients

Normalized cointegrating coefficients (standard error in parentheses)				
Currency Demand (LC_t)	GDP (LY_t)	Tax Burden (LT_t)	Inflation (LI_t)	Unemployment (LU_t)
1.000000	-3.071011	-5.663834	0.002278	-0.025343
	(0.09642)	(0.66374)	(0.00423)	(0.00160)

Source: Author's compilation

Table 5.5 shows the long-run influence of the demand for currency in the following manner,

$$demand\ for\ currency - economic\ growth - tax\ burden + inflation - unemployment = 0 \quad (5.4.1)$$

That is,

$$LC_t - 3.071011LY_t - 5.663834LT_t + 0.002278LI_t - 0.025343LU_t = 0 \quad (5.4.2)$$

Therefore, the normalized coefficients associated with a unique cointegrating vector from the Johansen procedure led to the derivation of the following long-run equation:

$$LC_t = 13.36005 + 3.071011LY_t + 5.663834LT_t + 0.025343LU_t - 0.002278LI_t \quad (5.4.3)$$

Considering the standard errors in parentheses, the rule of thumb is if a coefficient is at least twice as large when compared to its standard error, then that coefficient is significant at 5% (Sevi, 2021). All coefficients in Table 5.5 are significant at a 5% level of significance, except for the inflation rate. Equation 5.4.3 shows what happens to the demand for currency (LC_t) when there is a change in GDP (LY_t), tax burden (LT_t), unemployment rate (LU_t) and inflation rate (LI_t).

The results presented in Table 5.5 and Equation 5.4.3 indicate strong support of the model hypothesis discussed in Chapter 4. The income elasticity of the demand for currency of 3.07, suggest that in the long-run, a 1% increase in GDP growth will lead to 3.07 units boost in the demand for currency in South Africa. The relationship between these two variables is significant.

The elasticity of demand for currency with respect to tax burden is 5.66. It means that a 1% increase in the tax burden will lead to the increase of 5.66 units in the demand for currency. The estimated equation also shows that tax burden has a significant positive impact on demand for currency.

The elasticity of demand for currency with respect to the unemployment rate is 0.0023, which means that a 1% increase in the unemployment rate will lead to an increase of 0.03 units in the demand for currency. This relationship is also significant.

Moreover, the elasticity of demand for currency with respect to the inflation rate is 0.0023, which means that a 1% increase in inflation will drive the demand for currency down by 0.0023 units, ceteris paribus. This coefficient, however, is insignificant as highlighted by its standard error.

In summary, the results suggest that if there is a boost in GDP, the demand for currency will rise, resulting in individuals having less incentives to move away from cash transactions. In addition, the market environment will become favourable for illicit trade and IFFs. These findings are in line with those discovered by Mughel and

Schneider (2018) who found similar results in the case of Pakistan. This relationship should be a concern for policy makers because occurrence indicate that economic growth seems to do too little in reducing participation in the underground economy. This means that formal economy rebuilding efforts are not an answer to combating the underground economy in South Africa. As cited by the African Union (2008), it is reasonable to ask where is this growth going?

The results relating to the tax burden is in line with the priori expectation. Thus, from the theoretical and empirical grounds, the tax burden is the rationale behind underground economic activity. These findings support the view of many researchers, including Pickhardt and Sarda (2012) for Spain and Thiao (2020) for WAEMU countries. The more tax revenue the South African government seek to collect directly, the stronger the incentive for individuals and businesses to resort to tax evading strategies by conducting transactions using currency. Additionally, the increased tax burden will provide strong incentives for individuals and firms to store capital abroad through illicit financial flows.

When the formal economy is unable to provide new jobs or keep existing jobs, the results suggest that individuals will desire to hold more cash than before. Therefore, they have stronger incentives to engage in activities, either informal or illicit type of employment that will earn them income. These activities by their nature will require wages/incomes to be paid in currency. There are several reasons why the unemployed population may demand more currency, except for the obvious ones. For example, entrepreneurs may demand this currency to start informal businesses or finance informal or criminal activities. In line with Giles and Tedds (2002), this is true because unemployed people usually have more time to conduct such activities. The results support similar views of Skinner (2007) and Koloane and Bodhlyera (2022) that the underground economy is a key area of employment in post-democratic South Africa, considering its issues with formal employment.

Finally, the results from the Johansen test indicate that when the rate of inflation increases, households do not compromise on the quality of the things they consume from formal markets. The result of this inverse relationship is in line with the findings of Goel et al. (2017) for the USA. However, these results contradict with Etim and Daramola (2020) who found that inflationary tendencies drive the underground

economy while using data gathered from 17 primary studies for South Africa and 14 for Nigeria. The current study finds that the inflation rate is not a significant driver of the underground economy in the long-run.

5.2.3 Vector Error Correction Model test results

To capture the effects of the CDA model in the short-run, the study employs the VECM estimator.

Table 5.6: Summary of VECM estimates

Variables	Descriptions	CointEq1	Standard Error
Money Demand	Error correction term (ECT)	-0.079611	(0.04630)
Tax Burden	Short-run coefficient	0.195014	(0.03394)
Unemployment rate	Short-run coefficient	14.75678	(6.20202)
GDP	Short-run coefficient	0.018159	(0.05635)
Inflation rate	Short-run coefficient	-6.256547	(2.72241)
R-squared 0.495157			

Source: Author's compilation

The first vector of the target variable (demand for currency) is represented by CointEq1 in Table 5.6. The ECT coefficient of -0.08 shows the degree of correction to long-run equilibrium. This coefficient is statistically significant as complimented by its standard error and the R-squared. An R-squared of 0.50 suggest that approximately half of these variables explains the variation in the demand for currency in South Africa.

While investigating whether a low R-squared is appropriate in empirical modelling, Ozili (2023) find that an R-squared that lies between 10% and 50% is acceptable in the condition that some or more explanatory variables are statistically significant. Therefore, the error correction term suggests that approximately 8% of the adjustment takes place every short period, regardless of whether there is a disturbance in the system.

In summary, the results suggest that the demand for currency converges towards equilibrium with an adjustment speed of -0.08 per quarter. This result indicates stability in the long-run equilibrium relationship between the demand for currency and GDP, tax burden, unemployment rate, and inflation rate. Therefore, the general form of the VECM model used is:

$$LC_t = -0.079611 + 3.071011LY_t + 5.663834LT_t + 0.025343LU_t - 0.002278LI_t \quad (5.4.4)$$

Note that the results of Equation 5.4.4 are to those of Equation 5.4.3. Except here there is a constant term representing the ECT. If the size of the underground economy was to be estimated, which is not the subject in this study, Equation 5.4.4 will be used to apply Tanzi's (1983) theoretical approach. The interpretation would be different from the ones drawn in Equation 5.4.3. For instance, the income elasticity of the demand for currency (LY_t) of 3.07, which is far from unitary, undermines Tanzi's assumption of equal velocity in both economies, as discussed in Chapter 3. Karimo, Tumala, and Wambai (2022) can be used as reference since they have taken a similar approach in this regard.

Nonetheless, outcomes Table 5.6 suggest that in the short run, GDP is not a determinant of the underground economy because it has an insignificant impact on the demand for currency. Meanwhile, tax burden and unemployment rate drive the underground, as these variables are positive and statistically significant. The inflation rate in the short-run acts as a tax in the underground economy because this variable is negative and statistically significant, ceteris paribus.

5.2.4 Diagnostic tests results

Table 5.7 presents a summary of diagnostic test results. The rule of thumb is that if the probability value is greater than the 5% level of significance (L.O.S), then do not reject the null hypothesis (H_0).

Table 5.7: Summary of Diagnostic test results

Test	H_0 (Null Hypothesis)	P-value	Conclusion
Jarque-Bera	Residuals are normally distributed	0.000000	Reject the null hypothesis

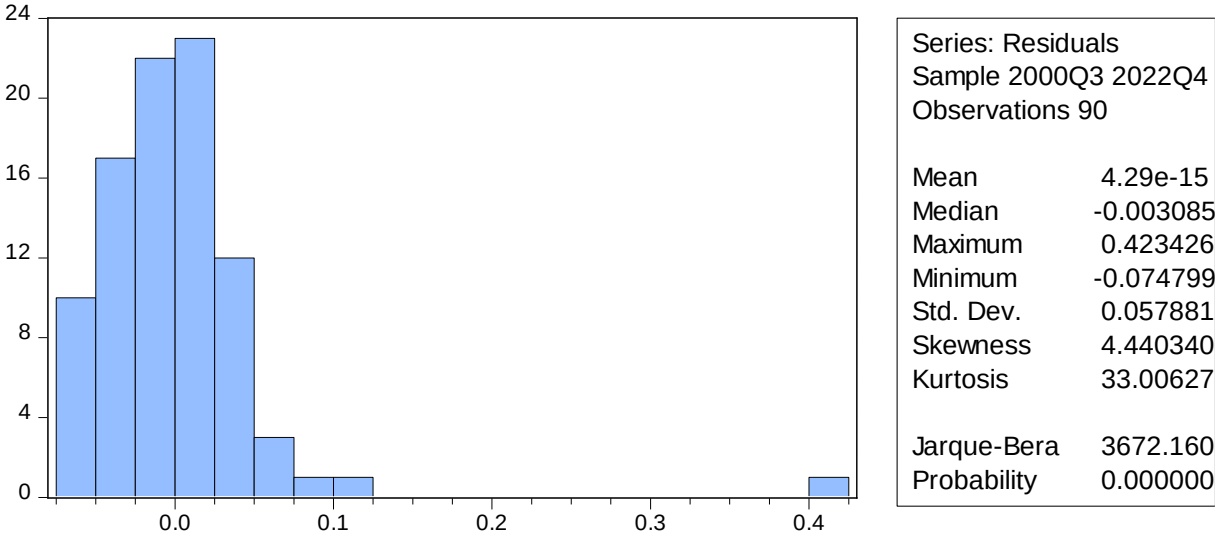
Breusch-Pagan-Godfrey	No Heteroscedasticity	0.3983	Do not reject the null hypothesis
Harvey	No Heteroscedasticity	0.2914	Do not reject the null hypothesis
Glejser	No Heteroscedasticity	0.4126	Do not reject the null hypothesis
White's test (excluding cross terms)	No Heteroscedasticity	0.5324	Do not reject the null hypothesis
White's test (including cross terms)	No Heteroscedasticity	0.4833	Do not reject the null hypothesis
ARCH	No Heteroscedasticity	0.6554	Do not reject the null hypothesis
Breusch-Godfrey LM test	No serial correlation	0.1283	Do not reject the null hypothesis

Source: Author's compilation

5.2.4.1 Normality test

In this study, the assumption of normality of the error terms is violated. As shown by Table 5.7 and Figure 5.3, the Jarque-Bera reveals a probability value of 0.00 which is less than 5% L.O.S. The probability value is insignificant, thus indicating that the flow of the data is strongly skewed and consists of a heavy tail which is decreasing away from zero. In addition, the Kurtosis value of 33.0063 supports the rejection of the null hypothesis. This shows that the error terms of the currency demand model are not normally distributed. This result however does not affect the quality of the estimates since the distribution of the errors possesses the unbiased property (Berry and Feldman, 1985; Opara and Isobeye, 2021).

Figure 2.3: Normality test histogram



Source: Author's compilation

5.2.4.2 Serial correlation

To check if the observations are independent of one another, serial correlation was examined. Because the study is using quarterly data, a lag order of 4 was included to test for serial correlation in the residuals. The results reveal a probability value of more than 5% L.O.S, as shown in Table 5.7. Thus, the Breusch-Godfrey LM test results suggest that the currency demand model does not suffer from auto-correlated errors. This makes the currency demand model more desirable.

5.2.4.3 Heteroskedasticity

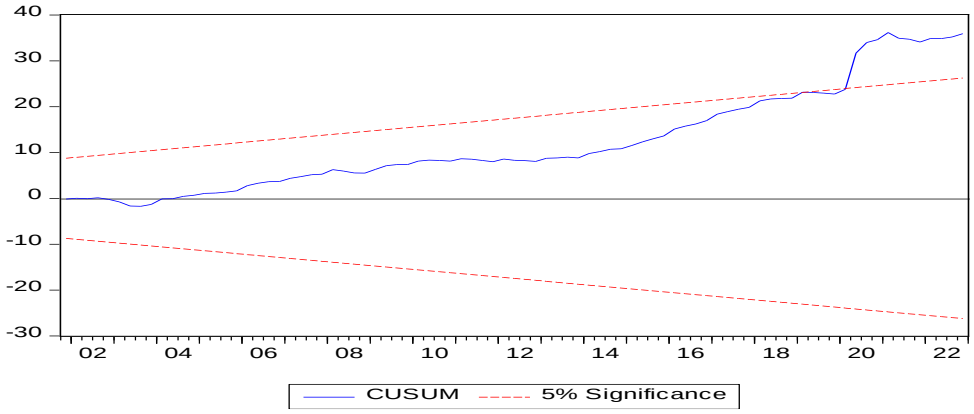
As shown in Table 5.7, all tests used confirm the same outcome, as the probability values are greater than 5% L.O.S. Therefore, this implies that the model does not suffer from the problem of heteroskedasticity, meaning that the residuals have constant variance in different periods.

5.2.5 Stability test results

The stability of the currency demand model was assessed using several tests such as the CUSUM, and CUSUM of square tests, the inverse roots of the AR Characteristic Polynomial and Ramsey's RESET tests. The results are presented as follows,

5.2.5.1 CUSUM and CUSUM of Squares test results

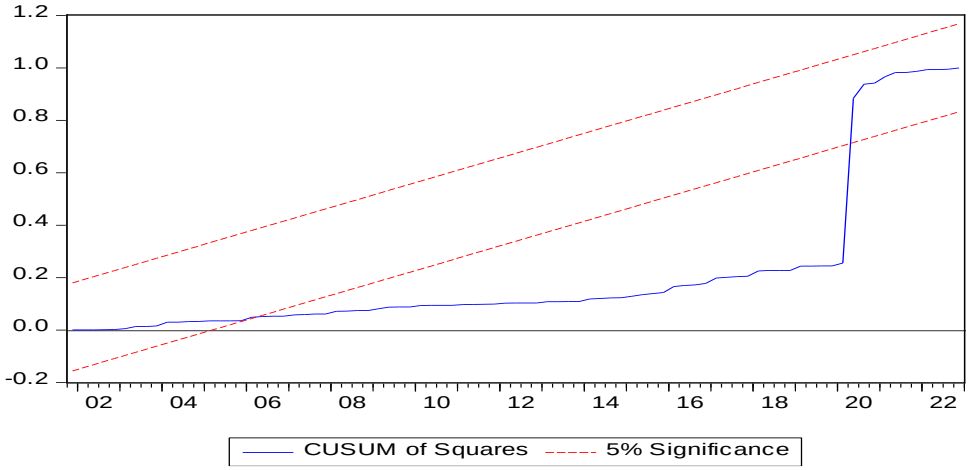
Figure 5.4: CUSUM test results



Source: Author's compilation

The CUSUM test results show functional stability apart from beyond 2020 quarter 1. This test suggests that the prediction errors are cumulating relatively slowly until 2020Q1 where there are additional shifts.

Figure 5.5: CUSUM of square test results



Source: Author's compilation

The CUSUM of square test outcomes in Figure 5.5 on the other hand indicate a model that wanders off outside the 5% significance area. However, the model slowly converges towards stability from 2020 quarter 2. This result is identical to that of the CUSUM test, except the errors are cumulating relatively quickly from 2006Q1. In

conclusion, CUSUM and CUSUM of square tests suggest that the demand for M1 in South Africa displays parameter instability.

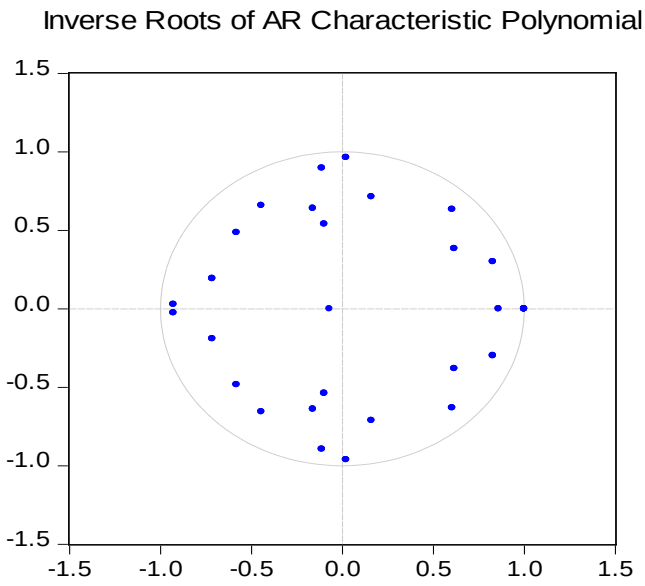
Theoretically, monetary targeting is often vulnerable to stability issues. Instability is often explained by unanticipated fluctuations in income velocity of money, unstable parameters, or changes in currency demand caused by swings in confidence (Andersen, 1985). Instability of both tests may also be explained by the nature of informality. According to Alberola and Urrutia (2019), informality influences the transmission of shocks and monetary policy. However, it is difficult to assess to which extent informality may explain the behaviour of these tests.

Literature suggests that changes that occurred in the banking sector and electronic payments have weakened the stability of currency demand in most countries (Tumturk, 2017). In comparatively analysing different models of currency demand in South Africa, Niyimbanira (2013) points out that it is simpler to fit a stable currency demand function with a smaller sample size than with larger samples because there is more time for things to change. Moreover, Nell (1999) finds that SARB uses M3 as an indicator for monetary policy because of its long-run stability, while M1 and M2 have been unstable since 1980. However, other research proves the contrary concerning M3. For example, Omar and Hussein (2020) have discovered an unstable money demand function using this indicator. Kapingura (2014) argue that in the case of an unstable money demand function, the SARB should justify the use of the repo rate as a monetary policy tool.

5.2.5.2 Inverse roots of the AR characteristic polynomial results

Due to the presence of some instability displayed by CUSUM and CUSUM of squares test outcomes during certain periods of the study, the inverse roots of the AR Characteristic Polynomial test were used to verify the stability of the VAR model. The results are presented in Figure 5.6.

Figure 5.6: Inverse roots test



Source: Author's compilation

The results of inverse roots of the AR characteristic polynomial of Figure 5.6 confirm the stability of the VAR model since all points are inside the unit circle.

5.2.5.3 Ramsey's RESET test results

The Ramsey's RESET test was also employed to determine the stability of the model and the results are summarized in Table 5.8 as follows,

Table 5.8: Ramsey's RESET test

Test	H_0	p-value	Decision
Ramsey's RESET	The equation is correctly specified	0.7026	Do not reject the null hypothesis since the p-value > 5% L.O.S.

Source: Author's compilation

Based on the decision rule, Ramsey's RESET test further confirms the stability of the model, and this suggests that it was correctly specified since the null hypothesis is not rejected.

5.3 Summary of the chapter

This chapter presented the results of the study based on the tests discussed in Chapter 4. The analysis started with unit root tests visual inspection of the variables. The visual inspection results were confirmed by formal unit root tests in the form of the ADF and PP tests. After unit root tests, the model was subjected to the Johansen test to determine the presence of the long run relationship. The study found that there exists more than one cointegrating relationship among the variables. Moreover, the VECM approach was employed to analyse the short run relationship(s). The chapter was concluded by testing for diagnostic tests and stability tests to avoid spurious results. The results of the diagnostic tests are similar to those of Saunders (2005), whose CDA model only passed a serial correlation after adjusting for lags, the Breusch-Godfrey and White heteroskedasticity tests, and Ramsey's RESET test. However, unlike Saunders (2005), the current study model passed more diagnostic tests.

CHAPTER 6

SUMMARY, RECOMMENDATIONS, CONCLUSION

6.1 Introduction

This chapter outlines the findings, conclusion, and recommendations of the study. The chapter is in response to the challenges facing the GDP, collection of taxes, unemployment rate, and inflation rate. Their influence on the demand for currency – underground economy is also noted.

6.2 Summary and Interpretation of Findings

In line with the theories, the study developed the underground economic model to analyse underground economic activities in South Africa. The unit root tests results revealed that all variables were integrated at $I(1)$. The Johansen cointegration technique was employed to determine whether a long-run relationship among the variables exists, and the results indeed showed that there is cointegration in the CDA model at a 5% significance level. Normalised results from the Johansen test output revealed a positive relationship between the demand for currency and GDP growth in the long run. Moreover, the tax burden and unemployment rate impact the demand for currency, whereas the inflation rate is inversely related to it.

The VECM was also employed for short-run analysis, specifically to determine the coefficient of the error correction term (ECT). Based on the sign and coefficient of the ECT of the speed of adjustment was revealed to be -0.08. This means that the demand for a currency can only return to its normal state at an 8% rate in the event of economic shocks. In addition, the results of the short-run analysis showed an insignificant relationship between the underground economy and GDP. Rising unemployment rates and increased tax burden drive the black-market economy. In addition, rising inflation rates reduce participation in the underground economy, as

the results suggest a significant negative relationship between the former and the latter, ceteris paribus.

The results obtained in the study were in line with the prior expectations of the theoretical currency demand model discussed in Chapters 3 and 4. The results also align with different empirical findings by other writers in this area of research. For instance, in Malaysia, Tan, Habibullah, and Yiew (2016) found that tax burden and unemployment rate have a beneficial impact on currency demand in the long-run. In addition, Signe, Sow, and Madden (2020) found that the illicit outflow of capital between Africa and China is caused by increased real GDP and higher taxes.

Diagnostic tests were conducted to determine if the OLS assumptions were not violated. The estimated model passed all the diagnostic tests of the Jarque-Bera normal distribution. Since Ramsey's RESET test and inverse roots of the autoregressive characteristic polynomial analysis produced better stability test results, the estimated VAR model was stable and correctly specified.

6.3 Conclusions

This study conducted an empirical analysis to understand the underground economy in South Africa between the period 2000 quarter 3 and 2022 quarter 4. The main objective was to investigate the connection between economic growth and the demand for currency. In addition, to examine the effects of tax burden, unemployment rate, and inflation rate on the demand for currency. The study found that the tax burden is one motivation behind the growing demand for currency in the long run. This will potentially lead to more crimes involving cash, informal employment, self-employment, and the creation of informal SMMEs, thus leading to more unreported economic activity.

When growth in the formal economy is improved by 1%, the demand for currency increases by roughly 3%. The transaction motive by the public becomes significant, and this has the potential to increase activity in the underground economy. As a result, there will be incentives for a corresponding income-tax-evading strategy. The surging official unemployment rates are also the driving force of the underground economy. The study finds that an increase in the unemployment rate will stimulate the demand for currency in both the long run and short run, worsening the tax

compliance problems. Moreover, evidence from the literature suggests that an increase in the inflation rate reduces the real income of those working in the underground economy in the short-run. Because consumers prefer goods from the formal and underground markets, inflation affects consumer behaviour in the underground market because of a declining use of currency.

A fascinating aspect of the results is that the demand for M1 does not pass all stability tests but is still consistent with economic theory. This may be due to various structural changes occurring in the country within the study sample such as the 2000 inflation targeting framework, technological innovations, the 2008/09 financial crises, the COVID-19 pandemic that had significant changes in consumption patterns, or the influence of informality and illicit activity in the country. An unstable currency demand function suggests that the stability of M1 in South Africa might not be explained by regressions used to study the underground economy.

In line with the literature analysis, the current study argues that CDA is appropriate in analysing the South African underground economy.

6.4 Contributions of the Study

Based on the empirical findings, the study offers the following recommendations:

Acknowledge the effects of the underground economy in policy design: Considering that underground economic activity is a reality, the South African Reserve Bank should consider making fundamental changes in its policy formulation, especially since the demand for M1 is demonstrating to be unstable. Because at some point, this will probably affect policies conducted through target goals such as stable inflation due to ‘missing money’, policy decisions based on this monetary aggregate (M1) might fail. Another point to consider is the triple effect of income growth (GDP) on the demand for currency. There is a need to monitor the money supply and the demand for currency. Policymakers should look for ways to reduce the supply of currency, or rather the use of cash, as a mismatch between these variables could be problematic.

Implementing recommendation 204 of the ILO: The government should put more resources through the South African Local Government Association (SALGA) to transition informal workers to the formal economy. This will improve the collection of

statistics on macroeconomic indicators such as the unemployment rate or GDP growth and assists in future policy design.

Broadening the tax net: South Africa is collecting a lower proportion of its tax revenue as % of GDP, the tax net needs to widen by targeting actors of the underground economy. Policymakers should look for ways to use inflation as a target in reducing underground economic activity, as complimented by the study's discovery.

6.5 Limitations of the study and future studies

The measurement technique employed in this study has limitations because not all underground economic activity may take place using a physical form of currency. As emphasised in Chapter Two, although this may be true, the South African economic conditions make this methodology reasonable because crimes such as corruption, which cannot be easily detected by officials, make the modelling technique even more appropriate.

Future studies can take advantage of these findings as they generate fresh queries. The Currency Demand Approach explains how macroeconomic variables affect the underground economy. A separate strategy is required to explain how the underground economy affects South Africa's economic policies and to what degree this phenomenon may cause the failure of such policies. Additionally, there is a need for more research on the stability of monetary aggregates.

REFERENCES

Abada, F.C., Manasseh, C.O., Nwakoby, I.C., Iroegbu, N.F., Okoh, J.I., Aloi, F.C., Lawal, A.I., and Asogwa, O.J. 2021. Relationship between Unemployment Rate and Shadow Economy in Nigeria: A Tado-Yamamoto Approach. *International Journal of Financial Research*, *12 (3).* [ONLINE]. Available at: https://doi.org/10.5430/ijfr.v12n3p271

Abel, A.B., Bernanke, B., and Croushore D. 2014. *Introduction to macroeconomics*. In: Alexander, D. (ed.) Macroeconomics. 8th edition. Pearson, p. 6.

Abela, G., Gauci, T., and Rapa, N. 2021. An analysis of the Shadow Economy in Malta: A currency Demand and MIMIC model approach. *International Journal of Economics and Financial Issues.*

African Monitor. 2017. *State of Illicit Financial Flows in South Africa: A scoping exercise*. [ONLINE]. Available at: https://www.africanmonitor.org/wp-content/uploads/2017/04/IFF-Report-1.pdf

African Union. 2013. *Illicit financial flows: Report of the High-Level Panel on Illicit Financial Flows from Africa.* [ONLINE]. Available at: https://au.int/documents/20210708/report-high-level-panel-illicit-financial-flows-africa

African Union. 2008. *The sixth ordinary session of the labour and social affairs: Study of the informal sector in Africa*. LSC/EXP, Addis Ababa, 4(6), pp. 21-25.

Ahumada, H., Alvaredo, F., and Canavese, A. 2006. *The Demand for Currency Approach and the Size of the Shadow Economy: A Critical Assessment*. Berkeley Olin Program in Law & Economics, Berkeley Olin Program in Law & Economics, Working Paper Series.

Alberola, E., and Urrutia, C. 2019. Does Informality Facilitate Inflation Stability? *BIS*, 778.

Alderslade, J., Talmage, J., and Freeman, Y. 2006. *Measuring the informal economy- one neighbourhood at a time.* The Brookings Institution Metropolitan Policy Program.

Alfoul, A.M.N., Khatatbeh, I.N., and Jamaani, F. 2022. What Determines the Shadow Economy? An Extreme Bounds Analysis. *Sustainability*, 14, 5761. [ONLINE]. Available at: https://doi.org/10.3390/su14105761

Alfoul, M.A., Mishal, Z.A., Schneider, F., Magebleh, K., and Alabdulraheem, A.R. 2022. The hidden economy in Jordan: A MIMIC approach. *Cogent Economics & Finance*, 10(1), 2031434.

Aliber, M. 2015. The importance of Informal Finance in Promoting Decent Work among Informal Operators: A Comparative Study of Uganda and India. *International Labour Review*, 66.

Alkhdour, R. 2011. *Estimating the Shadow economy in Jordan: Causes, Consequences, and policy implications.* Colorado State University, (Theses and Dissertations-Department of Economics). [ONLINE]. Available at: http://doi.org/10.17616/R31NJMSY

Almenar, V., Sanchez, J.L., and Sapena, J. 2020. Measuring the shadow economy and its drivers: the case of peripheral EMU countries. *Economic Research-Ekonomska Istraživanja*, 33 (1), 2904-2918.

Amoh, J.K., and Adafula, B. 2019. An estimation of the underground economy and tax evasion: an empirical analysis from the emerging economy. *Journal of Money Laundering Control*. [ONLINE]. Available at: https://ir.ucc.edu.gh/xmlui/bitstream/handle/123456789/4537/An%20estimation%20of%20the%20underground%20economy%20and%20tax%20evasion.pdf?sequence=1&isAllowed=y

Amstrong, P. 2009. *Poverty, Inequality, and the role of social grants: An analysis using decomposition techniques*. Stellenbosch Economic working papers: 15(09). Bureau for Economic Research.

Anand, R., Kothari, S., and Kumar, N. 2016. *South Africa: Labor Market Dynamics and Inequality*. IMF working paper, 16 (137).

Andersen, P.S. 1985. The stability of money demand functions: An alternative approach. *BIS economic papers*, 14.

Anderson, R.L. 1942. Distribution of the serial correlation coefficient. *The annals of mathematical statistics.*

Andreev, A.S., Andreeva, O.V., Bondareva, G.V., and Osyak, V.V. 2018. Understanding the underground economy. *European Research Studies Journal*, 21(2), pp. 814-822.

Andrei, D.M., and Andrei, L.C. 2015. Vector error correction model in explaining the association of some macroeconomic variables in Romania. *Procedia Economics and Finance*, 22, pp. 568 – 576.

Arby, M., Malik, M., and Hanif, M. 2010. The size of the informal economy in Pakistan. Working Papers, *eSocialSciences*. [ONLINE]. Available at: http://mpra.ub.uni-muenchen.de/22617/

Asaminev, E. 2010. *The Underground Economy and Tax Evasion in Ethiopia: Implications for Tax Policy*. Macroeconomic Division, Ethiopian Economic Policy Research Institute (EEPRI).

Asari, F.F.A.H., Baharuddin, N.S., Jusoh, N., Mohamad, Z., Shamsudin, N., and Jusoff, K. 2011. A Vector Error Correction Model (VECM) Approach in explaining the relationship between interest rate and inflation towards exchange rate volatility in Malaysia. *World Applied Science Journal*, 12, pp.49-56,

Asfuroglu, D., and Elgin, C. 2016. *Growth effects of inflation under the presence of informality*. Bulletin of Economic Research and John Wiley & Sons Ltd, 68(4), pp.0307-3378.

Asiedu, E., and Stengos, T. 2014. An empirical estimation of the underground economy in Ghana*. Economics Research International*, 14, pp.1-15.

Atkins A. 1997. A. *The illegal drugs trade and development in South Africa: some observations*. Catholic Institute for International Relations, London.

Attamah, N., and Chinedu, U.A. 2020. Impact of shadow/underground economy on economic growth: evidence from the Nigerian economy. *Journal of African Business & Management Studies*. [ONLINE]. Available at: https://publishingrealtime.com/files/196e7872_0812.pdf

Awad, I.M., and Alazzeh, W. 2012. *Using currency demand to estimate the Palestine underground economy: An econometric analysis*. Palgrave communications. [ONLINE]. AVAILABLE AT: https://doi.org/10.1057/s41599-020-0433-4

Awasthi, R., and Engelschalk, M. 2018. *Taxation and the Shadow Economy: How the Tax System Can Stimulate and Enforce the Formalization of Business Activities*. World Bank Group, Policy Research Working Paper 8391.

Ayodele, B., and Bamidele, O. 2017. *In the Shadows: Illicit Financial Flows in Nigeria's Oil Sector, Dakar: TrustAfrica*. [ONLINE]. Available at: http://iffoadatabase.trustafrica.org/cgi-bin/koha/opac-detail.pl?biblionumber=1001.

Bambujijumugisha, T. 2015. *The relationship between GDP and Money Demand in Rwanda*. [ONLINE]. Available at: https://ssrn.com/abstract=2973088

Barrett, J. 2003. Organizing in the Informal Economy: A Case Study of the Minibus Taxi Industry in South Africa. *SEED*, 39.

Barro, R.J. 1970. Inflation, the payment period, and the demand for money. *Journal of Political Economy* 78(6), pp.1228-1263.

Bartlett W, Cuckovic N, Xheneti M. 2005. *Institutions, Entrepreneurship Development and SME Policies in South East Europe*. In: Sixth International Conference on "Enterprise in Transition" Proceedings, Split, University of Split, pp. 1435–1454.

Batarseh, A. 2021. *The nature of the relationship between the money supply and inflation in the Jordanian economy (1980–2019)*. Banks and Bank Systems, 16(3).

BATSA. 2021. *Illegal cigarettes now out of control – New IPSOS report*. [ONLINE]. Available at:

https://www.batsa.co.za/group/sites/BAT_A2ELA_New_IPSOS_Report.pdf?openelement

Baum, C.F. 2015. *Serial correlation and heteroskedasticity in the time series regressions.* [Lecture] Economics, Boston College Chestnut Hill, Massachusetts. [ONLINE]. Available at: https://fmwww.bc.edu/EC-C/S2015/2228/ECON2228_2014_10.slides.pdf

Beck, M., Ougaard, F., Faruqui, U., and Picillo, C. 2018. Payments are a-changin' but cash still rules. *BIS* Quarterly Review.

BER. 2016. *The small medium and micro enterprise sector in South Africa*. Stellenbosch University.

Berry, A., Blottnitz, M., Cassim, R., Kesper, A., Rajaratnam, B., Seventer, D.E. 2002. *The economics of SMMEs in South Africa*. Trade and Industrial Policy Strategies.

Berry, W.D., and Feldman, S. 1985. *Multiple Regression in Practice: Quantitative Applications in the Social Science*. Thousand Oaks, CA: Sage.

Bhaskara, R.B. 2007. Deterministic and stochastic trends in the time series models: A guide for the applied economist. *MPRA*, 3580. [ONLINE]. Available at: https://mpra.ub.uni-muenchen.de/3580/

Bhorat, H., and Oosthuizen, M. 2005. *The Post-Apartheid South African Labour Market*. Development Policy Research Unit, 5(93).

Bitzenis, A., Vlachos, V., and Schneider, F. 2016. An Exploration of the Greek Shadow Economy: Can Its Transfer into the Official Economy Provide Economic Relief Amid the Crisis? *Journal of Economic Issues*, 50 (1), pp. 165-196.

Blaauw, P.F. 2017. Informal employment in South Africa: Still missing pieces in the vulnerability puzzle. *Southern African Business Review*, 21.

Boitano, G. 2019. *The informal economy and its impact on tax revenues and economic growth: The case of Peru, Latin America, and OECD countries*

(1995 – 2016). Deyvi Franco Abanto. [ONLINE]. Available at: https://doi.org/10.18800/360gestion.201901.005

Bojnec, S. 2006. *Small Business and the Shadow Economy*. University of Primorska, Faculty of Management Koper, Slovenia.

Boughton, J.M. 1981. Recent instability of Demand for Money: An International Perspective. *Southern Economic Journal,* 47(3), pp. 579-597.

Bouhail, A. 2020. *Fundamentals of deposit taking: Online CPT course 2020/2021*. Compliance and Learning Center, 10A Lever Street Brackenhurst Alberton, South Africa.

Breusch, T. 2005. *Estimating the underground economy using MIMIC models.* School of Economics, Faculty of Economics and Commerce, the Australian National University.

Breusch, T.S., and Godfrey, L.G. 1978. Misspecification Tests and Their Uses in Econometrics. *Journal of Statistical Planning and Inference*, 49, pp. 241-260.

Brockerhoff, S. 2013. A Review of the Development of Social Security Policy in South Africa. *Studies in Poverty and Inequality Institute (SPII).*

Brooks, C. 2008*. Introductory econometrics for finance*, 2nd edition*.* United State of America, New York. Cambridge University Press.

Budka, A., Kachlicka, D., and Kozlowska, M. 2008. Notes on the use of the Goldfeld-Quandt test for heteroscedasticity in environmental research. *Biometrical Letters.*

Buehn, A., and Schneider, F. 2008. MIMIC Models, integration and error correction: An Application to the French Shadow Economy. *The Institute for the study of labour (IZA)*, 3306.

Business Tech. 2019. *Drug dealers are making as much as R4000 a day from South Africa's heroin epidemic*. [ONLINE]. Available at: https://businesstech.co.za/news/lifestyle/3107dealers-are-making-as-much-as-r4000-a-day

Business Tech. 2023. *Huge blow for domestic workers in South Africa*. [ONLINE]. Available at: https://businesstech.co.za/news/lifestyle/688531/huge-blow-for-domestic-workers-in-...

Buthelezi, E.M. 2023. Impact of money supply in different states of inflation and economic growth in South Africa. *Economies*, 11 (64). [ONLINE]. Available at: https://doi.org/10.3390/economies11020064

Cabezas, L., and Jara, A. 2021. The demand for cash: stylized facts and substitution by electronic means of payment*. CEPAL*, 135.

Cadamuro, L., and Papadia, F. 2021. Does money growth tell us anything about inflation? *Bruegel*, 11.

Cagan, P. 1958. The Demand for Currency Relative to Total Money Supply. *Journal of Political Economy*, 66, pp. 1-37. [ONLINE]. Available at: http://www.nber.org/chapters/c5783

Cao, T. 2015. Paradox of Inflation: *The Study on Correlation between Money Supply and Inflation in New Era.* Arizona State University Digital Repository.

Caridi, P., and Passerini, P. 2001. The underground economy, the demand for currency approach, and the analysis of discrepancies: some recent European experience. *Review of income and wealth series* 47 (2).

Cash Essentials. 2021. *Cash and the Covid-19 pandemic in South Africa*. [ONLINE]. Available at: https://cashessentials.org/cash-and-the-covid-19-pandemic-in-south-africa/

Castells, M. and Portes, A. 1989. *World Underneath: The Origins, Dynamics and Effects of the Informal Economy.* John Hopkins University Press.

Cebula, R. & Feige, E. 2011. America's Underground Economy: Measuring the Size, Growth and Determinants of Income Tax Evasion in the U.S. *MPRA Paper*, 29672.

Celikay, F. 2019. Dimensions of tax burden: a review on OECD countries. *Journal of Economics, finance and administrative Science*. [ONLINE]. Available at: https://www.emerald.com/insight/2077-1886.htm

Chamberlain, D., and Smith, A. 2006. *Recent Findings on Tax-Related Regulatory Burden on SMMEs in South Africa: Literature Review and Policy Options*. Development Policy Research Unit, 06(105).

Chen, M.A. 2012. *The Informal Economy: Definitions, Theories and Policies*. WIEGO, 1.

Chisasa, J. 2014. *Rural credit markets in South Africa: A review of theory and empirical evidence*. Corporate Ownership & Control, 12(1).

Christine, C. 2015. *The formal-informal economy dualism in a retrospective of economic thought since the 1940s*. Schriftenreihe des Promotionsschwerpunkts Globalisierung und Beschäftigung, 43, Universität Hohenheim, Stuttgart. [ONLINE]. Available at: https://nbn-resolving.de/urn:nbn:de:bsz:100-opus-10572

Courtney, S. 2022. *South Africa loses billions to illicit money flows, OECD finds. Bloomberg Tax*. [ONLINE]. Available at: https://news.bloombergtax.com/daily-tax-report-international/south-africa-loses-billions-to-illicit-money-flows-oecd-finds

Cziraky, D., and Gillman, M. 2004. *Inflation and Endogenous Growth in Underground Economies*. Wiiw Balkan Observatory, 050, The Vienna Institute for International Economic Studies (wiiw), Vienna.

Daily Maverick. 2022. *Illicit and counterfeit trade fuels organized crime and is a growing threat to SA's economic recovery*. [ONLINE]. Available at: https://www.dailymaverick.co.za/opinionista/2022-12-11-illicit-and-counterfeit-trade-fuels-organise...

DailyMaverick. 2021. *Flourishing illicit trade in liquor and cigarettes is giving the fiscus a lockdown hangover*. [ONLINE]. Available at: https: www.dailymaverick.co.za/article/2021-02-0...

Davidescu, A.A.M., and Dobre, I. 2013. Revisiting the relationship between shadow economy and the level of unemployment rate, A SVAR empirical investigation for: The case of United States. *Journal of Applied Quantitative Methods*, 8(3).

De Beer, L., and Shikwane, J. 2021. *Note on banknotes and coin in South Africa*. South African Reserve Bank.

De Soto, H. 1989. The Other Path. *New York: Harper and Row.*

Deng, Z., Ke, Y., Gong, H., Li, X., and Li, Z. 2017. Land subsidence prediction in Beijing based on PS-InSAR technique and improved Grey-Markov model. *CiSience & Remote Sensing*, 54(6), pp. 797-818.

Dell'anno, R., and Schneider, F. 2006. *Estimating the Underground Economy by Using MIMIC Models: A Response to T. Breusch´s critique*. Department of Economics, Johannes Kepler University of Linz, working paper no. 0607.

Dell'Anno, R., and Solomon, O. H. 2008. Shadow Economy and Unemployment Rate in U.S.A. Is There A Structural Relationship? An Empirical Analysis. *Applied Economics*, 40(19), 2537-2555. [ONLINE]. Available at: https://doi.org/10.1080/00036840600970195

Department of Justice. 2020. *Broken and Unequal: The state of education in South Africa.* Amnesty International. [ONLINE]. Available at: https://www.justice.gov/eoir/page/file/1247956/download

Department of Social Development. 2023. *Annual Performance Plan 2022-2023*. [ONLINE]. Available at: https://www.dsd.gov.za/index.php/documents?task=download.send&id=422&catid=25&m=0

Devex. 2020. *How the illicit economy affects development in fragile settings*. [ONLINE]. Available at: https://youtu.be/IRIG53ZRexw?si=HE80c5zEMbFHL0eu

Devey, R., Skinner, C., and Valodia, I. 2006. *Second Best? Trends and Linkages in the Informal Economy in South Africa*. Development Policy Research Unit, 06(102).

Dickey, D.A. and Fuller, W.A. 1979. Distribution of the estimators for autoregressive time series with a unit root*. J. American Statistical Associations*, 74, pp. 427-431.

Dickey, D.A., Bell, W.R., and Miller, R.B. 1986. Unit roots in time series models: tests and implications*. Taylor and Francis Group*.

Dickey, D.A., Jansen, D.W., and Thornton, D.L. 1991. *A Primer on Cointegration with an Application to Money and Income*. Federal Reserve Bank of St Louis.

Dolado, J.J., Gonzalo, J., and Marmol, F. 1999. *Cointegration*. Department of Statistics and Econometrics, Universidad Carlos III de Madrid C/. Madrid 126, 28903 Getafe (Madrid) SPAIN.

Draper, N.R., and Smith, H. 1998. *Applied Regression Analysis, 3rd edition*. John Wiley & Sons Inc.

DTC. 2016. *Macro Analysis of the tax system and inclusive growth in South Africa: An analytical framework for the Davis Tax Committee*. [ONLINE] Available at: https://www.taxcom.org.za/docs/20160421%20%20Full&20Report.pdf

Du Toit, A., and Neves, D. 2007. *In search of South Africa's 'second economy': Chronic poverty, economic marginalisation and adverse incorporation in Mt Frere and Khayelitsha*. IDPM, School of Environment and Development, University of Manchester, CPRC Working Paper 102.

Duncan, D. 1990. *The Mills of God': state bureaucracy and African labour in South Africa, 1918-1948*. Queen's University, pp.106- 115.

El-Seoud, M.S.A. 2014. Testing the relationship between Money Supply and GDP in Bahrain. *International Journal of Economics*, Commerce and Management, United Kingdom, 2(5).

ENCA. 2016. *Man Arrested with R12m hard cash at King Shaka airport*. [ONLINE]. Available at: https://www.enca.com/south-africa/man-arrested-with-r12m-hard-cash-at-king-shaka-...

Enders, C.K. 2010. *Applied missing data analysis.* The Guilford Press: New York, London.

Engle, R.F., and Granger, C.W.J. 1987. Co-integration and Error Correction: Representation, Estimation, and Testing. *The Econometric Society*.

Ercolani, M.G. 2000. *Inflation tax and the hidden economy*. Department of Economics, University of Essex.

Etim, E., and Daramola, O. 2020. The Informal Sector and Economic Growth of South Africa and Nigeria: A Comparative Systematic Review. *Journal of Open Innovation*: Technology, Market, and Complexity.

FATF. 2021. *Anti-money laundering and counter-terrorist financing measures – South Africa.* Fourth Round Mutual Evaluation Report, FATF, Paris. [ONLINE]. Available at: http://www.fatf-gafi.org/publications/mutualevaluations/documents/mer-south-africa-2021.html

Feige, E.L. 1979. How big is the irregular economy? *Challenge*, 12, pp. 5-13.

Ferwerda, J., Deleanu, I., and Unger, B. 2010. *Revaluating the Tanzi-Model to Estimate the Underground Economy.* Koopmans Research Institute, 10(04).

FIAS. 2011. *South Africa: Sector Study of the Effective Tax Burden*. CICTI, USA, 1(1).

FIC. 2020. *Guidance Note 05 on section 28 of the Financial Intelligence Centre Act, Act 38 of 2001*. [ONLINE]. Available at: https://www.ficgov.za/documents/Guidance%20Note%205.pdf

Fin24. 2017. *SA's R1trn shadow economy trumps global average*. [ONLINE]. Available at: https://www.news24.com/fin24/economy/sas-r1trn-shadow-economy=trumps-global-a...

FinCen. 2002. *Informal Value Transfer Systems (IVTS).* [ONLINE]. Available at: https://www.fincen.gov/sites/default/files/advis

Fleming, M.H., Roman, J., and Ferrell, G. 2019. *The Shadow Economy.* Figshare, Loughborough's Research Repository. [ONLINE]. Available at: https://hdl.handle.net/2134/642.

Florenzano, L., and Paulo, P. 2018. *The Effects of the Underground Economy on Monetary Policies*. Department of Economics and Business, Chair of Money and Banking, LUISS.

Frey, B.S., and Schneider, F. 2000. Informal and Underground Economy. *International Encyclopedia of Social and Behavioral Science*, Bd. 12 Economics.

Frey, B.S., and Weck-Hannemann, H. 1984. A hidden economy as an "unobserved" variable. *European Economic Review*, 26, pp. 33-53.

FSCA. 2022. Financial sector outlook study. [ONLINE]. Available at: https://www.fsca.co.za.Documents/FSCA%20Fin

Gamal, A.A.M., Dahalan, J., and Viswanathan, K.K. 2018. Estimating the underground economy, illegal money and tax evasion in Qatar: Evidence from currency demand function. *Journal of Financial Crisis*, 26(4). [ONLINE]. Available at: www.emeraldinsight.com/1359-0790.htm

Gauci, T.M., and Rapa, N. 2020. *An analysis of the shadow economy in Malta: A Currency Demand and MIMIC model approach.* Central Bank of Malta, Eurosistema.

Geidigh, D.M., Schneider, F., and Blum, M. 2016. *Grey Matters*: *Charting the development of the shadow economy.* Centre for Economic Studies and IFO Institute (CESIfo).

Giammatteo, M., Lezzi, S., and Zizza, R. 2021. *Cash usage and the underground economy.* Banca d'Italia, Eurosistema, occasional papers, no. 649.

Giles, D. E. A., and Tedds, L. M. 2002. *Taxes and the Canadian underground economy*. Canadian Tax foundation, Canadian paper 106. Canada: Toronto.

Giles, D.E.A. 1998. Measuring the hidden economy: Implications for econometric modelling*. Econometric working paper (EWP),* 9809, Department of Economics, University of Victoria, Canada. [ONLINE]. Available at: http://web.uvic.ca/econ/economet_he.html

Goel, R.K., Saunoris, J.W., and Schneider, F. 2017. Drivers of the underground economy around the Millennium: a long look for the United States. *IZA Discussion papers*, no. 10857, Institute of labour economics, Bonn.

Goldman, T. 2003. *Organizing in South Africa's Informal Economy: An Overview of Four Sectoral Case Studies*. International Labour Office, Geneva, W/P No. 60.

Goswami, M., and Celasum, O. 2002. *An analysis of money demand and inflation in the Islamic Republic of Iran*. IMF working paper, 02(205).

Govender, M. 2011. *Conditional cash transfers as a means of addressing poverty in South Africa*. University of South Africa. [ONLINE]. Available at: https://hdl.handle.net/10500/5303

Gramley, L.E. 1982. *Financial Innovations and Monetary Policy*. Federal Reserve Bulletin, July 1982.

Guibourg, G., and Segendorf, B. 2007. *The use of cash and the size of the shadow economy in Sweden*. Sveriges Riksbank Working Paper Series, 204, Sveriges Riksbank, Stockholm

Gujarati, D.N. 2002. *Basic Econometrics, 4th edition*. Mcgraw Hill.

Gutierrez, C.E.C., Souza, R.C., and Guillen, O.S.C. 2007. *Selection of optimal lag length in integrated VAR models with a weak form of common cyclical features.* FUCAPE business school.

Gutmann, P.M. 1977. The subterranean economy. *Financial Analysts Journal*, 33(6), pp. 26-27+34.

Hall, S.G. and Asteriou, D. 2007. Applied econometrics: A modern approach. *New York: Palgrave Macmillan*.

Haque, S.T. 2013. *Underground economy of Bangladesh: An econometric analysis*. Research study series no- FDRS 01.

Hart, K. 1973. Informal income opportunities and urban employment in Ghana. *Journal of Modern African Studies*, 11, pp. 61–89.

Hassan, M., and Schneider, F. 2016. *Modelling the Egyptian Shadow Economy: A Currency Demand and A MIMIC Model Approach*. Center for Economic Studies and IFO Institute (CESIfo), 5727, Munich.

Herranz, E., 2017. Units root tests. *Wiley Interdisciplinary Review: Computational Statistics* 9, e1396.

Hjalmarsson, E., and Osterholm, P. 2007. *Testing for integration using bon methodology when variables are near integrated*. International Monetary Fund (IMF), FRB International Finance.

Hoang, H. 2020. The underground economy in transition countries from the perspective of globalization: The case of Vietnam. *Amazonia Investiga*, 9(29), pp. 234-242.

Hopkins, J. 2006. *Social Housing in South Africa: Review of South Africa's Housing Policy. South Africa.* [ONLINE]. Available at: http://www.psdas.gov.hk/content/doc/2006-1-04/Social%20Housing%20in%20South%20Africa%20-%20John%20Hopkins%20-%202006-1-04.pdf

Howak, M., and Ricci, L.A. 2005. *Post-apartheid South Africa: the first ten years*. International Monetary Fund.

Hunter, M. 2019. *African illicit financial flows: Designing and prioritising responses*. Enact research paper, European Union.

Huynh, C.M., and Nguyen, T.L. 2019. Fiscal policy and shadow economy in Asian developing countries: does corruption matter? *Empirical Economics* (2020) 59, pp. 1745–1761.

Ilesanmi, K.D., and Tewari, D.D. 2019. Management of shadow banks for economic and financial stability in South Africa. *Cogent Economics & Finance*, 7(1). [ONLINE]. Available at: https://doi.org/10.1080/23322039.2019.1568849

ILO. 1972. *Employment, Incomes and Equality: a Strategy for increasing productive employment in Kenya*. Geneva.

IOL. 2018. *Man bust with R6.9m in cash at OR Tambo*. [ONLINE]. Available at: https://www.iol.co.za/news/south-africa/man-bust-with-r69m-in-cash-at-or-tam...

Islam, T. 2011. Normality Testing- A new direction. *International Journal of Business and Social Science*, 2 (3).

Jarque, C.M., and Bera, A.K. 1987. A test for Normality of Observations and Regression Residuals. *International Statistical Review*, 55(2), pp. 163-172.

Johnson, R.A., and Bagshaw, M. 1974. The effects of serial correlation on the performance of CUSUM tests. *Technometrics*, 16, pp. 103-112.

Jokivuolle, E. 2018. Shadow Banking: *Financial Intermediation beyond Banks*. SUERF/Bank of Finland Conference.

Kabatas, R.C., and Turkler, F. 2012. *The size of the shadow economy in GDP: An estimation for Germany and USA.* The University of Vienna, Faculty of Business, Economics and Statistics, Department of Economics.

Kapingura, F.M. 2014. The Stability of the Money Demand Function in South Africa: A VAR-Based Approach. *International Business & Economics Research Journal*, 13(6).

Karimo, T.M., Tumala, M.M., and Wambai, I.U. 2022. Size and Determinants of the Shadow Economy in Nigeria: Evidence from a Monetary Approach. *CBN Journal of Applied Statistics*, 13(2), pp. 1-40.

Kelmanson, B., Kirabaeva, K., Medina, L., Mircheva, B and Weiss, J. 2019. *Explaining the Shadow Economy in Europe: Size, Causes and Policy Options*. IMF, 19(278).

Kemp, E. 2017. *Measuring shadow banking activities and exploring its interconnectedness with banks in South Africa*. South African Reserve Bank, occasional paper series, 17(01)

Kemp, E. 2022. *Non-Bank Financial Intermediation: A focus on South Africa*. University of Cape Town. University of Cape Town, School of Economics.

Kenny, V. S. 2019. Financial Development and Economic Growth in the Era of Financial Liberalization*. MPRA Paper* 95717, University Library of Munich, Germany.

Khamis, M., and Selassie, A. 2022. *South Africa: Financial System Stability Assessment*. IMF Country Report, 22 (39).

Khiaonarong, T., and Humphrey, D. 2023. *Measurement and use of cash by half the world's population*. IMF working paper, 23(62).

Khuong, N.V., Shabbir, M.S., Sial, M.S., and Khanh, T.H.T. 2020. Does the informal economy impede economic growth? Evidence from an emerging economy. *Journal of Sustainable Finance & Investment*. [ONLINE]. Available at: https://doi.org/10.1080/20430795.2020.1711501

Kieswetter, E.2020. *Illicit economy*. Presentation to standing committee on finance. [ONLINE]. Available at: https://www.tralac.org/documents/news/3182-presentation-sars-illicit-economy-scof-17-march-2020/file.html

Kline, E.B. 1998. Principles and practices of structural equation modelling. *New York: The Guilford Press*

Koloane, C. T., and Bodhlyera, O. 2022. Health insurance and Out-of-Pocket health care expenditure in Kenya. *Journal of Economics & Management*, 44, pp. 64-95. [ONLINE]. Available at: https://doi.org/10.22367/jem.2022.44.04

Koufopoulou, P., Williams, C.C., Vozikis, A., and Souliotis, K. 2019. Shadow Economy: Definitions, terms & theoretical considerations. *Advances in Management & Applied Economics*, 9 (5), pp. 35-57.

Kremers, J.J.M., Ericsson, N.R., and Dolado, J.J. 1992. The power of cointegration tests. *International finance discussion papers*, 431.

Krstic, G., and Schneider, F. 2015. *Formalizing the Shadow Economy in Serbia: Policy Measures and Growth Effects*. Faculty of Economics, University of Belgrade and FREN (Foundation for the Advancement of Economics), pp. 21-46.

Lafleche, T. 1994. *The demand for currency and the underground economy.* Department of Monetary and Financial Analysis, Bank of Canada Review.

Laguta, K.L. 2018. *How the underground economy affects GDP.* Kyiv National University of Technologies and Design.

Leibbrandt, M., Woolard, I., and Woolard, C. 2007. *Poverty and Inequality Dynamics in South Africa: Post-apartheid Developments in the Light of the Long-Run Legacy*. Southern Africa Labour & Development Research Unit, University of Cape Town, South Africa

Leibbrandt, M., Woolard, I., Finn, A. and Argent, J. 2010. *Trends in South African income distribution and poverty since the fall of Apartheid*. OECD Social Employment and Migration, 101.

Leibbrandt, M., Woolard, I., McEwen, H., and Koep, C. 2011. *Employment and inequality outcomes in South Africa*. Southern Africa Labour and Development Research Unit (SALDRU) and School of Economics, University of Cape Town.

Leshoele, M., and Gumede, V. 2018. Social and economic effects of illicit financial flows in South Africa. *Vusi Gumede Research & Publications*.

Lewis, G.H. 2021. *The taxi industry only pays R5m in tax*. [ONLINE]. Available at: https://www.da.org.za/2021/05/taxi-industry-only-pays-r5m-in-tax

Leybourne, S.J., and Newbold, P. 1999. The behaviour of Dickey-Fuller and Phillips-Perron tests under the alternative hypothesis. *Econometric Journal*, 2, pp. 92-106.

Liew, V.K.S. 2004. Which lag selection criteria should we employ? *Economics Bulletin* 3(33), pp. 1-9. [ONLINE]. Available at: https://www.researchgate.net/publication/4827253

Ligthelm, A.A. 2008. Size estimate of the informal sector in South Africa*. South African Business,* 10(2).

Lippert, O., and Walker, M. 1997. *The Underground Economy: Global Evidence of its Size and Impact.* The Fraser Institute.

Luiz, J.M. 1997. *The Evolution and fall of the South African Apartheid State: A Political Economy Perspective*. Centre for Science Development (HSRC).

Lund, F. 2002. Crowding-in care, security and micro-enterprise formation: Revisiting the role of the state in poverty reduction and in development. *Journal of International Development,* (14), pp. 681-694.

Lyocsa, S., Vyrost, T., and Baumohl, E. 2011. Unit-root and stationarity testing with empirical application on industrial production of CEE-4 countries. *MPRA Paper* 29648. [ONLINE]. Available at: https://mpra.ub.uni-muenchen.de/29648/

MacCallum, R.C., and Austin, J.T. 2000. Applications of structural equation modelling in psychological research. *Annual Review of Psychology*, 51, pp. 201-226.

Makananisa, M.P., Koloane, C.T., and Schneider, F. 2020. Modelling the shadow economy of South Africa: Using the currency demand and MIMIC approach. *Journal of Economics and Political economy*.

Makgetla, N., Moshikaro, L., and Levenson, H. 2023. *The real economy bulletin: State of small business 2023*. Trade & Industrial Policy Strategy (TIPS).

Makino, K. 2004. *Social Security Policy Reform in Post-Apartheid South Africa: A Focus on the Basic Income Grant*. Centre for Civil Society Research Report No. 11. Centre for Civil Society, University of KwaZulu-Natal.

Maloney, W. F. 2004. Informality revisited. *World Development*, 32(7), pp. 1159-1178.

Maluleke, M. 2021. *Gender Series volume VII: Informal economy*. StatsSA, Report No. 03-10-23.

Marhamah, and Zulaikha. 2021. *How are the Underground Economy Levels in Indonesia?* 3rd International Conference on Banking, Accounting, Management and Economics (ICOBAME 2020). [ONLINE]. Available at: https://doi.org/10.2991/aebmr.k.210311.0

Marinescu, C., and Valimereanu, I. 2019. The main current (Schools) of thought about the informal economy. *Review of international comparative management*.

Marshal, I. 2016. The Link between Money Supply and Economic Growth in Nigeria: An Econometric Investigation. *IIARD International Journal of Economics and Business Management*, 2 (3).

Marwa, S., and Chokri, A. 2019. *The nexus between the unemployment rate and shadow economy: a comparative analysis of developed and developing countries using a simultaneous-equation model*. Economics Discussion Papers, No 2019-30, Kiel Institute for the World Economy. [ONLINE]. Available at: http://www.economics-ejournal.org/economics/discussionpapers/2019-30

Mascagni, G., Moore, M., and Mcclusky, R. 2014. *Tax revenue mobilisation in developing countries: Issues and Challenges.* Institute of Development Studies (IDS). [ONLINE]. Available at: http://www.europarl.europa.eu/activities/committees/studies.do?language=EN

Mashamaite, P.M. 2019. *The relationship between economic growth and unemployment in South Africa.* University of Limpopo, School of economics and management. [ONLINE]. Available at: https://www.ulspace.ul.ac.za

Mashigo, P. 2010. Transforming the South African credit market. *Journal of Case Research in Business and Economics,* 2 (1), p. 16.

Mashiri, E., and Sebele-Mpofu, F.Y. 2015*. Illicit trade, economic growth and the role of Customs: A Literature Review*. International Network of Customs Universities, 9 (2).

Masoga, M.M. 2018. *The impact of public debt on economic growth in South Africa: A cointegration approach*. University of Limpopo, School of economics and management. [ONLINE]. Available at: https://www.ulspace.ul.ac.za

Mastercard, 2019. *The future of payments in South Africa: Enabling financial inclusion in a converging world.* Deloitte.

Mazhar, U., and Meon, P.G. 2017. Taxing the unobservable: The impact of the shadow economy on inflation and taxation. *World Development*, 90, pp. 89–103.

McCleary, R., and Hay, R.A. 1980. *Applied time series analysis*. Beverly Hills CA: Sage.

McKinsey Global Institute. 2012. *Debt and deleveraging: uneven progress on the path to growth*. Seoul, San Francisco, London, and Washington.

Medina, L., and Schneider, F. 2018. *Shadow Economies Around the World: What Did We Learn Over the Last 20 Years?* IMF working paper, 18/17.

Mercier, J.F. 2021. *Inflation in the time of Covid-19: (II) the liquidity surge*. South African Reserve Bank, OBEN 2101.

Minderoo Foundation. 2019. *South Africa Country Data 2018.* Nedlands: Minderoo Foundation. [ONLINE]. Available at: https://www.globalslaveryindex.org/2018/data/country-data/south-africa/

Mirus, R., Smith, R.S., and Karoleff, V. 1994. *Canada's underground economy revisited: update and critique*. Canadian public policy – Analyse de Politiques, XX: 3, pp. 235-252.

Mkandawire, T. 2016. Colonial legacies and social welfare regimes in Africa: An empirical exercise*. UNRISD Working Paper*, No. 2016-4, Geneva.

Mlambo, M.N. 2020. *Informal Foreign Small Business Enterprises: Contribution and Experiences.* University of KwaZulu-Natal, College of Humanities.

Molele, S.B. 2019. *Economic risk exposure in stock market returns: A sector approach in South Africa (2007-2015).* University of Limpopo, school of economics and management. [ONLINE]. Available at: https://www.ulspace.ul.ac.za

Moodley, M. 2008. *The extent and security implications of money laundering in South Africa.* Department of political sciences, University of Pretoria.

Mpofu, O., and Sibindi, A.B. 2022. *Informal Finance: A Boon or Bane for African SMEs?* Journal of Risk and Financial Management 15(270). [ONLINE]. Available at: https://doi.org/10.3390/jrfm15060270

Mughel, K.S., and Schneider, F. 2018. Shadow economy in Pakistan: its size and interaction with the official economy. *Munich Personal RePEc Achieve*. [ONLINE]. Available at: https://mpra.ub.uni-muenchen.de/870871

Mulaudzi, M.P. 2018. *The impact of capital flight and investment on economic growth in South Africa*. University of Limpopo, school of economics and management. [ONLINE]. Available at: https://www.ulspace.ul.ac.za

Mulinge, M.M. and Munyae, M.M. 1998. The persistent growth in size and importance of the informal economy in African countries and labour markets: Implications for theorising the economy. *African Sociological Review*, 2(2), pp. 20–46.

Mupamhadzi, D. 2019. *Informal Sector, Corruption and Economic Development in Africa: An Empirical Analysis Based on Panel Data*. Department of Economics, University of South Africa.

Mustafa, S., Riaz, K., and Perveen, Q. 2014. Stability of linear regression models. *Sci.Int. (Lahore)*, 27(1), pp. 73-76.

Narendrecumar, N. 2019. *The regulation of shadow banking in South Africa and proposals for reform based on the United States and China experience.* Research Report in Banking Law submitted to the Faculty of Commerce, Law and Management, University of Witwatersrand.

National Treasury. 2020. *Economic transformation, inclusive growth, and competitiveness: Towards an Economic Strategy for South Africa*. [ONLINE]. Available at: https://www.treasury.gov.za/documents/mtbps/2020/mtbps/Chapter&202.pdf

Naylor, R.T. 2005. The Rise and Fall of the Underground Economy. *The Brown Journal of World Affairs, WINTER / SPRING*, 11 (2), pp. 131-143

Ncanywa, T., and Makhanyane, L. 2016. *Can investment activities in the form of capital formation influence economic growth in South Africa*? SAAPAM Limpopo chapter 5th annual conference proceedings. [ONLINE]. Available at: http://ulspace.ul.ac.za/handle/10386/945

Nchor, D., and Konderla, T. 2016. *The underground economy of Czech Republic and tax evasion: the currency demand approach*. Procedia – Social and Behavioral Science, 220, pp. 294-301.

Nell, K.S. 1999. *The Stability of Money Demand in South Africa, 1965-1997*. Department of Economics Discussion Paper, No. 9905, University of Kent, Department of Economics, Canterbury

News24. 2021. *Man Jailed for trying to smuggle almost R2m to Dubai in his luggage.* [ONLINE]. Available at: https://www-news24-com.cdn.ampproject.org/v/s/www.news24.com/amp/news24/southafri...

Ngcobo, N.N.P. 2021. *The informal economy for local economic development in South Africa: A constitutional law approach*. University of North West, Faculty of Law.

Nguye, E.L. *1979. How big is the irregular economy?* Challenge, 22 (5), pp. 5-13. [ONLINE]. Available at: https://www.researchgate.net/publication/23747491.

Nicholas, A., and Umeh, A.C, 2020. *Impact of Shadow/Underground economy on economic growth in the Nigerian economy*. JABMS, 1(1), pp. 36-44.

Nicolaou-Manias, K. 2015. Understanding trade mispricing in South Africa. [ONLINE]. Available at: https://www.tips.org.za/files/u72/tips_aporde_umanias.pdf

Nicolaou-Manias, K., and Wu, Y. 2016. Illicit Financial Flows: Estimating Trade Mispricing and Trade-based Money Laundering for five African Countries. *GEGAFRICA Discussion Paper*.

Nitu, A.S., and Contantin, M. 2022. The Pandemic- The Disease of the Underground Economy. *AUDOE*, 18(2), pp. 222-228.

Niyimbanira, F. 2013. Money Demand in South Africa Revisited: A detailed Analysis of Different Models. *International Business & Economics Research Journal*, 12(14).

Nkepe, M. 2008. *The informal social security sector: A case for statutory regulation in South Africa*. School of Post-Graduate Studies and Research in the Faculty of Law at the North West University, Mafikeng Campus.

Ntuli, I.S. 2020. *Informal trading in post-apartheid South Africa: An examination of the experiences of black African women street traders in Durban*. School of social sciences, college of humanities, University of KwaZulu-Natal.

Nyong, M. 2018. Dynamics of the underground economy in Sierra Leone and macroeconomic policy implications. *Advances in Business-Related Scientific Journal*, 9(2). [ONLINE]. Available at: https://www.researchgate.net/publication/331179596

OECD. 2023. Aged 15-64: *All persons for South Africa.* Retrieved from FRED, Federal Reserve Bank of St. Louis. [ONLINE]. Available at: https://fred.stloiusfed.org/series/LRUN64TTZAQ15S

OECD. 2023. *IFFs South Africa*. [ONLINE]. Available at: available at: https://oe.cd/iffs-south-africa

OECD. 2023. *Tax revenue (indicator*). Doi: 10.1787/d98b8cf5-en

OECD. 2022. *Revenue Statistics in Africa*. [ONLINE]. Available at: https://www.oecd.org/tax/tax-policy/brochure-revenue-statistics-africa.pdf

Ogbonnaya, A.K., and Ogechuckwu, O.S. 2017. Impact of Illicit Financial Flow on Economic Growth and Development: Evidence from Nigeria. *International Journal of Innovation and Economic Development*, 3(4), pp. 19-33.

Ogunc, F., and Yilmaz, G. 2000. *Estimating the underground economy in Turkey.* The Central Bank of the Republic of Turkey, Research Department.

Olla, R. 2016. *A discussion of the tax burden on SMEs in South Africa*. North West University

Omar, F.A., and Hussein, A.M. 2020. The Stability of Money Demand Function: Evidence from South Africa. *International Journal of Economics and Financial Issues*, 10(5), pp. 16-22.

Opara, J., and Isobeye, G. 2021. Effects of non-normal error distribution on simple linear/non-parametric regression models. *International Journal of Statistics and Applied Mathematics*, 6(4), pp. 131-136.

Ozili, P.K. 2023. The acceptable R-squared in empirical modelling for social science research. *MPRA*, 115769.

Ouma, S., Njeru, J., Khainga, D., Kiriga, B., and Kamau, A. 2007. *Estimating the Size of the Underground Economy in Kenya.* Macroeconomics Division, Kenya Institute for Public Policy Research and Analysis.

PASA. 2017. *South Africa Future state, demands and pressures*. [ONLINE]. Available at: https://pasa.org.za/wp-content/uploads/2023/05/payments-...

Pauw, K., and Mncube, L. 2007. *Expanding the Social Security Net in South Africa: Opportunities, Challenges and Constraints*. Development Policy Research Unit, DPRU Working Paper, 7(127).

Petersen, M.M. 2011. *Informal employment in South Africa: A critical assessment of its definition and measurement*. University of the Western Cape, Department of Economics.

Philips, P. 1986. Understanding spurious regressions in Econometrics. *J. Econometrics*, 33, pp. 311-340.

Phillips, P.C.B. 1991. Optimal inference in integrated systems*. Econometrica*, 59(2), pp. 283-306.

Phillips, P.C.B. and Perron, P, 1988. Testing for a unit root in time series regressions. *Biometrics*, 75, pp. 335-346.

Pickhardt, M., and Sarda, J. 2012. *Size and causes of the underground economy in Spain: A correction of the record and new evidence from the MCDR approach*. Commerzbank Foundation and the Spanish Ministry of Education and Science, Project Nr. ECO2010-17113.

Piraee K., and Rajaee, H. 2015. The Causal Relationship between Unemployment Rate and Underground Economy in Iran. *International Journal of Economic Behaviour and Organization.* 3(2), pp. 23-28.

Plagerson, S., Ulriksen, M., Patel, L., and Hochfeld, T. 2015. *Social Policy Development in South Africa: A Shift towards a Redistributive Paradigm*? Centre for Social Development in Africa, University of Johannesburg

Ploberger, W., and Kramer, W. 1992. The CUSUM test with OLS residuals. *The Econometric Society*.

Portes, A., Castells, M., and Benton, L.A. 1989. The Informal Economy: Studies in Advanced and Less Developed Countries. *Baltimore: Johns Hopkins University Press*, p. 12.

PubMed. 2015. *Estimating the number of sex workers in South Africa: Rapid population size estimate.* [ONLINE]. Available at: https://pubmed.ncbi.nlm.nih,gov/25582921/

Pwc. 2019. Payments Study Tour Report 2019: *Lessons from Asia to inform South Africa's payments modernisation journey*. [ONLINE]. Available at: https://www.strategyand.pwc.com/a1/en/insightstudy-tour-report.html

Rambau, L.P. 2004. *The constitutional impact of social security in South Africa in the context of enforcement by the courts*. Rand Afrikaans University.

Rathore, S. 2020. *Functional forms of regression models*, Lecture notes, Introductory Econometrics: HC43, Delhi University.

Ratombo, N.E. 2019. *The effects of international trade on economic growth in South Africa (2000Q1 to 2017Q2) and econometric view*. University of Limpopo, Faculty of Management and Law.

Remeikiene, R., and Gaspareniene, L. 2021. The nexus between unemployment and the shadow economy in Lithuanian regions during the Covid-19 pandemic. *Journal of International Studies*, 24(3).

RNSF. 2017. *Extending Coverage: Social protection and the informal economy*. European Commission

Rogan, M., and Skinner, C. 2019. *In Defence of SA's Informal Economy.* [ONLINE]. Available at: www.news.uct.ac.za/article/-2019-09-12-in-defence-of-sas-infom...

Rogerson, C.M. 2000. Emerging from Apartheid's Shadow: South Africa's Informal Economy. *Journal of International Affairs, Spring*, Shadow Economies: Promoting Prosperity or Undermining Stability? 53(2), pp. 673-695.

Rosaldo, M., Tilly, C., and Evans, P. 2012. *A Conceptual Framework on Informal Work and Informal Worker Organizing.* EOIW

Rosser J.B. - Rosser M.V. - Ahmed E. 2003. Multiple Unofficial Economy Equilibria and Income Distribution Dynamics in Systemic Transition. *Journal of Post Keynesian Economics*, 25(3), pp. 425-447.

Roth, H.L. 1984. *Recent experience with M1 as a policy guide*. Federal Reserve Bank of Kansas City, economic review.

Sabra M.M., Eltalla A.H.A., Alfar A.R. 2015. The Shadow Economy in Palestine: Size & Causes. *International Journal of Economics & Finance*, 7 (3), pp. 98-108.

Said, S., and Dicky, D.A. 1984. Testing for unit roots in Autoregressive-moving Average models of unknown order. *Biometrika*, 71, 599-607. [ONLINE]. Available at: https://doi.org/10.1093/biomet/71.3.599

Sameti, M., and AlBooSoveilem, M. 2009. Impact Participation Rate and Unemployment Rate on Underground Economy in OECD Countries. *Quarterly Journal of Quantitative Economics, Summer*, 6(2), pp. 63-88.

Sanusi, K.A., and Meyer, D.F. 2018. Money Demand function in the South African economy: Evidence from ARDL and Structural breaks analysis. *International Journal of economics and finance studies*, 10 (1).

SApeople News. 2021. *SA's R90-Billion Taxi Industry Only Pays R5-Million in Tax*. [ONLINE]. Available at: https://www.sapeople.com/2021/05/11/sas-r90-billion-taxi-industry-only-pay-r5-million-in-tax/

SARS. 2020. *ILLICIT TRADE: The monster that eats into our socio-economic sovereignty*. [ONLINE]. Available at: https://www.sars.gov.za/wp-content/uploads/Docs/CandE/ILLICIT-TRADE-...

SARS. 2021. *Tax Statistics 2021*. [ONLINE]. Available at: https://www.sars.gov.za/about/sas-tax-and-customs-system/tax-statistics/

SARS. 2023. *Illicit trade and counterfeit goods. [PRESENTATION] by Patrick Moeng*. [ONLINE]. Available at: https://www.sars.gov.za/wp-content/uploads/Docs/Webinarsuppdocs/Werbi...

Sassen, S. 1994. The informal economy: Between new developments and old regulations. *The Yale Law Journal*, 103, pp. 2289-2304.

Saunders, S.G. 2005. Estimates of the informal economy in South Africa: Some macroeconomic policy implications. *South African Journal of Economic and Management Sciences*, 8(1).

Schirmer, S., and Visser, R. 2021. *What role can small and micro businesses play in achieving inclusive growth*? Centre for Development and Enterprise (CDE).

Schmitt, C. 2018. From Colonialism to International Aid: External Actors and Social Protection in the Global South. *Global Dynamics of Social Policy*, pp. 109-137. [ONLINE]. Available at: https://doi.org/10.1007/978-3-030-38200-1

Schneider, F, and Dell'Anno, R. 2003. The Shadow Economy of Italy and Other OECD Countries: What Do We Know? *Journal of Public Finance and Public Choice Economia Delle Scelte Pubbliche*, 21, pp. 97–120.

Schneider, F. 2000. *Informal and underground economy*. Forthcoming in Orley Ashenfelter: International Encyclopedia of Social and Behavioral Science. Bd. 12 Economics, Amsterdam: Elsevier Science Publishing Company.

Schneider, F. 2005. Shadow economies around the world: What do we know? *European Journal of Political Economy*, 21, pp. 598-642.

Schneider, F. 2006. Shadow Economies and Corruption All Over the World: What Do We Really Know? *Discussion paper series, IZA DP*, 2315.

Schneider, F., and Buehn, A. 2013. *Estimating the size of the shadow economy: Methods, problems and open questions*. Working Paper, No. 1320, Johannes Kepler University of Linz, Department of Economics, Linz, pp.11-40.

Schneider, F., and Enste, D. 2000, *Hiding in the Shadows: The growth of the underground economy*. IMF, Economic Issues 30.

Schneider, F., and Enste, D.H. 2000. *Shadow Economies around the World – Size and Causes*. Cambridge University Press.

Schneider, F., and Enste, D.H. 2002. *The shadow economy: An international survey.* Cambridge University Press.

Seitz, F., Reimers H.E., and Schneider, F. 2018. *Cash in circulation and the shadow economy: an empirical investigation for Euro area countries and beyond*. CESIfo working paper, 7143.

SERI. 2018. *Informal Settlements and Human Rights in South Africa*. Submission to the United Nations Special Rapporteur on adequate housing as a component of the right to an adequate standard of living.

Sethuraman S.V., 1976. The Urban Informal Sector: Concept, Measurement and Policy. *International Labor Review*, 114, 1, pp. 69-81.

Sevi, S. 2021. *A guide to interpreting regression tables*. [ONLINE]. Available at: https://semrasevi342192471.files.wordpress.com

Sharp, G.D. 2010. Lag length selection for Vector Error Correction Models. *CORE*.

Shima, I. 2004. *The shadow economy in Norway: Demand for currency approach.* EconStor. [ONLINE]. Available at: https://www.researchgate.net/publication/5097239_The_shadow_economy_in_Norway_Demand_for_currency_approach

Signe, L., Sow, M., and Madden, P. 2020. *Illicit financial flows in Africa: Drivers, destinations, and policy options.* African Growth Initiative (AGI), policy brief.

Skinner, S. 2007. *Inclusive planning for the informal economy: Lessons from Durban, South Africa.* ILO Interregional Symposium on the IE, 27(9).

Smith, P. 1994. Assessing the size of the underground economy: The Statistics Canada Perspective. *Canadian Economic Observer*, 7(5).

Sorensen, B.E. 2019. *Cointegration*. *Economics 266, Spring*.

Spanos, A. 1995. On normality and the linear regression model. *Econometric Reviews*, 14(2), pp. 195-203.

Srakar, A., Vecco, M., Verbic, M., Garibay, M.G., and Sambt, J. 2008. *MIMIC modelling with instrumental variables: A 2SLS-MIMIC approach*. Institute for Economic Research (IER). [ONLINE]. AVAILABLE AT: https://arxiv.org/abs/2008.02148

Ssekuma, R. 2011. *A study of cointegration models with applications*. University of South Africa.

Stats SA. 2024. *Quarterly Labour Force Survey - Q4:2023*. [ONLINE]. Available at: https://www.statssa.gov.za

Stats SA. 2021. *Gender Series Volume VII: Informal Economy 2013–2019*. [ONLINE]. Available at: https://www.statssa.gov.za/publications/Report-03-10-23/Report-03-10-232019.pdf

Steenekamp, T.J. 2008. Tax performance in South Africa: a comparative study. *Southern African Business Review*, 11(3).

Steenkamp, T.J. 2012. Taxing the rich at higher rates in South Africa? *Southern African Business Review*, 16 (3).

Stephen, A. 2006. Inflation and the underground economy. *MPRA.* [ONLINE]. Available at: https://mpra.ub.uni-muenchen.de/id/eprint/1760

Stigler, M. 2020. *Threshold cointegration: overview and implementation in R*. Handbook of Statistics, 42, pp.229-264, Elsevier, www.

Strauss, I., Isaacs, G., Rosenberg, J., and Passoni, P. 2020. *Rapid Country Assessment: South Africa – The impact of a Covid-19 shock to South Africa's economy and labour market*. ILO, Geneva.

Tan, Y.L., Habibullah, M.S., and Yiew, T.H. 2016. Shadow economy in Malaysia: Evidence from an ARDL Model. *Int. Journal of Economics and Management* 10(2): pp. 261 – 277.

Tanzi, V. 1980. Underground economy and tax evasion in the United States: estimates and implication. *Banca Nazionale Del Lavoro Quarterly Review*, 32, pp.27-53.

Tanzi, V. 1983. *The Underground economy in the United States: annual estimates, 1930-80.* IMF Staff papers, 30(2). [ONLINE]. Available at: https://www.elibrary.imf.org/view/journals/024/1983/002/article-A002-en.xml

Tanzi, V. 1999. Uses and Abuses of Estimates of the Underground Economy. *The Economic Journal*, 109(456), pp. 338-347.

Thadewald, T., and Buning, H. 2007. Jarque-Bera test and its competitors for testing normality- a power comparison*. Journal of Applied Statistics, Taylor & Francis Journals*, 34(1), pp. 87-105.

Thomas, J.J. 1992. *The informal financial sector: How does it operate and who are the customers?* Overseas Development Institute (ODI), 61.

Timeslive. 2020. *Cigarettes 'exported' from SA during lockdown never got out: report*. [ONLINE]. Available at: https:www.timeslive.co.za/amp/news/south-africa…

Tokman, V. 1978. An exploration into the nature of informal-formal sector relationships. *World Development*, 6, pp. 1065-1075.

Trabelssi, K. 2011. *Current State of the Informal Economy in Tunisia as seen through its stakeholders: Facts and Alternatives*. Tunisian General Labor Union.

TRACIT. 2019. *Illicit trade in South Africa: Challenges and solutions.* Transnational Alliance to Combat Illicit Trade, One Penn Plaza, New York.

Tran, T.K.P. 2021. Unemployment and Shadow Economy in ASEAN Countries. *Journal of Asian Finance, Economics and Business*, 8 (11), pp. 0041-0046.

TRANCIT. 2023. *Organized crime, corruption and illicit trade: spotlight on South Africa.* [ONLINE]. Available at: https://www.tracit.org/uploads/1/0/2/2/102238

Traore, F., and Diop, I. 2022. Unit Root Tests: Common Pitfalls and Best Practices. *AGRODEP*.

Trebicka, B. 2014. The size of the underground economy in Albania. *Academic Journal of Interdisciplinary Studies*, 3(4), pp. 503-508.

Triegaardt, J. 1992. Unemployment in South Africa: Dilemmas and challenges for the 1990s. *Academic Journal of Interdisciplinary Studies*, 3(4).

Tsenkwo, J.B.M. 2013. The Underground Economy and GDP Estimation in Developing Countries. *LWATI: A Journal of Contemporary Research*, 10(2), 1-12.

Tumturk, O. 2017. Stability of Money Demand Function in Turkey. *Business and Economics Research Journal*, 8, pp. 35-48.

Turner, P. 2009. Power properties of the CUSUM and CUSUMSQ tests for parameter instability. *Applied Economics Letters*, 17(11), pp. 1049-1053.

UNECA-UNCTAD. 2021. *South African perspective on Financial flows.* [ONLINE]. Available at: https://unctad.org/system/files/non-official-document/20210616-...

Us, V. 2004. Inflation dynamics and monetary policy strategy: Some aspects for the Turkish economy. *Journal of Policy Modeling*, 26, pp. 1003–1013.

Valentini, E. 2007. *Inequality and Underground Economy: A Not so Easy Relationship*. QUADERNI DI RICERCA, 283.

Van de Berg, S. 1997. South African social security under apartheid and beyond. *Development Southern Africa*, 14:4, pp. 481-503. [ONLINE]. Available at: https://doi.org/10.1080/03768359708439982

Van de Zee, K., Van Walbeek, C., and Magadla, S. 2019. *Illicit/cheap cigarettes in South Africa*. Trends in Organized Crime (2020) 23, pp. 242–262.

Van Walbeek C. 2020. *Case Studies in Illicit Tobacco Trade: South Africa.* Tobacconomics Fact Sheet. Chicago, IL: Tobacconomics, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago.

Van Zyl, J.S., Human, J.J., and Swanepoel, D.J. 2002. *New Economics 2000: Grade 12 Learner's book*. NASOU.

Van Zyl, L. 2003. South Africa's experience of regional currency areas and the use of foreign currencies. *BIS Papers*, 17, pp. 134-139.

Verick, S. 2020. *Covid-19's impact on the Labour Market of Middle income Countries: The case of South Africa*. ILO, Geneva.

Visser, W. 2004. *Shifting RDP into GEAR: The ANC Government Dilemma in providing an equitable system of social security for the "New" South Africa*. Development of Social Security Systems, Akademische Verlaganstalt, Wien, pp.105-124.

Vos, F., Vos, J., Dlanjwa, N.N., Chauke, T., and Fakazi, J. 2018. *Promoting financial inclusion of informal businesses through effective delivery of financial education and consumer protection in South Africa*. BANK SETA.

Vuba, S. 2019. *SMMEs in the South African economy*. Mail & Guadian.

Webster, E., Benya, A., Dilata, X., Joynt, K., Ngoepe, K., and Tsoeu, M. 2008. *Making visible the invisible: Confronting South Africa's Decent Work Deficit.* Sociology of Work Unit, University of the Witwatersrand, Johannesburg.

WEF. 2022. *The Global Risks Report*. [ONLINE]. Available at: https://www3.weforum.org/docs/WEF_The_Glob

Westhuizen, C. 2016. *South Africa: Economic growth, poverty and inequality.* Development Policy Research Unit at the University of Cape Town in South Africa (DPRU).

Williams, C. C., and Windebank, J. 2001. *The Growth of Urban Informal Economies*. Paddison and Ronan ed. Handbook of Urban Studies, Sage Publications: London.

Williams, R. 2015. *Serial Correlation [Optional; Very brief overview].* Notes drawn from Pindyck and Rubinfeld's Econometric Models and Economic Forecasts (1991 edition).

Wills, G. 2009. South Africa's Informal Economy: *A Statistical Profile. Women in Informal Employment: Globalizing and Organizing (WIEGO).* Urban Policies Research Report, 7.

Wittenberg, M. 2017. Wages and wage inequality in South Africa 1994–2011: Part 2 – Inequality measurement and trends. *South African Journal of Economics*, 85(2), pp. 298-318.

Wooldridge, J.M. 2013. *Introductory Econometrics, A modern approach*. 5th ed. Cengage, Boston. Chapter 9, pp. 306-308.

World Bank, 2019. *Poverty and Equity data portal*. [ONLINE]. Available at: https://povertydata.worldbank.org

Yap, B.W., and Sim, C.H. 2011. Comparisons of various types of normality tests. *Taylor and Francis Group, Journal of Statistical Computation and Simulation*, 81(12), pp. 2141-2155.

Yasmin, B., and Rauf, H. 2003. Measuring the underground economy and its impact on the economy of Pakistan. *The Labour Journal of Economics*, 9 (2).

Zaman, A. 2017. Lessons in Econometric Methodology: The Axiom of Correct Specification. *International Econometric Review (IER)*, ISSN 1308-8815, *Econometric Research Association (ERA)*, Ankara, 9(2), pp. 50-68. [ONLINE]. Available at: https://doi.org/10.33818/ier.337657

Zaman, G., and Goschin, Z. 2015. Shadow economy and economic growth in Romania. Cons and Pros. *Procedia Economics and Finance*, 22(2015), 80-87. [ONLINE]. Available at: https://creativecommons.org.licenses/by-nc-nd/4.0/

Zeileis, A., Leisch, F., Kleiber, C., and Hornik, K. 2005. Monitoring structural change in dynamic econometric models. *Journal of Applied Econometrics*, 20(1), pp. 99-121.

Zellner, A. 1970. Estimation of regression relationships containing unobservable independent variables. *International Economic Review,* 11(3), pp. 441–454.

Zhong, X. 2015. *Essays on unit root testing in time series*. Doctoral Dissertations. 2463. [ONLINE]. Available at: https://scholarsmine.mst.edu/doctoral_dissertations/2463

Zhou, S., and Tewari, D.D. 2019. Shadow financial services and firm performance in South Africa. *Cogent Economics & Finance*, 7, 1603654. [ONLINE]. Available at: https://doi.org/10.1080/23322039.2019.1603654

APPENDICES

Appendix A: DATA

Date	M1	LM1	GDP	LGDP	Inflation	Unemployment	TaxB
2000/09/30	776483	5.890132	723789	5.859612	6.2	23.3	0.11
2000/12/31	804934	5.90576	728444	5.862396	6.7	23.3	0.12
2001/03/31	822042	5.914894	699015	5.844486	6.3	24.6	0.127
2001/06/30	851743	5.930309	726480	5.861224	6.3	24.6	0.121
2001/09/30	884550	5.946722	734714	5.866118	6.2	26.2	0.12
2001/12/31	920062	5.963817	742840	5.870895	5.9	26.2	0.139
2002/03/31	1001114	6.000484	723732	5.859578	7.1	27.7	0.109
2002/06/30	1037016	6.015785	753912	5.877321	7.6	27.7	0.117
2002/09/30	1047625	6.020206	760843	5.881295	7.7	26.6	0.122
2002/12/31	1057429	6.024251	771986	5.887609	9.2	26.6	0.134
2003/03/31	1045126	6.019169	746942	5.873287	9.4	29.3	0.1
2003/06/30	1019579	6.008421	778102	5.891037	9.1	29.3	0.121
2003/09/30	1038172	6.016269	783700	5.89415	7.4	28.4	0.114
2003/12/31	1121144	6.049661	790510	5.897907	6.9	28.4	0.118

2004/03/31	1209949	6.082767	774936	5.889266	4.7	26.4	0.102
2004/06/30	1187691	6.074703	807131	5.906944	4.6	26.4	0.112
2004/09/30	1219654	6.086237	823047	5.915425	4.2	23	0.111
2004/12/31	1256716	6.099237	835297	5.921841	3.8	23	0.121
2005/03/31	1285074	6.108928	817147	5.9123	3.3	24.2	0.118
2005/06/30	1360016	6.133544	849012	5.928914	3.2	24.2	0.124
2005/09/30	1453574	6.162437	867946	5.938493	3.344683	23.5	0.117
2005/12/31	1492256	6.173843	877305	5.943151	3.6	23.5	0.126
2006/03/31	1571684	6.196365	858817	5.933901	4.2	23.1	0.126
2006/06/30	1644616	6.216065	890003	5.949391	4.1	23.1	0.13
2006/09/30	1732366	6.23864	914091	5.960989	4.8	22.1	0.129
2006/12/31	1794727	6.253998	939667	5.972974	4.9	22.1	0.143
2007/03/31	1866919	6.271125	914059	5.960974	5.291398	23.6	0.135
2007/06/30	1972628	6.295045	938671	5.972513	5.508144	23.6	0.135
2007/09/30	2085260	6.31916	959477	5.982035	6.036847	21	0.131
2007/12/31	2168786	6.336217	983487	5.992769	6.21756	21	0.146
2008/03/31	2285370	6.358957	949047	5.977288	8.229547	23.2	0.139
2008/06/30	2214066	6.345191	982491	5.992329	9.539294	22.6	0.134

2008/09/30	2231598	6.348616	990597	5.995897	10.62939	22.8	0.119
2008/12/31	2279216	6.357785	994682	5.997684	10.98369	21.5	0.149
2009/03/31	2184515	6.339355	938575	5.972469	8.337043	23	0.167
2009/06/30	2284735	6.358836	957117	5.980965	8.668897	23.2	0.119
2009/09/30	2304271	6.362534	971559	5.987469	8.205039	24.5	0.125
2009/12/31	2362923	6.37345	989320	5.995337	8.126175	24.1	0.127
2010/03/31	2408514	6.381749	961966	5.98316	6.52787	25.1	0.134
2010/06/30	2455205	6.390088	988367	5.994918	6.314365	25.1	0.112
2010/09/30	2511778	6.399981	1003788	6.001642	5.731496	25.4	0.115
2010/12/31	2586911	6.412781	1019682	6.008465	5.354837	23.9	0.142
2011/03/31	2607906	6.416292	994364	5.997545	5.259669	24.8	0.123
2011/06/30	2652505	6.423656	1019292	6.008299	5.300977	25.6	0.123
2011/09/30	2696694	6.430832	1033943	6.014497	5.47063	25	0.123
2011/12/31	2808537	6.44848	1052115	6.022063	5.513772	23.8	0.133
2012/03/31	2857735	6.456022	1018377	6.007909	6.115987	25	0.127
2012/06/30	2843821	6.453902	1048866	6.02072	6.101268	24.8	0.133
2012/09/30	2986359	6.475142	1057278	6.024189	5.761233	25.2	0.124
2012/12/31	3070261	6.487175	1073432	6.030775	5.918519	24.5	0.125

2013/03/31	3097769	6.491049	1038973	6.016604	5.988399	25	0.124
2013/06/30	3227439	6.508858	1073797	6.030922	6.043598	25.3	0.129
2013/09/30	3344410	6.52432	1083914	6.034995	6	24.5	0.128
2013/12/31	3390586	6.530275	1105607	6.043601	6.019357	24.1	0.133
2014/03/31	3461249	6.539233	1058057	6.024509	6.1	25.2	0.128
2014/06/30	3573389	6.55308	1088318	6.036756	6.1	25.5	0.132
2014/09/30	3723148	6.57091	1095636	6.039666	6.2	25.4	0.131
2014/12/31	3766445	6.575932	1121107	6.049647	6.1	24.3	0.138
2015/03/31	3799458	6.579722	1083841	6.034966	5.364483	26.4	0.134
2015/06/30	3919388	6.593218	1099417	6.041162	5.585556	25	0.134
2015/09/30	4040774	6.606465	1107572	6.044372	5.536771	25.5	0.137
2015/12/31	4229155	6.626254	1129962	6.053064	5.604394	24.5	0.135
2016/03/31	4351655	6.638654	1083941	6.035006	6.178398	26.7	0.135
2016/06/30	4323528	6.635838	1113437	6.046666	6.343389	26.6	0.134
2016/09/30	4386415	6.64211	1117489	6.048243	6.240764	27.1	0.137
2016/12/31	4735304	6.675348	1135304	6.055112	6.007174	26.5	0.138
2017/03/31	4785562	6.679933	1091114	6.03787	6.166875	27.7	0.143
2017/06/30	4766532	6.678203	1125688	6.051418	5.89603	27.7	0.135

2017/09/30	4917970	6.691786	1132522	6.054047	5.74424	27.7	0.137
2017/12/31	5048064	6.703125	1152378	6.061595	5.682143	26.7	0.141
2018/03/31	5002523	6.699189	1105005	6.043364	5.249672	26.7	0.143
2018/06/30	4953693	6.694929	1134992	6.054993	5.229028	27.2	0.139
2018/09/30	5176619	6.714046	1156399	6.063108	5.297009	27.5	0.14
2018/12/31	5262892	6.721224	1173838	6.069608	5.137816	27.1	0.134
2019/03/31	5234678	6.71889	1111361	6.045855	4.844123	27.6	0.137
2019/06/30	5337153	6.72731	1146266	6.059285	4.755927	29	0.142
2019/09/30	5454509	6.736756	1158118	6.063753	4.648741	29.1	0.139
2019/12/31	5504115	6.740687	1168356	6.067575	4.535939	29.1	0.135
2020/03/31	5725814	6.757837	1118596	6.048673	4.424567	30.1	0.131
2020/06/30	6184977	6.791338	955753	5.980346	3.903625	23.3	0.139
2020/09/30	6327438	6.801228	1091730	6.038115	3.565876	30.8	0.12
2020/12/31	6559869	6.816895	1127276	6.05203	3.690915	32.5	0.13
2021/03/31	6634743	6.821824	1091929	6.038194	3.890934	32.6	0.127
2021/06/30	6613515	6.820432	1141655	6.057535	4.19234	34.4	0.158
2021/09/30	6780536	6.831264	1124280	6.050874	4.204552	34.9	0.143
2021/12/31	6929386	6.840695	1146428	6.059347	4.557373	35.3	0.146

2022/03/31	7026940	6.846766	1122431	6.05016	5.14038	34.5	0.133
2022/06/30	7053101	6.84838	1145027	6.058816	5.991311	33.9	0.157
2022/09/30	7258574	6.860851	1171794	6.068851	6.520414	32.9	0.144
2022/12/31	7338365	6.865599	1157032	6.063345	6.643814	32.7	0.147

Source: Author's compilation, data from SARB

Appendix B: UNIT ROOTS

Appendix B1: Augmented Dickey-Fuller Unit Roots Test

DEMAND FOR CURRENCY (M1)

- ***At Level***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		9.760780	1.0000
Test critical values:	1% level	-2.591204	
	5% level	-1.944487	
	10% level	-1.614367	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.986147	0.2924
Test critical values:	1% level	-3.505595	
	5% level	-2.894332	
	10% level	-2.584325	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.734415	0.7277
Test critical values:	1% level	-4.064453	
	5% level	-3.461094	
	10% level	-3.156776	

- ***At First Difference***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.199837	0.0276
Test critical values:	1% level	-2.592129	
	5% level	-1.944619	
	10% level	-1.614288	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.908768	0.0000
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.104102	0.0000
Test critical values:	1% level	-4.065702	
	5% level	-3.461686	
	10% level	-3.157121	

ECONOMIC GROWTH (GDP)

- ***At Level***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.906656	1.0000
Test critical values:	1% level	-2.592129	
	5% level	-1.944619	
	10% level	-1.614288	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.858225	0.0546
Test critical values:	1% level	-3.508326	
	5% level	-2.895512	
	10% level	-2.584952	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.858225	0.0546
Test critical values:	1% level	-3.508326	
	5% level	-2.895512	
	10% level	-2.584952	

- ***At First Difference***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.858225	0.0546
Test critical values:	1% level	-3.508326	
	5% level	-2.895512	
	10% level	-2.584952	

(ii) INTERCEPT

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-10.14442	0.0000
Test critical values:	1% level	-3.508326	
	5% level	-2.895512	
	10% level	-2.584952	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.82799	0.0000
Test critical values:	1% level	-4.068290	
	5% level	-3.462912	
	10% level	-3.157836	

TAX BURDEN

- ***At Level***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.857150	0.8933
Test critical values:	1% level	-2.592129	
	5% level	-1.944619	
	10% level	-1.614288	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.225354	0.6604
Test critical values:	1% level	-3.508326	
	5% level	-2.895512	
	10% level	-2.584952	

(iii) TREND AND INTERCEPT

Augmented Dickey-Fuller test statistic		-2.205175	0.4805
Test critical values:	1% level	-4.068290	
	5% level	-3.462912	
	10% level	-3.157836	

- ***At First Difference***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.83400	0.0000
Test critical values:	1% level	-2.592129	
	5% level	-1.944619	
	10% level	-1.614288	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.85922	0.0001
Test critical values:	1% level	-3.508326	
	5% level	-2.895512	
	10% level	-2.584952	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.79413	0.0000
Test critical values:	1% level	-4.068290	
	5% level	-3.462912	
	10% level	-3.157836	

UNEMPLOYMENT RATE

- ***At Level***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.776010	0.8792
Test critical values:	1% level	-2.591505	
	5% level	-1.944530	
	10% level	-1.614341	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.097039	0.7141
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.805885	0.6936
Test critical values:	1% level	-4.065702	
	5% level	-3.461686	
	10% level	-3.157121	

- ***At First Difference***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.69480	0.0000
Test critical values:	1% level	-2.591505	
	5% level	-1.944530	
	10% level	-1.614341	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.71522	0.0001
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.68404	0.0000
Test critical values:	1% level	-4.065702	
	5% level	-3.461686	
	10% level	-3.157121	

INFLATION RATE

- ***At Level***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.741685	0.3924
Test critical values:	1% level	-2.591813	
	5% level	-1.944574	
	10% level	-1.614315	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.495075	0.0104
Test critical values:	1% level	-3.507394	
	5% level	-2.895109	
	10% level	-2.584738	

(iii) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.643453	0.0319
Test critical values:	1% level	-4.066981	
	5% level	-3.462292	

	10% level	-3.157475

- ***At First Difference***

(i) NONE

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.320490	0.0000
Test critical values:	1% level	-2.591813	
	5% level	-1.944574	
	10% level	-1.614315	

(ii) INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.294774	0.0008
Test critical values:	1% level	-3.507394	
	5% level	-2.895109	
	10% level	-2.584738	

(iv) TREND AND INTERCEPT

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.276323	0.0054
Test critical values:	1% level	-4.066981	
	5% level	-3.462292	
	10% level	-3.157475	

Appendix B2: Phillips-Perron Unit Roots Test

DEMAND FOR CURRENCY (M1)

- ***At Level***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		8.698228	1.0000
Test critical values:	1% level	-2.591204	
	5% level	-1.944487	
	10% level	-1.614367	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.923970	0.3200
Test critical values:	1% level	-3.505595	

	5% level	-2.894332
	10% level	-2.584325

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.810363	0.6916
Test critical values:	1% level	-4.064453	
	5% level	-3.461094	
	10% level	-3.156776	

- ***At First Difference***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.771608	0.0000
Test critical values:	1% level	-2.591505	
	5% level	-1.944530	
	10% level	-1.614341	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.863365	0.0000
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.116655	0.0000
Test critical values:	1% level	-4.065702	
	5% level	-3.461686	
	10% level	-3.157121	

ECONOMIC GROWTH (GDP)

- ***At Level***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		2.832315	0.9988
Test critical values:	1% level	-2.591204	
	5% level	-1.944487	
	10% level	-1.614367	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.929504	0.3175
Test critical values:	1% level	-3.505595	
	5% level	-2.894332	
	10% level	-2.584325	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.899024	0.1679
Test critical values:	1% level	-4.064453	
	5% level	-3.461094	
	10% level	-3.156776	

- ***At First Difference***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-12.46776	0.0000
Test critical values:	1% level	-2.591505	
	5% level	-1.944530	
	10% level	-1.614341	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-15.56537	0.0001
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-25.11655	0.0001
Test critical values:	1% level	-4.065702	
	5% level	-3.461686	
	10% level	-3.157121	

TAX BURDEN

- ***At Level***

(i) NONE

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	0.793525	0.8824

Test critical values:	1% level	-2.591204
	5% level	-1.944487
	10% level	-1.614367

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.770946	0.0000
Test critical values:	1% level	-3.505595	
	5% level	-2.894332	
	10% level	-2.584325	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.863405	0.0000
Test critical values:	1% level	-4.064453	
	5% level	-3.461094	
	10% level	-3.156776	

- ***At First Difference***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-32.02459	0.0000
Test critical values:	1% level	-2.591505	
	5% level	-1.944530	
	10% level	-1.614341	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-34.71314	0.0001
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-34.39939	0.0001
Test critical values:	1% level	-4.065702	
	5% level	-3.461686	
	10% level	-3.157121	

UNEMPLOYMENT RATE

- At Level

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.897235	0.8999
Test critical values:	1% level	-2.591204	
	5% level	-1.944487	
	10% level	-1.614367	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.499180	0.5295
Test critical values:	1% level	-3.505595	
	5% level	-2.894332	
	10% level	-2.584325	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.307535	0.4253
Test critical values:	1% level	-4.064453	
	5% level	-3.461094	
	10% level	-3.156776	

- ***At First Difference***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-13.05106	0.0000
Test critical values:	1% level	-2.591505	
	5% level	-1.944530	
	10% level	-1.614341	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-13.13055	0.0001
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-13.19180	0.0000
Test critical values:	1% level	-4.065702	

	5% level	-3.461686
	10% level	-3.157121

INFLATION RATE

- ***At Level***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.604988	0.4526
Test critical values:	1% level	-2.591204	
	5% level	-1.944487	
	10% level	-1.614367	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.599366	0.0969
Test critical values:	1% level	-3.505595	
	5% level	-2.894332	
	10% level	-2.584325	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.668982	0.2519
Test critical values:	1% level	-4.064453	
	5% level	-3.461094	
	10% level	-3.156776	

- ***At First Difference***

(i) NONE

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.314653	0.0000
Test critical values:	1% level	-2.591505	
	5% level	-1.944530	
	10% level	-1.614341	

(ii) INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.275908	0.0000
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

(iii) TREND AND INTERCEPT

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.250749	0.0000
Test critical values:	1% level	-4.065702	
	5% level	-3.461686	
	10% level	-3.157121	

Appendix C: COINTEGRATION

Sample (adjusted): 2002Q1 2022Q4
Included observations: 84 after adjustments
Trend assumption: Linear deterministic trend
Series: LM1 LGDP INFLATION TAXB UNEMPLOYMENT
Lags interval (in first differences): 1 to 5

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.575497	138.7029	69.81889	0.0000
At most 1 *	0.290546	66.72867	47.85613	0.0003
At most 2 *	0.271793	37.89490	29.79707	0.0047
At most 3	0.086176	11.25266	15.49471	0.1964
At most 4	0.042896	3.682823	3.841466	0.0550

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.575497	71.97421	33.87687	0.0000
At most 1 *	0.290546	28.83377	27.58434	0.0344
At most 2 *	0.271793	26.64224	21.13162	0.0076
At most 3	0.086176	7.569841	14.26460	0.4241
At most 4	0.042896	3.682823	3.841466	0.0550

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LM1	LGDP	INFLATION	TAXB	UNEMPLOYMENT
-46.58345	143.0583	-0.106134	263.8409	1.180563
11.43665	-61.51189	-0.021622	2.090383	-0.579647
20.04742	-48.52499	1.862968	-97.61454	-0.020945
-2.170794	5.489018	-0.124670	156.5306	-0.234543
25.16111	-106.8337	-0.053607	109.4476	-0.341766

Unrestricted Adjustment Coefficients (alpha):

D(LM1)	0.001709	-4.56E-05	-0.003812	-6.34E-05	-0.000167
D(LGDP)	-0.000390	0.001042	0.000938	-0.001639	0.001392
D(INFLATION)	0.134308	-0.043503	-0.008163	0.086072	0.061665
D(TAXB)	-0.004186	-0.001966	1.86E-05	-0.000588	2.70E-05
D(UNEMPLOYMENT)	-0.316782	0.420315	0.053248	0.010110	0.116552

1 Cointegrating Equation(s): Log-likelihood 753.7287

Normalized cointegrating coefficients (standard error in parentheses)

LM1	LGDP	INFLATION	TAXB	UNEMPLOYMENT
1.000000	-3.071011	0.002278	-5.663834	-0.025343
	(0.09642)	(0.00423)	(0.66374)	(0.00160)

Adjustment coefficients (standard error in parentheses)

D(LM1)	-0.079611
	(0.04630)
D(LGDP)	0.018159
	(0.05635)
D(INFLATION)	-6.256547
	(2.72241)
D(TAXB)	0.195014
	(0.03394)
D(UNEMPLOYMENT)	14.75678
	(6.20202)

2 Cointegrating Equation(s): Log-likelihood 768.1455

Normalized cointegrating coefficients (standard error in parentheses)

LM1	LGDP	INFLATION	TAXB	UNEMPLOYMENT
1.000000	0.000000	0.007827	-13.44506	0.008382
		(0.03636)	(4.80435)	(0.01521)
0.000000	1.000000	0.001807	-2.533767	0.010982
		(0.01163)	(1.53628)	(0.00486)

Adjustment coefficients (standard error in parentheses)

D(LM1)	-0.080133	0.247295
	(0.04767)	(0.15477)
D(LGDP)	0.030073	-0.119846
	(0.05765)	(0.18715)
D(INFLATION)	-6.754081	21.88991
	(2.78959)	(9.05630)
D(TAXB)	0.172524	-0.477927
	(0.03264)	(0.10597)
D(UNEMPLOYMENT)	19.56378	-71.17262
	(5.80107)	(18.8329)

3 Cointegrating Equation(s): Log-likelihood 781.4667

Normalized cointegrating coefficients (standard error in parentheses)

LM1	LGDP	INFLATION	TAXB	UNEMPLOYMENT
1.000000	0.000000	0.000000	-13.65875	0.006882
			(4.68750)	(0.01235)
0.000000	1.000000	0.000000	-2.583095	0.010635
			(1.48942)	(0.00392)
0.000000	0.000000	1.000000	27.30241	0.191725
			(25.6310)	(0.06753)

Adjustment coefficients (standard error in parentheses)

D(LM1)	-0.156545	0.432250	-0.007281
	(0.04451)	(0.13964)	(0.00160)

D(LGDP)	0.048886	-0.165383	0.001767
	(0.06214)	(0.19497)	(0.00223)
D(INFLATION)	-6.917720	22.28600	-0.028521
	(3.02291)	(9.48417)	(0.10851)
D(TAXB)	0.172896	-0.478829	0.000521
	(0.03538)	(0.11100)	(0.00127)
D(UNEMPLOYMENT)	20.63126	-73.75647	0.123732
	(6.27665)	(19.6925)	(0.22530)

4 Cointegrating Equation(s): Log-likelihood 785.2516

Normalized cointegrating coefficients (standard error in parentheses)

LM1	LGDP	INFLATION	TAXB	UNEMPLOYMENT
1.000000	0.000000	0.000000	0.000000	-0.017141
				(0.02330)
0.000000	1.000000	0.000000	0.000000	0.006092
				(0.00541)
0.000000	0.000000	1.000000	0.000000	0.239745
				(0.07684)
0.000000	0.000000	0.000000	1.000000	-0.001759
				(0.00145)

Adjustment coefficients (standard error in parentheses)

D(LM1)	-0.156407	0.431902	-0.007273	0.812947
	(0.04454)	(0.13971)	(0.00160)	(0.27561)
D(LGDP)	0.052443	-0.174378	0.001971	-0.448783
	(0.06116)	(0.19184)	(0.00220)	(0.37844)
D(INFLATION)	-7.104564	22.75845	-0.039251	49.61477
	(2.96682)	(9.30535)	(0.10664)	(18.3566)
D(TAXB)	0.174173	-0.482056	0.000595	-1.202472
	(0.03518)	(0.11033)	(0.00126)	(0.21765)
D(UNEMPLOYMENT)	20.60931	-73.70097	0.122472	-86.31657
	(6.28173)	(19.7025)	(0.22579)	(38.8668)

Appendix D: Vector Error Correction Model (VECM)

Sample (adjusted): 2002Q1 2022Q4
Included observations: 84 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LM1(-1)	1.000000
LGDP(-1)	-3.071011
	(0.09642)
	[-31.8502]
TAXB(-1)	-5.663834
	(0.66374)
	[-8.53317]
UNEMPLOYMENT(-1)	-0.025343
	(0.00160)

	[-15.8350]				
INFLATION(-1)	0.002278				
	(0.00423)				
	[0.53880]				
C	13.36005				

Error Correction:	D(LM1)	D(LGDP)	D(TAXB)	D(UNEMPLOYMENT)	D(INFLATION)
CointEq1	-0.079611	0.018159	0.195014	14.75678	-6.256547
	(0.04630)	(0.05635)	(0.03394)	(6.20202)	(2.72241)
	[-1.71947]	[0.32224]	[5.74508]	[2.37935]	[-2.29817]
D(LM1(-1))	0.457083	0.061397	-0.124445	-24.10214	10.60466
	(0.13381)	(0.16286)	(0.09810)	(17.9243)	(7.86796)
	[3.41590]	[0.37699]	[-1.26853]	[-1.34466]	[1.34783]
D(LM1(-2))	-0.213621	0.078053	-0.247609	-2.440474	18.36121
	(0.14187)	(0.17267)	(0.10401)	(19.0033)	(8.34159)
	[-1.50580]	[0.45205]	[-2.38068]	[-0.12842]	[2.20116]
D(LM1(-3))	0.553384	0.284498	-0.193235	-10.00362	30.99427
	(0.14564)	(0.17726)	(0.10678)	(19.5095)	(8.56380)
	[3.79956]	[1.60493]	[-1.80969]	[-0.51276]	[3.61922]
D(LM1(-4))	-0.027507	-0.061573	-0.069377	-3.987623	11.56216
	(0.15626)	(0.19019)	(0.11456)	(20.9318)	(9.18813)
	[-0.17603]	[-0.32375]	[-0.60558]	[-0.19051]	[1.25838]
D(LM1(-5))	0.164969	0.203259	-0.097684	2.368851	1.347723
	(0.14841)	(0.18063)	(0.10881)	(19.8800)	(8.72641)
	[1.11158]	[1.12527]	[-0.89778]	[0.11916]	[0.15444]
D(LGDP(-1))	-0.407805	-0.429313	0.915297	1.921146	-28.19375
	(0.22158)	(0.26968)	(0.16245)	(29.6809)	(13.0286)
	[-1.84047]	[-1.59192]	[5.63442]	[0.06473]	[-2.16400]
D(LGDP(-2))	-0.237900	-0.322967	0.830052	-17.58720	-22.93224
	(0.18842)	(0.22933)	(0.13814)	(25.2394)	(11.0789)
	[-1.26261]	[-1.40833]	[6.00884]	[-0.69682]	[-2.06989]
D(LGDP(-3))	-0.125755	-0.196589	0.684894	-12.42248	-27.02637
	(0.17536)	(0.21344)	(0.12857)	(23.4905)	(10.3113)
	[-0.71711]	[-0.92107]	[5.32715]	[-0.52883]	[-2.62105]
D(LGDP(-4))	0.039442	0.426000	0.434939	-47.63530	-20.07950
	(0.15365)	(0.18700)	(0.11265)	(20.5815)	(9.03433)
	[0.25671]	[2.27802]	[3.86114]	[-2.31448]	[-2.22258]
D(LGDP(-5))	0.294112	0.232232	0.012441	0.111050	-1.983773
	(0.14055)	(0.17106)	(0.10304)	(18.8268)	(8.26414)
	[2.09261]	[1.35759]	[0.12074]	[0.00590]	[-0.24005]
D(TAXB(-1))	-0.038919	0.157775	-0.130453	82.60815	-6.812930
	(0.21899)	(0.26653)	(0.16055)	(29.3339)	(12.8763)
	[-0.17772]	[0.59196]	[-0.81255]	[2.81613]	[-0.52911]
D(TAXB(-2))	-0.043632	-0.012659	-0.234437	105.2156	24.33179
	(0.21431)	(0.26084)	(0.15712)	(28.7077)	(12.6014)
	[-0.20359]	[-0.04853]	[-1.49208]	[3.66506]	[1.93088]

D(TAXB(-3))	0.113283	-0.263991	-0.136692	54.38239	28.06044
	(0.21312)	(0.25939)	(0.15625)	(28.5479)	(12.5312)
	[0.53155]	[-1.01775]	[-0.87485]	[1.90495]	[2.23924]
D(TAXB(-4))	0.117376	-0.361043	0.405715	15.80223	21.56486
	(0.19111)	(0.23260)	(0.14011)	(25.5997)	(11.2371)
	[0.61418]	[-1.55221]	[2.89568]	[0.61728]	[1.91908]
D(TAXB(-5))	0.175877	-0.274681	0.151572	3.973184	1.983952
	(0.15688)	(0.19094)	(0.11501)	(21.0143)	(9.22431)
	[1.12111]	[-1.43860]	[1.31786]	[0.18907]	[0.21508]
D(UNEMPLOYMENT(-1))	0.001740	0.000184	0.001746	-0.127101	-0.032198
	(0.00118)	(0.00143)	(0.00086)	(0.15790)	(0.06931)
	[1.47644]	[0.12836]	[2.02004]	[-0.80495]	[-0.46455]
D(UNEMPLOYMENT(-2))	-0.000638	0.001101	0.000394	0.050419	-0.053908
	(0.00094)	(0.00114)	(0.00069)	(0.12547)	(0.05508)
	[-0.68105]	[0.96566]	[0.57341]	[0.40184]	[-0.97879]
D(UNEMPLOYMENT(-3))	0.001365	0.002207	0.001189	0.055008	0.066983
	(0.00092)	(0.00112)	(0.00067)	(0.12304)	(0.05401)
	[1.48553]	[1.97441]	[1.76485]	[0.44706]	[1.24018]
D(UNEMPLOYMENT(-4))	-0.001207	-0.004031	0.001337	0.261582	-0.014488
	(0.00096)	(0.00116)	(0.00070)	(0.12815)	(0.05625)
	[-1.26168]	[-3.46217]	[1.90558]	[2.04127]	[-0.25757]
D(UNEMPLOYMENT(-5))	-0.002460	-3.15E-05	0.002129	-0.058507	-0.069391
	(0.00122)	(0.00149)	(0.00089)	(0.16352)	(0.07178)
	[-2.01546]	[-0.02121]	[2.37848]	[-0.35780]	[-0.96677]
D(INFLATION(-1))	-0.007018	0.002546	0.001310	0.119490	0.035726
	(0.00226)	(0.00275)	(0.00166)	(0.30305)	(0.13303)
	[-3.10217]	[0.92451]	[0.79003]	[0.39429]	[0.26856]
D(INFLATION(-2))	-0.000867	-0.002730	0.000420	0.419484	0.250469
	(0.00225)	(0.00274)	(0.00165)	(0.30163)	(0.13240)
	[-0.38504]	[-0.99605]	[0.25442]	[1.39070]	[1.89170]
D(INFLATION(-3))	-0.003270	-0.003755	0.003322	-0.136237	-0.121357
	(0.00235)	(0.00286)	(0.00173)	(0.31518)	(0.13835)
	[-1.38966]	[-1.31139]	[1.92605]	[-0.43225]	[-0.87717]
D(INFLATION(-4))	-0.000145	0.000888	0.003184	0.126264	-0.073410
	(0.00208)	(0.00253)	(0.00153)	(0.27887)	(0.12241)
	[-0.06954]	[0.35058]	[2.08607]	[0.45278]	[-0.59971]
D(INFLATION(-5))	-0.000588	0.000880	-0.001040	0.159658	-0.148790
	(0.00209)	(0.00254)	(0.00153)	(0.27946)	(0.12267)
	[-0.28161]	[0.34664]	[-0.67987]	[0.57131]	[-1.21292]
C	0.001665	-0.002874	0.000533	0.569721	-0.567043
	(0.00319)	(0.00388)	(0.00234)	(0.42728)	(0.18756)
	[0.52189]	[-0.74037]	[0.22789]	[1.33337]	[-3.02333]
R-squared	0.495157	0.621075	0.800965	0.559084	0.541892
Adj. R-squared	0.264878	0.448232	0.710177	0.357964	0.332931
Sum sq. resids	0.004730	0.007007	0.002542	84.87070	16.35300
S.E. equation	0.009109	0.011087	0.006678	1.220229	0.535626
F-statistic	2.150248	3.593286	8.822390	2.779853	2.593264

Log-likelihood	291.7653	275.2612	317.8400	-119.6239	-50.46180
Akaike AIC	-6.303936	-5.910980	-6.924761	3.491046	1.844329
Schwarz SC	-5.522602	-5.129646	-6.143428	4.272380	2.625663
Mean dependent	0.010736	0.002291	9.52E-05	0.077381	0.008855
S.D. dependent	0.010625	0.014926	0.012405	1.522866	0.655807

Determinant resid covariance (dof adj.)	7.69E-14
Determinant resid covariance	1.11E-14
Log-likelihood	753.7287
Akaike information criterion	-14.61259
Schwarz criterion	-10.56123

Appendix E: DIAGNOSTICS

Appendix E1: Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.844647	Prob. F(4,81)	0.1283
Obs*R-squared	7.513957	Prob. Chi-Square(4)	0.1111

Sample: 2000Q3 2022Q4
Included observations: 90
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP	0.004049	0.125579	0.032244	0.9744
INFLATION	-0.000696	0.004074	-0.170828	0.8648
TAXB	-0.103283	0.675059	-0.152999	0.8788
UNEMPLOYMENT	-0.001750	0.002349	-0.745261	0.4583
C	0.039382	0.694088	0.056739	0.9549
RESID(-1)	0.268771	0.112142	2.396697	0.0188
RESID(-2)	0.068822	0.116286	0.591828	0.5556
RESID(-3)	0.022553	0.117938	0.191231	0.8488
RESID(-4)	0.045475	0.120585	0.377121	0.7071

R-squared	0.083488	Mean dependent var	3.92E-15
Adjusted R-squared	-0.007031	S.D. dependent var	0.057881
S.E. of regression	0.058084	Akaike info criterion	-2.759218
Sum squared resid	0.273273	Schwarz criterion	-2.509237
Log-likelihood	133.1648	Hannan-Quinn criteria.	-2.658411
F-statistic	0.922323	Durbin-Watson stat	1.948026
Prob(F-statistic)	0.502673		

Appendix E2: Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.026719	Prob. F(4,85)	0.3983
Obs*R-squared	4.148038	Prob. Chi-Square(4)	0.3863
Scaled explained SS	59.21076	Prob. Chi-Square(4)	0.0000

Sample: 2000Q3 2022Q4
Included observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.202765	0.223021	0.909175	0.3658
LGDP	-0.033868	0.040086	-0.844897	0.4005
INFLATION	-0.002215	0.001316	-1.682744	0.0961
TAXB	0.240199	0.213994	1.122456	0.2648

UNEMPLOYMENT	-0.000565	0.000656	-0.861593	0.3913

R-squared	0.046089	Mean dependent var	0.003313
Adjusted R-squared	0.001199	S.D. dependent var	0.018848
S.E. of regression	0.018836	Akaike info criterion	-5.052095
Sum squared resid	0.030159	Schwarz criterion	-4.913216
Log-likelihood	232.3443	Hannan-Quinn criteria.	-4.996091
F-statistic	1.026719	Durbin-Watson stat	1.816720
Prob(F-statistic)	0.398284		

Heteroskedasticity Test: Harvey

F-statistic	1.261787	Prob. F(4,85)	0.2914
Obs*R-squared	5.044504	Prob. Chi-Square(4)	0.2828
Scaled explained SS	8.441153	Prob. Chi-Square(4)	0.0767

Sample: 2000Q3 2022Q4
Included observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	56.19134	34.01411	1.652001	0.1022
LGDP	-11.48655	6.113716	-1.878816	0.0637
INFLATION	-0.237166	0.200741	-1.181455	0.2407
TAXB	22.66465	32.63741	0.694438	0.4893
UNEMPLOYMENT	0.112297	0.099995	1.123028	0.2646

R-squared	0.056050	Mean dependent var	-8.127469
Adjusted R-squared	0.011629	S.D. dependent var	2.889700
S.E. of regression	2.872849	Akaike info criterion	5.002438
Sum squared resid	701.5272	Schwarz criterion	5.141317
Log-likelihood	-220.1097	Hannan-Quinn criteria.	5.058442
F-statistic	1.261787	Durbin-Watson stat	1.708181
Prob(F-statistic)	0.291421		

Heteroskedasticity Test: Glejser

F-statistic	0.999379	Prob. F(4,85)	0.4126
Obs*R-squared	4.042544	Prob. Chi-Square(4)	0.4003
Scaled explained SS	6.982984	Prob. Chi-Square(4)	0.1368

Sample: 2000Q3 2022Q4
Included observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.715395	0.558691	1.280483	0.2039
LGDP	-0.116848	0.100420	-1.163597	0.2478
INFLATION	-0.006026	0.003297	-1.827475	0.0711
TAXB	0.390455	0.536079	0.728353	0.4684
UNEMPLOYMENT	0.000100	0.001642	0.060979	0.9515

R-squared	0.044917	Mean dependent var	0.033333

Adjusted R-squared	-0.000028	S.D. dependent var	0.047187
S.E. of regression	0.047187	Akaike info criterion	-3.215429
Sum squared resid	0.189265	Schwarz criterion	-3.076551
Log-likelihood	149.6943	Hannan-Quinn criteria.	-3.159425
F-statistic	0.999379	Durbin-Watson stat	1.647349
Prob(F-statistic)	0.412558		

Heteroskedasticity Test: ARCH

F-statistic	0.200509	Prob. F(1,87)	0.6554
Obs*R-squared	0.204647	Prob. Chi-Square(1)	0.6510

Sample (adjusted): 2000Q4 2022Q4
Included observations: 89 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003186	0.002049	1.554578	0.1237
RESID^2(-1)	0.047948	0.107079	0.447783	0.6554

R-squared	0.002299	Mean dependent var	0.003346
Adjusted R-squared	-0.009168	S.D. dependent var	0.018952
S.E. of regression	0.019039	Akaike info criterion	-5.062479
Sum squared resid	0.031535	Schwarz criterion	-5.006554
Log-likelihood	227.2803	Hannan-Quinn criteria.	-5.039937
F-statistic	0.200509	Durbin-Watson stat	1.998775
Prob(F-statistic)	0.655423		

Heteroskedasticity Test: White

F-statistic	0.978331	Prob. F(14,75)	0.4833
Obs*R-squared	13.89791	Prob. Chi-Square(14)	0.4573
Scaled explained SS	198.3843	Prob. Chi-Square(14)	0.0000

Sample: 2000Q3 2022Q4
Included observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.97119	36.44683	-0.493079	0.6234
LGDP^2	-0.502744	1.119909	-0.448915	0.6548
LGDP*INFLATION	0.012398	0.041821	0.296452	0.7677
LGDP*TAXB	-1.284250	5.485583	-0.234114	0.8155
LGDP*UNEMPLOYMENT	0.003940	0.027269	0.144498	0.8855
LGDP	5.948401	12.72413	0.467490	0.6415
INFLATION^2	0.001037	0.000667	1.555682	0.1240
INFLATION*TAXB	-0.261290	0.140372	-1.861415	0.0666
INFLATION*UNEMPLOYMENT	0.000362	0.000539	0.671093	0.5042
INFLATION	-0.065897	0.240032	-0.274533	0.7844
TAXB^2	2.851077	13.99305	0.203749	0.8391
TAXB*UNEMPLOYMENT	-0.074984	0.076074	-0.985679	0.3275
TAXB	10.92729	30.37408	0.359757	0.7200

UNEMPLOYMENT^2	-3.86E-05	0.000273	-0.141597	0.8878
UNEMPLOYMENT	-0.013859	0.151017	-0.091769	0.9271

R-squared	0.154421	Mean dependent var	0.003313
Adjusted R-squared	-0.003420	S.D. dependent var	0.018848
S.E. of regression	0.018880	Akaike info criterion	-4.950421
Sum squared resid	0.026734	Schwarz criterion	-4.533786
Log-likelihood	237.7690	Hannan-Quinn criteria.	-4.782410
F-statistic	0.978331	Durbin-Watson stat	1.774262
Prob(F-statistic)	0.483301		

Heteroskedasticity Test: White

F-statistic	0.793945	Prob. F(4,85)	0.5324
Obs*R-squared	3.241481	Prob. Chi-Square(4)	0.5183
Scaled explained SS	46.27020	Prob. Chi-Square(4)	0.0000

Sample: 2000Q3 2022Q4
Included observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.094935	0.111244	0.853393	0.3958
LGDP^2	-0.002638	0.003318	-0.794803	0.4289
INFLATION^2	-0.000140	9.88E-05	-1.413071	0.1613
TAXB^2	0.876357	0.808129	1.084427	0.2812
UNEMPLOYMENT^2	-9.70E-06	1.18E-05	-0.821241	0.4138

R-squared	0.036016	Mean dependent var	0.003313
Adjusted R-squared	-0.009347	S.D. dependent var	0.018848
S.E. of regression	0.018936	Akaike info criterion	-5.041591
Sum squared resid	0.030477	Schwarz criterion	-4.902712
Log-likelihood	231.8716	Hannan-Quinn criteria.	-4.985587
F-statistic	0.793945	Durbin-Watson stat	1.811554
Prob(F-statistic)	0.532353		