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Contents

Global Trade Tensions: Opportunities and Risks to the SADC Region

Lesego Molefhe and Tlotlo Nkile[1]

ABSTRACT

This paper assesses the potential macroeconomic impact of global trade tensions on the SADC region, using the US-China trade tension as a case study.[2] *The study explores both the economic threats and opportunities the escalation of the war presents to the region. The paper employs a New Keynesian model for a small open economy, calibrated on SADC countries' data for the period 2000 to 2019, to quantify the potential impact of this trade war on key macroeconomic fundamentals in the region. The main findings of the paper are that, the escalation of the 'war' will have detrimental macroeconomic ramifications for the region, and while the effects on most macroeconomic fundamentals are expected to be short term, the war is however, anticipated to have a long-lasting dampening effect on the region's economic growth potential, which has been falling since the 2008-2009 global financial crisis. With regard to opportunities for the region arising out of the tensions, the study finds that, in the short term, there are minimal and limited to very few member states. However, there are prospects for long-term opportunities with wide-spread economic gains across the region, and these lie in concerted efforts to strengthen intra-regional trade, through for example, establishment of strong and deeply integrated regional value chains. Regional integration should foster industrial development, boost the region's deteriorating productive capacity (potential output growth) and moderate vulnerabilities to adverse external political and economic shocks that undermine economic progress. Formulation and timely implementation of economic policies and programmes should be geared towards guiding and coordinating the Community's efforts with respect to the envisaged regional-trade transformation agenda.*

1. INTRODUCTION

1.1 Overview

International trade has strengthened substantially over time and has become an engine of growth for many economies across the world. It has facilitated better allocation of resources, enhanced competitiveness and innovation through technology transfer across many industries and economic activities, which contributed immensely to total factor productivity in many economies, particularly developing and transition economies (Boudreaux and Ghei, 2017). However, extreme protectionist policies, which often lead to trade wars, have, over the years, been disruptive to this growth-engine process. The history of protectionist behaviour and the trade tensions it ultimately instigates, can be traced as far back as the 17th century; the Anglo-Dutch war between 1652 and 1784, the Opium war between China and Britain from 1839 to 1860, Smoot-Hawley Tariff Act of 1930, the Anglo-Irish war in 1932 and the Banana wars in 1993. Another fierce trade tension ensued in 2018, involving the two largest economies in the world; the United States of America (US) and China.

A series of retaliatory tariff war between these two economic giants (US and China) started playing out in mid-2018, induced primarily by extreme protectionist-oriented policies by the US. These policies were mainly motivated by what the US government perceived as unfair and unethical trade conduct by the Chinese government. Some of the concerns raised by the US include: China's cyber economic espionage against US technological firms; ineffective record of enforcing intellectual property rights; discriminatory innovation policies; extensive use of industrial policies to promote and protect industries favoured by the Chinese government and continuous interventions in the foreign exchange market to influence the value of the Chinese currency. The US government alleged that, these 'trade misconduct' had led to the US economy incurring a huge trade deficit with China (United Nations Conference on Trade and Development (UNCTAD), 2019). For these reasons, the US government engaged in a fierce trade war with China, unleashing a chain of import tariffs on billions of dollars' worth of Chinese commodities, and China retaliating with similar measures of import tariffs on US products.

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1 Senior Economist and Economist, Modelling and Forecasting Unit and Money and Financial Markets Unit, respectively, Research and Financial Stability Department. The views expressed in this paper are those of the authors and do not necessarily reflect those of the members of the CCBG in the Southern African Development Community (SADC) and the Bank of Botswana. While every precaution is taken to ensure the accuracy of information, the CCBG shall not be liable to any person for inaccurate information or opinions contained herein.

2 This paper was prepared at the height of the US-China trade tension and, therefore, does not cover the current tensions emanating from the Ukraine-Russian war. However, a variety of significant deveopments relating to the trade war have nonetheless transpired since the paper was first written in 2020. A summary of these developments is presented in the postscript section at the end of this paper.

Recognising the harmful impact of the persistence of the war on their individual economies and the rest of the world, the two governments found it prudent to engage on ways to resolve the trade tension. A trade agreement was finally reached towards the end of 2019, after countless number of back and forth negotiations. The agreement, which will be implemented in two phases (Phase 1 implemented in January 2020) mainly aims at addressing some of the US fundamental concerns that instigated the war. In the first phase of the agreement, China promised to implement intellectual property safeguards and pledged to buy approximately US$200 billion of US exports in manufactured goods, agriculture, energy and services in the next two years. In return, the US committed to suspend further imposition of tariffs on Chinese goods, reduce some of the existing tariffs on Chinese imports (in particular, the September 1, 2019 tariffs will be cut from 15 percent to 7.5 percent) and desist from labelling China a *'currency manipulator'*. The second phase of the agreement deals with the Chinese industrial policy which the US launched an investigation on and expressed immense discontentment with its current provisions. These provisions mainly relate to forced technology transfer to local companies and subsidisation of Chinese industries. The US government demands significant reforms to the framework to ensure fair and balanced trade relations.

It, however, remains questionable whether China will meet all the US demands. There are already concerns about the feasibility of some of the agreements in Phase 1 of the deal, in particular China's ability to meet sale volumes it pledged to the US within a short space of time. According to the US-China Business Council (2020), although the target could be achieved through state-directed purchases, enforceability may however, be extremely difficult. There are also doubts whether China will make concessions about subsidisation of state-controlled businesses, particularly given its socialist economic model. The current agreement, generally, does not come close to ending the war. The prospects for further escalation in the war remains high, because of the stringent conditions set out to the Chinese government in the agreement. The US maintains the threat of additional punishment if the conditions are not met. The geopolitical tension between the two countries generally continues to escalate; more recently in July 2020, US closed Chinese consulate in Houston and within a week, China retaliated by closing US consulate in Chengdu.

1.2 Problem Statement

Evidently, unabated escalation of the trade dispute between these two global economic giants (US and China) will have significant macroeconomic ramifications for the countries themselves and the global economy. It is worth noting that the effects of the trade tensions have already started to be felt by some countries around the world. Against this backdrop, assessment of the potential macroeconomic effects of this war is of interest, particularly for countries with close trade links with the two countries.

1.3 Objectives and Organisation of the Study

This study focuses on the implications of the trade tensions between China and US on the Southern African Development Community (SADC)[3] region; exploring both the economic threats of the war on the region and opportunities that the region could harness. It is worth pointing out that, first, a wide range of studies that investigated different aspects and dynamics of this trade war invariably reached the conclusion that, the escalation of the trade war will have a detrimental effect on both the US and Chinese economies (Bolt *et al.* (2019), OECD (2019), IMF (2018)). Therefore, to limit the scope of this study, there will be no attempt made to establish the eventual consequence of the trade war on the two economies in dispute. The study will only rely on existing evidence regarding this aspect of the war. Focus will be restricted to the third party effects of the war, that is, the macroeconomic implication of the war on the SADC region. Secondly, the assessment will be carried out under multiple assumptions relating to the extent to which the war will affect (i) global output, and (ii) SADC's trade flows and its macroeconomic well-being.

A New Keynesian (NK) model for a small open economy is employed to quantify the impact of the war on the SADC region. In particular, the model traces the potential impact of the war on the region's trade flows (trade account balance), economic growth, price and exchange rate stability, as well as implications for policy formulation. The study also explores the possibility of the region benefiting from trade diversion and intensive intra-regional trade as the war deepens. The rest of the paper is organised as follows. The next section presents a

3 SADC Member States include the following 16 countries: Angola, Botswana, Comoros, Democratic Republic of Congo, Kingdom of Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe.

review of literature on trade wars, Section 3 provides a brief analysis of SADC's global and intra-regional trade patterns, Section 4 provides stylised facts on SADC's macroeconomic dynamics over time, Section 5 discusses the methodological approach employed in this study, Section 6 provides model simulation results and analysis thereof, and lastly Section 7 concludes the study and provides recommendations.

2. LITERATURE REVIEW ON TRADE WARS

In theoretical literature, a trade war refers to an economic conflict where one country imposes different forms of trade barriers against one or more countries, with the targeted country(s) retaliating with proportionate or disproportionate trade restrictive measures against the first mover. It is essentially the retaliation that makes it a war (Conybeare, 1987). Theoretical literature however, offers limited guidance on the macroeconomic effects of a trade war. The bulk of the theory on the subject is in the domain of international trade, abstracting from macroeconomic considerations. Few exceptions include, Van Wijnbergen (1987), who provides an intertemporal analysis of the employment and current account effects of trade tariffs under various assumptions about real wage indexation in a small open economy, without an attempt at quantification, however. A recent paper by Linde and Pescatori (2017) applies a DSGE model to analyse Lerner symmetry, focusing on the equivalence between import tariffs and export taxes. The analysis however, precludes third party effects of a bilateral trade war, which is the key issue of focus in this study.

The chronicles of trade wars reveal that, the use of extreme protectionist measures as a means to shield domestic industries from external competition, is the most common cause of trade tensions and ultimately fullscale trade wars (Conybeare, 1987). These extreme measures are usually applied if a country holds a firm belief that trade is being conducted unfairly against it, or simply as a means to influence trade balance positions. Trade wars, usually, play-out in the form of import tariffs, with countries at war engaging in rounds of retaliatory import tariffs against each other (Grossman and Helpman, 1991; Conybeare, 1987). The history of these wars can be traced as far back as the 17th century; beginning with the Anglo-Dutch war between 1652 and 1784 Opium war between China and Britain from 1839 to 1860, Smoot-Hawley Tariff Act of 1930, the Anglo-Irish war between 1932 and 1938 and the Banana wars in 1993.

According to Irwin (2011) and Robert (1995), countries applying protectionist measures may have some economic gains envisioned from these measures, especially in the short term. However, retaliatory measures by affected/targeted countries, which may lead to a full-scale trade war, ultimately reverse the gains and harm both the countries at war, as well as the global economy. In the long run, therefore, a trade war produces no outright winners. Irwin (2011) uses the Smoot-Hawley Tariff Act of 1930 to illustrate and substantiate this assertion. In 1930, US president Herbert Hoover signed the Smoot-Hawley Tariff Act to protect American farmers from increasing external competition and declining prices from spare capacity. The Act, which mainly aimed to reduce US imports of agricultural products, actually succeeded in the early stages of the war. Imports to the US economy from the Euro area fell by over 60 percent between 1930 and 1932. The Act however, instigated a chain of retaliatory measures by affected countries, mainly European countries. The retaliatory acts severely harmed the US exports, which fell substantially from $5.2 billion in 1929 to $1.7 billion in 1933. In addition, the war aggravated the severity of the 1930 global economic depression and the adverse effects thereof across the world. The global economic effects of the Smoot-Hawley Tariff Act became some of the strong motivating forces behind the establishment of the General Agreement on Tariffs and Trade (GATT) in 1948, which aimed to regulate and promote international trade to prevent future occurrence of such a vicious and economically destructive trade war (Irwin, 2011; Krugman, 2010; and Robert, 1995). The GATT later became the World Trade Organisation (WTO) in 1995.

The current trade war between the US and China, which has similarities to that triggered by the Smoot-Hawley Tariff Act, has sparked immense interest and provoked a lot of empirical research on its potential macroeconomic effects if it escalates. The studies generally have varying scopes; some focused on single country impact, while others with a relatively broader scope assessed regional and global economic implications. The South African Provincial Treasury of Kwazulu Natal (2018)[4] assessed the macroeconomic implications of the war, with specific focus on the South African economy. According to the study, given the strong trade relations between the South African economy and the two countries at war, the escalations of the war will have negative spill-over effects on the South African economy. China is currently the largest single-country market for

4 Referred to as the South African Treasury or just Treasury, henceforth.

South African exports, accounting for approximately 9.2 percent of total South African export market share, followed by the US at 7.4 percent (SARS, 2018). China is also the largest source of South African imports; 17.1 percent of total South African imports originate from China, while 5.4 percent is from the US.

The South African Treasury (2018), envisage the South African rand becoming highly volatile with investors' risk aversion on high risk emerging market assets heightening as the trade war escalated further. The rand is thus, expected to depreciate significantly against trading partner currencies, leading to high import prices and second round effects on domestic consumer prices. Mgangaluma, *et al.* (2019) examined implications of the war on the Tanzanian economy. Trade and financial channels were found to be the major conduits, with the returns from the country's investment of official reserve being adversely affected as the currencies in which the country invests depreciated significantly against the US dollar after the beginning of the trade war. Despite adverse consequences, the study found several opportunities the country could venture on. These include taking advantage of the reduced tariff to access Chinese market with products such as cotton and fish; and benefitting from rising world gold prices as investors' appetite to hold gold picks amid depreciations of all major currencies and uncertainties in the global financial markets.

For regional impact focused studies, the African Development Bank (2019) assessed the potential impact of the escalation of the trade war on African economies. The study employed a global vector autoregressive model (GVAR) to estimate the potential impact of a contraction in global trade volumes on African countries, given the nature and intensity of their main exports. Impulse response from a 1 percentage point contraction shock in global trade volumes below its long term growth trend showed that, in the short term (one year), the impact of the shock on the GDP growth of African economies is negligible. However, in the medium term (within three years), the impact grows larger and it is more pronounced for mineral resource-intensive exporters, at -2.5 percent, followed by oil exporters at -1.9 percent, and relatively marginal for non-resource-exporting economies, at -1.1 percent. One of the overriding factors put forth as an explanation of this outcome is the degree of African countries openness to and intensity of trade with the US and Chinese economies. According to the study, over 60 percent of Africa's exports go to the US, China, and Europe, and more than 70 percent of Africa's imports originate from these countries. Therefore, a significant fall in demand for Africa's exports due to a slowdown in the global economy prompted by the trade war is an important channel that could substantially slow economic activity in Africa. However, the study postulates that, despite the negative effects of the war on African economies, Africa could, with the right policy responses, turn the escalation of the trade tensions into an opportunity to improve competitiveness and deepen regional trade integration. African countries could also take advantage of the trade diversion caused by the tensions to become the new supplier of goods previously supplied, for example, by China to the US.

Jean and Sapir (2018) explored the potential macroeconomic effects of the full-scale trade war between the US and China on the European Union (EU). The study established that, a full-scale war would have an effect of similar magnitude to that of the global economic recession of 2008-2009 on the EU. According to the study, a full-scale trade war would reduce economic activity by more than 4 percent for most small and widely open countries in the EU. The study attributes this drastic slowdown in economic activity to the rise in production costs due to the destruction of value chains. Potential benefits to the region, particularly trade diversion effects, are also considered in the study. For example, the study found that, if the EU gets involved in the war, then high customs duties between the US and the EU will destroy trade between the two economies but increase France's trade with its European partners. The study employed the gravity model to simulate this scenario, assuming a 60 percentage points increase in tariffs on manufacturing goods (currently below 3 percent on average for the US and the EU) and extreme restrictions on trade in services.

A similar study was conducted by Bolt *et al.* (2019) on the global macroeconomic effects of the US-China tariff war, with special attention on its impact on the Euro area. Using an extended version of the European Central Bank (ECB) global multiregional EAGLE model, the study reached the conclusion that a trade war between the US and China will dampen both the US and Chinese economies in line with the Lerner Symmetry theorem[5] and world output would also contract. World output contracts further with each retaliation measure by the two governments. The Euro area would benefit from this trade war, through trade diversion. Trade diversion benefits emanate from cheaper imports from China and

5 According to the theorem, an ad valorem import tariff (a percentage of value or an amount per unit) will have the same effects as an export tax.

Europe's improved competitiveness in the EU and US market (assuming the EU stays out of the conflict). However, in the long-term, as price stickiness in the export sector in each region increases, the negative effects of tariffs in the US and China are mitigated, but the positive effects in the EU are also dampened.

Apart from the studies discussed above, which are more focused on single country and regional macroeconomic impact of the trade war, a number of macroeconomic policy institutions also contributed to the subject, but with a broader perspective, focusing mainly on the potential effects of the US-China war on the global economy (OECD 2019, IMF 2018, Bank de France 2018). These studies invariably anticipate that the war, if it escalates, will have severe adverse macroeconomic effects on the global economy. For example, the OECD report on Trade and Investment Measures (2019), provides empirical analysis on the potential macroeconomic costs associated with a full-scale trade war scenario. According to the report, a full-scale trade war is a worst case scenario where international trade cooperation breaks down and countries set tariffs non-cooperatively.

The report assumes that, in this scenario, world exporters will on average face import tariffs close to 32 percentage points more than the prevailing tariffs. Using a dynamic computable general equilibrium model (DCGE), the report projects that a full-scale trade war will reduce global trade by approximately 17 percent and global GDP will fall by almost 1.96 percentage points, in a space of 3 years. Therefore, by implication, the worst-case scenario of the on-going trade war will have a similar impact on the global economy as the 2008/09 global financial crisis, where global trade and GDP fell by 12.4 and 2.1 percentage points, respectively.

Besides the predicted substantial fall in global trade and GDP, the report presents a much larger detrimental effect of the full-scale trade war on sectoral production in many countries. The report anticipates that a full-scale trade war will lead to a reallocation of resources away from their most efficient use based on comparative advantage. These sectoral production changes will cause significant labour displacement. The estimates from the report show that, across the world, an average of 69 million high-skilled and low-skilled workers would have to leave their initial sector of employment to find jobs elsewhere.

Regarding the response of macroeconomic policy to the current and anticipated effects of this trade war, the IMF, in its 2019 series of World Economic Outlook (WEO) reports, consistently advised that the dampening effect of the trade war on investment, demand and inflation should be countered (if prevailing economic conditions in a country permits) with expansionary macroeconomic policy measures. The IMF expects core inflation, in the context of the on-going trade war, to remain low across most economies in the world, consistent with subdued growth in aggregate demand and investment. Movements in headline inflation for most economies are therefore, expected to be largely determined by prospective developments in international commodity prices. The inflation outlook therefore, according to the IMF, augurs well for accommodative monetary policy stance. On the fiscal policy front, the Fund advised that fiscal policy authorities should strive to balance multiple objectives in these periods of trade policy uncertainty. In that regard, the authorities should smooth demand as needed, protect the vulnerable classes in the economy and boost potential output growth with spending that supports structural reforms and ensures sustainable public finances over the medium term.

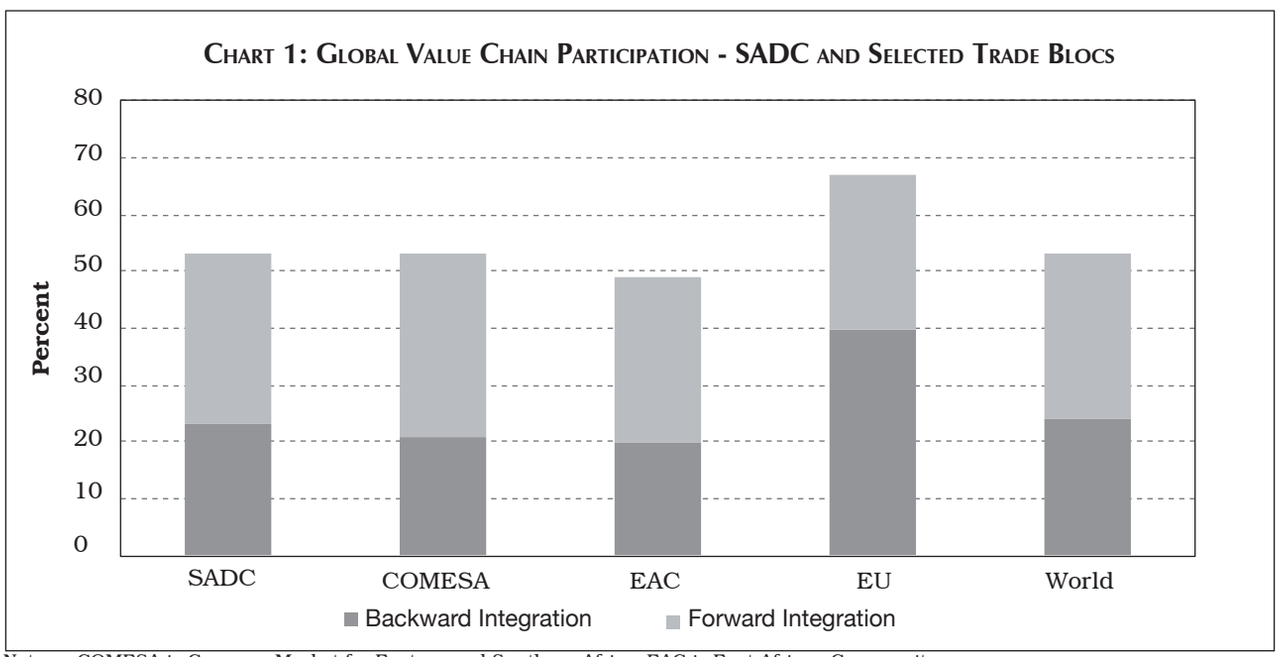
In summary, the trade war between the US and China generally presents a downside risk to the macroeconomic wellbeing of virtually all economies around the world. Empirical literature on this subject invariably foresees the global economy worse off in the eventuality of a full scale war. Nevertheless, several studies discern potential areas of benefit from the war (trade diversion for example) although some literature perceive such benefits to be fleeting (Bolt *et al,* 2019). One of the shortcomings of the literature however, is its limited theoretical guidance on the macroeconomic effects of the war. The bulk of theoretical literature on the subject is in the domain of the theory of international trade, abstracting from macroeconomic considerations.

3. SADC COUNTRIES' PARTICIPATION IN GLOBAL AND REGIONAL TRADE

This section analyses participation of the SADC region in the global value chain with the aim of exploring the implications of the escalation of the trade war on the region, given its depth of integration in global trade. In addition, the section examines SADC intra-regional trade dynamics to establish any discernible opportunities the region can exploit from the war. To control for the dominance of the South African economy in the region, the analysis is disaggregated to reflect the trade dynamics of both individual member states and the region as a whole.

SADC Participation in the Global Value Chain

To untangle how the SADC region is integrated into global production networks and the challenges it stands to face with any disruption to the networks, the study analysed SADC's trade dynamics from the United Nations Conference on Trade and Development (UNCTAD)-Eora Global Value Chain Database. Two main global value chain participation indicators are analysed, being backward and forward integration. Backward integration measures the share of foreign value added embodied in a country's exports. The indicator is usually higher for economies that are largely engaged in downstream economic activities. The other indicator, forward integration, measures a country's value addition in intermediate inputs used to produce other countries exports. Countries participating predominantly in upstream economic activities will generally have high levels of forward integration. The sum of the two indicators measures the country's level of integration in the global value chain.



Notes: COMESA is Common Market for Eastern and Southern Africa; EAC is East African Community.

Source: UNCTAD-Eora Global Value Chain

Chart 1 shows SADC's level of backward and forward integration in global trade against selected regional trade blocs in Africa and developed economies. In general, SADC's level of integration in the global value chain, (measured by the sum of backward and forward integration) is almost at par with most regional trade blocs considered in this analysis as well as the world average. A breakdown of the nature of SADC's integration in the global value chain also reveals that the region has a relatively higher level of forward integration, indicating that the region's participation in the global value chain is more upstream compared to advanced economies (EU, for example) which are heavily involved in downstream activities. The nature of SADC's participation in the global value chain as identified by Black *et al.* (2019), reflects, to a large extent the natural resource-intensive composition of the region's exports. For example, the principal export commodities for almost half of the countries in the SADC region are mineral resources, unrefined ores, metals and fuels (Black *et al.*, 2019).

CHART 2: SOURCE OF FOREIGN VALUE ADDED IN SADC EXPORTS

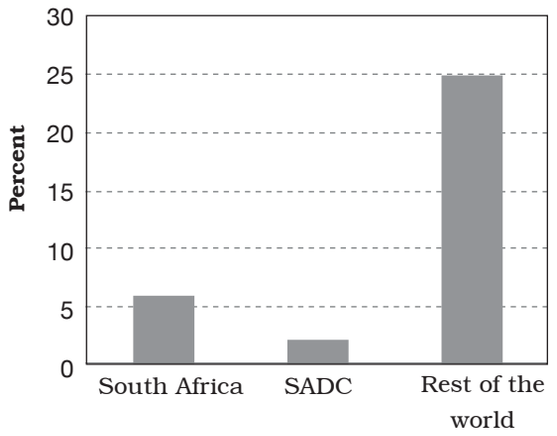
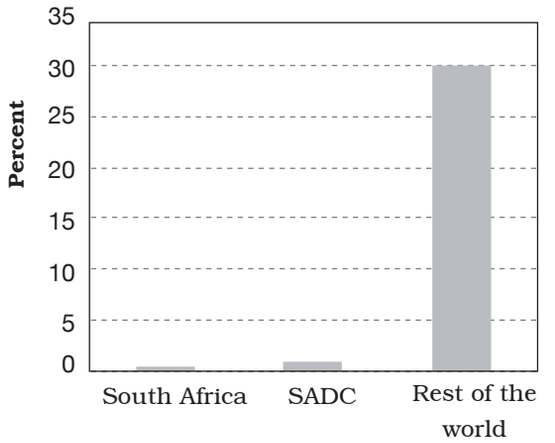


CHART 3: SADC FORWARD INTEGRATION BY DESTINATION



Source: UNCTAD-Eora Global Value Chain

Further disaggregation of SADC's trade patterns (Chart 2 and 3) by source of imports and destination of exports shows strong trade relations between the region and the rest of the world (China, EU and US). Most of the intermediate inputs embodied in the region's exports are imported from outside the region. Chart 3 also shows very high forward linkages of SADC countries with the rest of the world. A large share of intermediate inputs or raw materials produced within the region are exported to the rest of the world. This analysis is by and large, in line with the findings of the UNCTAD Report (2019) on Economic Development in Africa. According to the report, the share of total exports from Africa (which include SADC member states) to the rest of the world ranged from 80 percent to 90 percent between the year 2000 and 2017. In contrast, intra-African exports averaged 16.6 percent of total exports over the review period.

By implication therefore, the region's aggregate output is a strong function of foreign demand, and hence widely exposed to external economic and political developments. The current trade war between the US and China, and its anticipated adverse impact on global demand therefore, presents a significant threat to the economic well-being of the SADC region (these threats will be explored further in subsequent sections of the paper).

Intra-SADC Trade Patterns

Regarding intra-regional trade, the analysis further reveals that trade within the region is not balanced, with South Africa being the main source of regional imports and the primary market for other SADC countries' exports (Charts 4 to 7). Approximately 70 percent of intra-SADC's imports are sourced from South Africa and the same proportion of regional exports flows to South Africa. This intra-regional trade pattern underscores the dominance of the South African economy in the SADC region and the central role the country plays as both a supplier of intermediate inputs in the production processes of other SADC countries and the primary regional market for their export commodities.

CHART 4: INTRA-SADC IMPORTS - SHARE OF TOTAL IMPORTS IN 2018

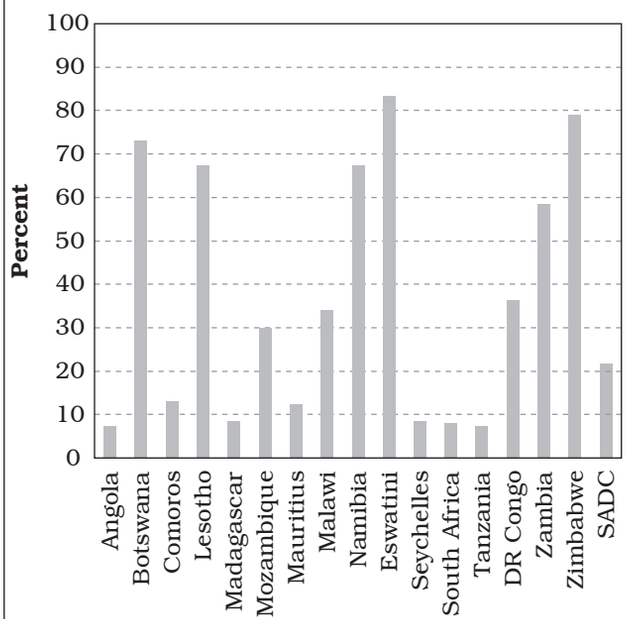


CHART 5: PROPORTION OF INTRA-SADC IMPORTS FROM SOUTH AFRICA IN 2018

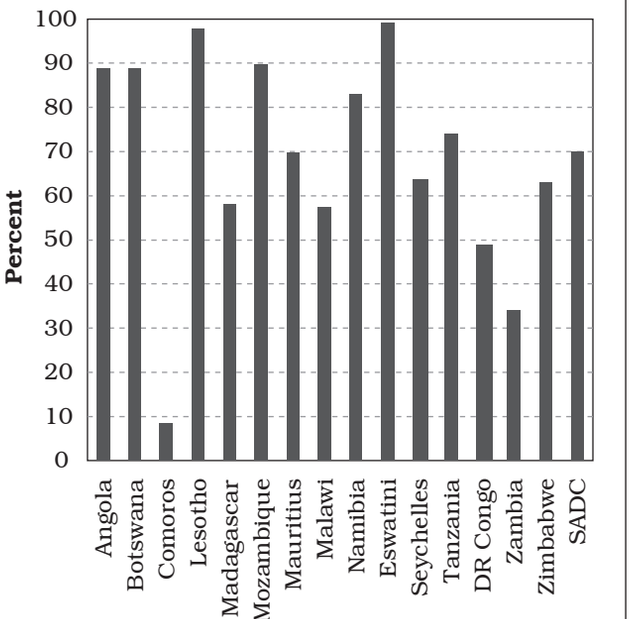


CHART 6: INTRA-SADC EXPORTS - SHARE OF TOTAL EXPORTS IN 2018

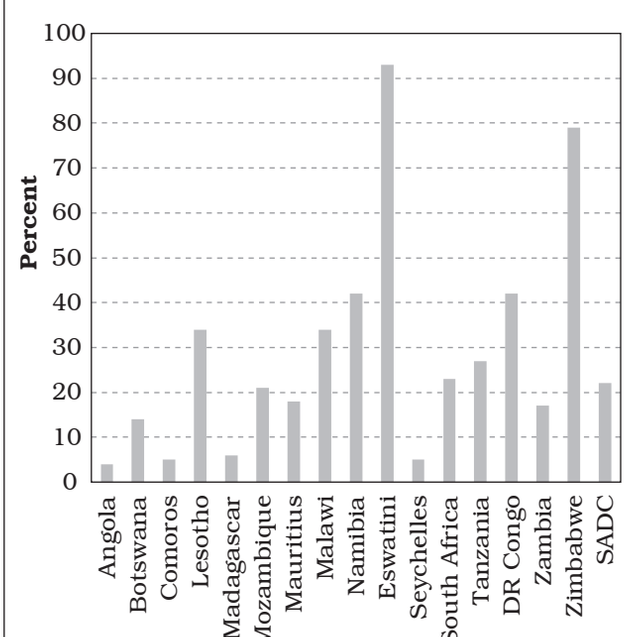
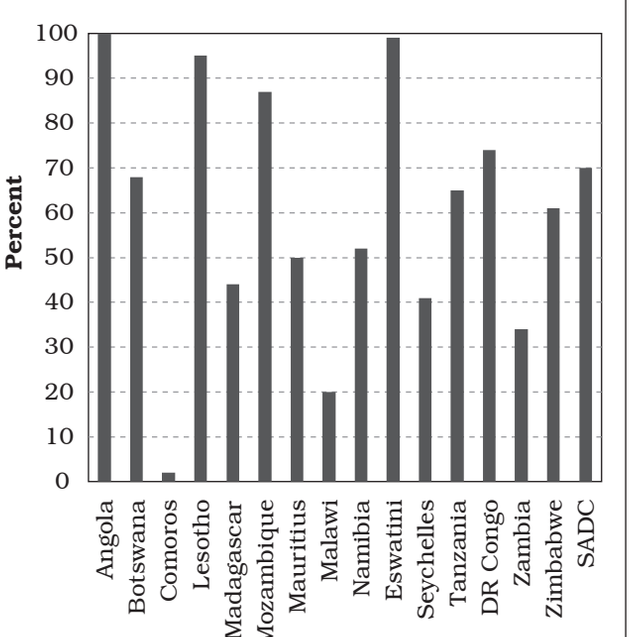


CHART 7: PROPORTION OF INTRA-SADC EXPORTS TO SOUTH AFRICA IN 2018



Source: IMF's Direction of Trade Statistics (DOTS)

Intra-Trade Diversion Opportunities

Short-term opportunities for balanced or evenly distributed trade diversions within the region as the dispute escalates are somewhat minimal, given SADC's current trade patterns. Generally, SADC's intra-regional trade is deeply entrenched on the South African economy, for both imports and exports (Chart 5 and 7). Therefore, short term prospects for intra-regional trade diversion depends largely on the ability and willingness of South Africa (as the anchor economy in region) to increase the volume of its regional imports. The analysis in Chart 7 shows that approximately 70 percent of SADC's total intra-regional exports flows to the South African economy and these exports constitute only 5 percent of South Africa's total imports (Chart 4). Therefore, there is scope for South Africa to increase regional imports, particularly if the escalation of the trade war adversely impacts the competitiveness of some of its

extra-regional imports[6], and if there are countries within the SADC region who can efficiently supply these imports, most importantly, at the same quality level. However, given that most of SADC's exports are unprocessed raw materials which may not really meet the demands and needs of the South African economy, potential benefits the region can reap from this opportunity are therefore, minimal.

Extra-Trade Diversions and Relocation Opportunities

Trade diversion opportunities outside the region also exist, although minimal. For example, according to the African Economic Outlook report by the African Development Bank (2019), China is increasingly diverting its import of crude oil to African countries like Angola to compensate for the decline in import of natural gas from the US. Furthermore, there are also trade relocation opportunities which the region can leverage from the war. According to the UNCTAD (2019) report, once it became clear that the trade dispute between these two countries was not transitory, some firms started relocating their operations outside China, to avoid high US tariffs. The relocations are mainly destined to countries and regions with developed manufacturing sectors and more integrated value chains. Very few countries within the SADC region however, seem to be well positioned to harness the potential benefit arising from this opportunity, at least according to the findings of the CCBG study on Regional Economic Integration and Capital Flows in the SADC Region prepared by Bank of Botswana (2018). The study shows that, very few countries in the region, mainly South Africa and Mauritius, meet most of the necessary preconditions for attracting FDI inflows. These countries are therefore, perceived to be among the few countries in the region which stand a better chance of benefiting from this trade relocation effects of the war. According to the CCBG study, inflow of FDI for most SADC countries is largely constrained by low level of infrastructural and industrial development; poor governance; and administrative bottlenecks precisely in business registration, licensing and processing of work permits for foreign workers. Noteworthy, some trade relocation was observed to some countries in the region with massive investment on infrastructure. The study by Mgangaluma *et al.* (2019) noted abrupt increase in import of steel from China during the wartime, mainly to support the on-going infrastructure projects.

Long-Term Opportunities

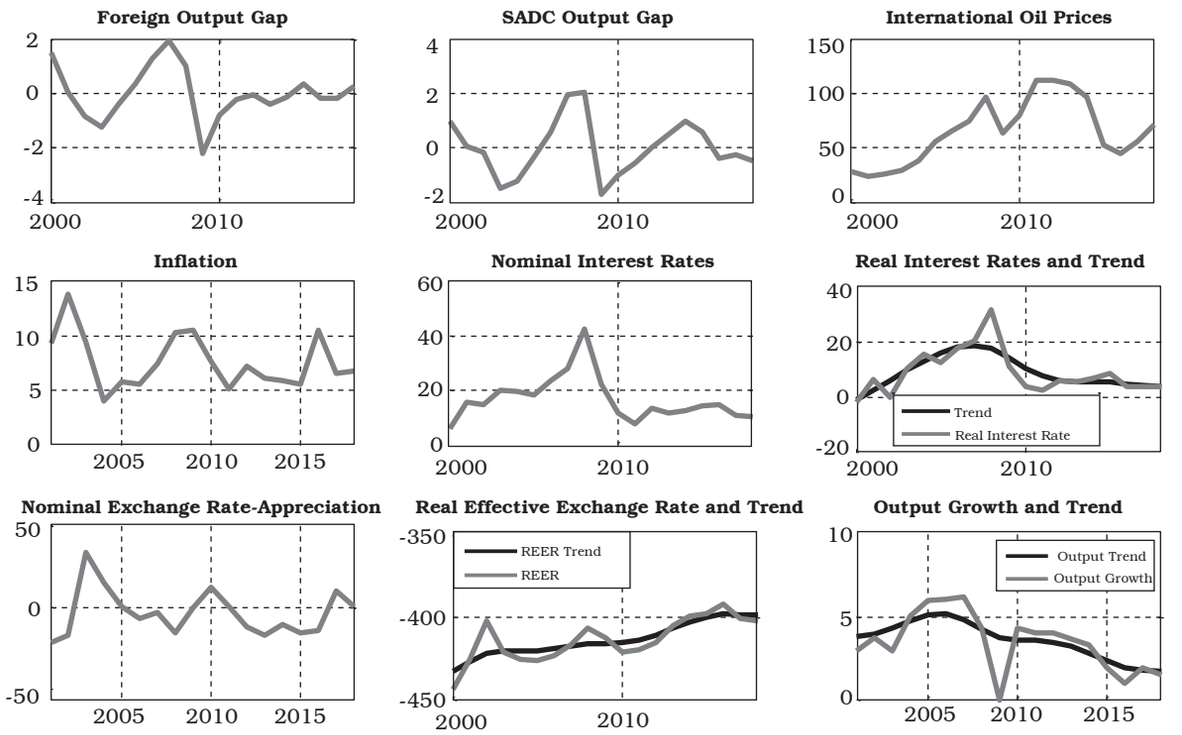
The trade war generally presents limited exploitable opportunities for most countries in the region, especially in the short term. SADC could therefore, focus on devising strategies to reposition itself for long term and sustainable gains that may emanate from such external crisis. One of these strategies would be to establish strong and deeply integrated regional value chains with the capacity to process and refine SADC's resource-intensive exports into finished goods of high value. This will first and foremost limit the region's exposure to foreign political and economic developments (highlighted in Chart 2 and 3). Furthermore, efficient and deeply integrated value chains will immensely enlarge the regional market, attract foreign investment and draw significant trade relocations (induced by trade wars or other sources of external crisis) to the region. Such inflow of FDI will help to avail the skills, technology and financial capital necessary to foster regional infrastructural and industrial development, support the region's employment creation endeavours and enhance the pace of convergence for most of the member states to the SADC macroeconomic targets.

4. STYLISED FACTS OF SADC MACROECONOMIC DYNAMICS (2000-2018)

This section analyses macroeconomic developments in the SADC region between the year 2000 and 2018. Consistent with the variable measurement technique employed by the Research and Statistics Unit of the SADC Secretariat, all the SADC macroeconomic variables analysed in this section are measured as an economic size or GDP weighted average for all the 16 SADC member states. From Figure 1 below, economic growth in the SADC region was on a positive trajectory between 2000 and 2007, supported mainly by growth in global output and accommodative monetary policy environment (low interest rates and stable real effective exchange rates). The positive economic growth momentum was, however, halted by the 2008/09 global financial crisis (GFC).

6 This is highly probable given that, the import tariff-cost component of targeted products in the US and China trade war may significantly inflate prices along all the streams of the value chain. Therefore, importers may seek alternative markets (free of US and Chinese produced intermediate goods) to avoid the negative externality of this war.

FIGURE 1: SADC MACROECONOMIC ANALYSIS (2000-2019)



Source: Authors' computation (Trends and Gaps), World Bank and Bloomberg

The 2008/09 GFC led to a significant fall in global output and demand, which immensely suppressed SADC exports and aggregate output in the region fell far below its potential level. Inflation in SADC countries also increased sharply at the time, amidst a steep rise in international oil prices (which reached a peak of USD140.00 per barrel in mid-2008) and the 2007/08 world food price crisis. The region was technically experiencing stagflation. The monetary policy authorities, whose primary mandate is price stability, became oblivious to output developments at the time and aggressively hiked nominal interest rates to bring inflation down. Market interest rates in the region increased from 19 percent to over 40 percent[7], and as a result real interest rates became extremely restrictive, which to some degree, aggravated the decline in economic activity in the region. The increase in relative prices or the inflation differential between SADC and its trading partner countries also implied tighter real effective exchange rate or decrease in competitiveness of SADC exports, hence contributing to a fall in the SADC output gap. Inflation ultimately eased towards the end of 2009, and the monetary policy authorities in the region began to cut the interest rates to support economic growth.

Although the region managed to recover from the crisis and macroeconomic fundamentals stabilised around tolerable levels, the potential output growth of the region has been trending downward since the crisis. Therefore, by implication, the GFC caused a permanent negative shock to the productive capacity of the SADC region, and economic stimulus and other growth-oriented macroeconomic policies measures implemented across the region, during and after the GFC, have thus far, not been able to reverse or counteract the fall. Furthermore, given the current global economic and health shock caused by the outbreak and rapid spread of coronavirus of 2019 (COVID-19) pandemic, the region's potential output growth will most likely contract further in the short to medium term. For most countries across the region, it is highly likely that there will be inadvertent and profound underinvestment in structural economic fundamentals (such as infrastructural developments) going forward, particularly given the elevated requirement for fiscal policy to support livelihoods and capacitate public health systems to withstand the potential overwhelming medical needs of COVID-19 patients.

Therefore, in view of the current COVID-19 induced government budget priorities, as well as the revenue constraints presented by subdued foreign demand for some of the region's primary export commodities, the long term economic ambitions of the region, such

7 Zimbabwe's extremely high nominal interest rates explain the high regional interest rates average

as employment creation, industrial development, low and sustainable public debt, may remain elusive for years to come. Based on the current SADC countries growth projections by the IMF[8], a less pessimistic assumption (used in this study) is that potential output growth in the SADC region will fall to around 0.5 percent in the next two years. This is before accounting for the impact of the potential escalation in the trade war between the US and China.

5. METHODOLOGY

The study uses a New Keynesian (NK) model for a small open economy to quantify the potential macroeconomic impact of the escalation of the ongoing trade war between the US and Chinese governments on the SADC region. The NK model which is widely used in contemporary forward looking monetary policy framework, describes the interaction of macroeconomic variables over the medium term horizon. The model structure resembles the log-linearised version of the micro-founded Dynamic Stochastic General Equilibrium (DSGE) model, with few differences mainly pertaining to the methodological process followed in derivation of the model equations and parameters. Thus, unlike in the DSGE model, equations in the NK model are not explicitly and entirely derived from micro-foundations, other components of the equations (i.e., parameters) are derived in line with the underlying economic theory and patterns or trends exhibited by the data.

The NK model is founded on two main assumptions regarding the price setting mechanism, that is: firms' exhibit attributes of monopolistic competition in their price setting behaviour and market price adjustment is assumed to be a slow process (sticky prices). The NK framework is entirely a gap model with short term cycles, which are influenced mainly by monetary policy actions and long- term trends which are exclusively influenced by structural economic fundamentals. The model parameters or coefficients are calibrated such that in the long run, growth trends of model variables converge to their exogenously determined steady states and all the gaps or short- term cycles are closed. The model comprises four main behavioural equations: domestic aggregate demand, domestic aggregate supply, monetary policy reaction function and nominal exchange rate equation.

5.1 Domestic Aggregate Demand Equation/IS Curve

The IS curve is a reduced form of the log-linearised Euler equation derived from the households' optimisation function (with habit formation). At micro-level, the equation relates short term interest rates with household intertemporal choice between consumption and saving. The micro-founded version is expressed as follows;

$$\hat{c}_t = \left(\frac{1}{1+\gamma}\right) E_t \hat{c}_{t+1} + \left(\frac{\gamma}{1+\gamma}\right) \hat{c}_{t-1} - \frac{1}{\sigma(1+\gamma)}(\hat{\imath}_t - E_t \pi_{t+1}) \quad (1)$$

Where $\hat{c}_t$ is current consumption, $E_t \hat{c}_{t+1}$ is expected consumption, $\hat{c}_{t-1}$ is past consumption, i_t is nominal interest rates, $E_t \pi_{t+1}$ is expected inflation, hence $(i_t - E_t \pi_{t+1})$ is Fisher's definition of real interest rates, γ is strength of habit formation and σ is risk aversion.

Aggregation of the consumption patterns of all households and expressing the sum in terms of output gap yields the IS curve

$$\hat{y}_t = \left(\frac{1}{1+\gamma}\right) E_t \hat{y}_{t+1} + \left(\frac{\gamma}{1+\gamma}\right) \hat{y}_{t-1} - \frac{1}{\sigma(1+\gamma)} \hat{r}_t \quad (2)$$

Where $\hat{y}_t$ is current output gap, $\hat{y}_{t+1}$ is output gap in the next period, $\hat{y}_{t-1}$ is output gap in the previous period, $\hat{r}_t$ the real interest rate gap, defined formally as

$$\hat{r}_t = i_t - E\{\pi_{t+1}\} - r_t^n \quad (3)$$

Where r_t^n is the trend or equilibrium of the nominal interest rates

Substituting parameters in equation 2 with calibrated parameters, equation (2) simplifies to

$$\hat{y}_t = b_1 \hat{y}_{t-1} + (1 - b_1)\hat{y}_{t+1} + b_2 rmci_t + b_3 \hat{y}_t^* + \varepsilon_t^y \quad (4)$$

Where, b_1, b_2 and b_3 are calibrated parameters, $rmci_t$ is the real monetary conditions index, which gauges the impact of monetary policy stance (weighted average of real interest rate gap and real effective exchange rate gap) on the economic activity, $\hat{y}_t^*$ is foreign output gap which captures the impact of changes in foreign demand on domestic exports and hence economic activity, ε_t^y is demand shock

$$rmci_t = b_4 \hat{r}_t + (1 - b_4)(-\hat{z}_t) \quad (5)$$

8 Economic growth in the SADC region is projected to contract by a weighted average of -7.1 percent in 2020, before rebounding to 3.2 percent in 2021. The projected deep contraction in 2020 will dampen the region's average trend growth from 1.2 percent (observed in the past 3 years) to approximately 0.45 percent.

Where b_4 is a calibrated parameter, $\hat{r}_t$ the real interest rate gap as defined in equation 3 and $\hat{z}_t$ real exchange rate gap.

5.2 Domestic Aggregate Supply/New Keynesian Philips Curve (NKPC)

A New Keynesian forward-looking inflation equation is derived from firms' profit maximisation function under a monopolistic competition market structure and sticky prices. The derivation involves making assumptions that greatly simplify the aggregation of individual firms' price determination mechanism, but still retain the feature of non-synchronised multi-period price determination behavior. There are two basic building blocks to the NKPC:

a. The first block is an equation that relates current inflation to three factors: the percent deviation of real marginal cost (averaged across firms) from its steady state, past and expected future inflation. This relation is obtained as a log-linear approximation of the aggregated behavior of individual firms in setting prices for multiple periods based on past and anticipated future prices (inflation) as well as nominal marginal costs.

$$\pi_t = \left(\frac{1}{1+\beta}\right)\pi_{t-1} + \left(\frac{\beta}{1+\beta}\right)E_t\,\pi_{t+1} + \frac{(1-\beta\omega)(1+\omega)}{(1+\beta)\omega}\,\hat{\varphi}_t \quad (6)$$

Where π_t is current inflation, π_{t-1} is past inflation and is π_{t+1} anticipated or expected inflation and $\hat{\varphi}_t$ is marginal cost. β is the discount factor and ω is a share of firms that reset prices at t via indexing on inflation at $_{t-1}$.

b. The second key building block is an equation that has real marginal costs varying proportionately with the output gap and real effective exchange rate gap.

$$\pi_t = a_1\pi_{t-1} + (1-a_1)\,E(\pi_{t+1}) + a_2 rmc_t + \varepsilon_t^{\pi} \quad (7)$$

Where a_1, $(1-a_1)$ and a_2 are parameters for past inflation, expected inflation and real marginal cost, ε_t^{π} is the inflation shock and rmc_t is the real marginal costs defined as:

$$rmc_t = a_3\hat{y}_t + (1-a_3)\,\hat{z}_t \quad (8)$$

Where $\hat{y}_t$ is the output gap and $\hat{z}_t$ is real effective exchange rate gap.

The output gap captures the real marginal cost of domestic producers. The common belief is that, an increase in aggregate demand will put pressure on domestic firms to increase utilisation of spare capacity. Capacity utilisation implies increase in cost of production or service delivery, the cost incurred will be entirely or partially passed on to consumers through high prices, thus higher inflation. The real effective exchange rate gap on the other hand measures the real marginal cost of importers. For example, if the exchange rate depreciates, then the marginal cost of importers increases and hence domestic prices will be increased to restore profit margins. This translates to high inflation. Parameter a_2 has a condition that; $0<a_2<1$ which means that increasing marginal costs do not translate into higher prices over 1 period, some profit is sacrificed, because of price rigidity. More flexible prices are associated with higher values of a_2.

5.3 Uncovered Interest Rate Parity (UIP)

In a micro-founded model, the UIP is derived from the household utility optimisation function in an open economy with domestic and foreign bonds. This version of the UIP assumes the absence of arbitrage behavior: households must be indifferent between holding domestic or foreign bonds. Therefore, since domestic and foreign bonds are assumed to be perfect substitutes, households would react to the interest rate differential by moving funds from a low interest rate country to countries with relatively higher interest rates to maximise returns on investment. The appreciation of the domestic currency will therefore, be determined to a large degree by the differential between domestic and foreign interest rates, as indicated in the equation below

$$s_t - E_t\{s_{t+1}\} = i_t^* - i_t \quad (9)$$

Where S_t is current nominal exchange rate and $E_t\{S_{t+1}\}$ is expected nominal exchange rate one period ahead, hence $S_t - E_t\{S_{t+1}\}$ is the expected nominal exchange rate appreciation, i_t^* is foreign interest rates and i_t, is domestic interest and hence $(i_t^* - i_t)$ is the interest rate differential. This equation however, does not hold empirically as financial markets in less developed countries are typically undeveloped, illiquid and hence much riskier. In a macro model, the UIP is modified to include a wedge that is interpreted as a country risk premium.

$$s_t = E_t\{s_{t+1}\} + (i_t^* - i_t + prem_t)\,/\,4 + \varepsilon_t^s \quad (10)$$

Where $prem_t$ is the risk premium and ε_t^s is the exchange rate shock. This version of the UIP

models the relationship between current domestic nominal exchange rate and the expected exchange rate movement, interest rate differential and risk premium, under a full inflation targeting monetary policy framework with a flexible exchange rate regime and perfect capital mobility. Intuitively, changes in the interest rate differential $(i_t^* - i_t)$ move the current exchange rate as capital flows in and out of the domestic financial market.

5.4 Interest Rate Reaction Function/Taylor Rule

The policy rule closes the model, thus it ensures unique equilibrium after any form of disturbance or shock to short term model dynamics. In particular, the rule suggest that

$$i_t = \delta\pi_t + v_t \tag{11}$$

Where δ is the parameter that guides the response of interest rates to changes in inflation. According to the Taylor principle $\delta > 1$, which implies that; in response to an increase in inflation, the nominal interest rate must increase by a magnitude sufficient enough to induce an increase in the real interest rate (RIR) which affects the output gap (through real monetary conditions) and hence inflation through real marginal costs (output gap). Otherwise, the inflationary shock that is met with a small change in i_t and implies a lower RIR, will create an "inflationary spiral".

The most common Taylor rule entails also, policy response to the deviation of actual output from its potential level or long run trend (output gap), given as

$$\hat{\imath}_t = \delta_\pi\pi_t + \delta_{\hat{y}}\hat{y}_t + v_t \tag{12}$$

An extension is the forward looking Taylor Rule, in which policy responds not to current inflation but to forecast inflation, which makes policy more forward-looking.

The central bank policy reaction function is an extension of the forward looking Taylor rule, in which policy respond not to forecast inflation, but rather to the deviation of forecast inflation from the central bank inflation target.

$$i_t = g_1 i_{t-1} + (1 - g_1)(i_t^n + g_2(E_t\{\pi_{t+N}\} - \pi_{t+N}^T) + g_3\hat{y}_t) + \varepsilon_t^i \tag{13}$$

Where g_1 is the smoothing parameter of past policy rate i_{t-1}, which accounts for "wait-and-see" behavior in policy making. Thus, central banks generally avoid too aggressive and abrupt changes in the policy rate. Parameter g_2 is for the deviation of inflation from its target which is guided by the Taylor Principle that $g_2 > 1$, i_t^n is the Policy Neutral Rate and ε_t^i is policy shock. i_t^n is the rate consistent with a closed output gap and inflation being on its target; i_t^n is defined as;

$$i_t^n = \bar{r}_t + E_t\{\pi_{t+N}\} \tag{14}$$

Where $\bar{r}_t$ is the real interest rate trend and π_{t+N} is the inflation target.

The central bank policy reaction function simply describes how the interest rate should be adjusted if forecast inflation is off-target and output is off its long-term equilibrium. The rate is adjusted such that the predicted inflation hits the target, hence the reaction function targets the inflation forecast (which then becomes a nominal anchor).

5.5 Adjusting the Model Structure for a Fixed Exchange Rate Regime

While there is a vast number of exchange rate regimes employed by individual member states in the SADC region, all these regimes, however, have features or attributes that have a close resemblance to the two mainstream exchange rate regimes, being the flexible and fixed exchange rate regimes. The model used in this study therefore, simplify the exchange rate regimes employed in the region to these two mainstream regimes. The model for the SADC countries operating a flexible exchange rate regime is structured in the manner described by equations 1 to 14.

Based on the principle that a central bank cannot simultaneously target the exchange rate and inflation on the back of a free capital mobility environment, it therefore implies that, in fixing the exchange rate, the central bank loses autonomy to adjust interest rates in isolation from movements in foreign interest rates as well as the independence to set an explicit inflation target. To reflect these restrictions, the UIP and central bank reaction function are adjusted accordingly.

First, a fixed exchange rate implies that

$$E_t\Delta S_{t+1} = \Delta\bar{s}, \text{ and } E_t\Delta S_{t+1} = 0 \tag{15}$$

Therefore, the nominal exchange rate is not determined by the UIP equation in this case.

Secondly, lack of central bank autonomy on interest rate decisions implies that the central bank reaction function has to be expanded to include the UIP (which captures movements in the foreign interest rates). In this case, the policy rate is therefore partly foreign determined (by the UIP) and domestically determined by the Taylor rule as shown below.

$$i_t = h_1[E_t\Delta s_{t+1} + i_t^* + prem_t] + (1-h_1)[g_1 i_{t-1} + (1-g_1)(i_t^n + g_2(E_{t+1}\pi_{t+3} - \pi^T)\, g_3\hat{y}_t] + \varepsilon_t^i \quad (16)$$

Thirdly, the inflation target is implicitly determined by the exchange rate target through the relative Purchasing Power Parity (PPP) function below.

$$\bar{\pi} = \Delta\bar{s} + \bar{\pi}^* - \Delta\bar{z} \quad (17)$$

Where $\bar{\pi}$ is domestic inflation target, $\bar{s}$ is exchange rate target, $\bar{\pi}^*$ is foreign inflation target, $\bar{z}$ is real effective exchange rate trend.

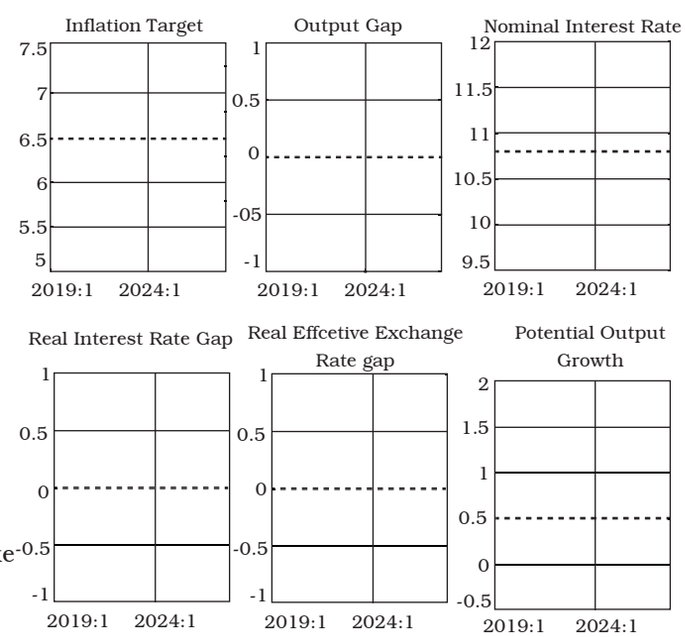
Data and Measurement of Variables

The study uses data for SADC countries from the World Bank data portal and Bloomberg on; consumer price index (CPI), real gross domestic product (GDP), real effective exchange rate (REER), nominal exchange rate, nominal interest rates, real interest rates, foreign output (US, Euro and China), and world oil and food prices. To control for the dominance of the South African economy in the SADC region, the SADC region assumes two identities in this study;

(a) SADC-With-SA: measured as the economic size or GDP weighted average of all variables used in the study for all the 16 SADC member states. This SADC identity is modeled under a flexible exchange rate regime since SADC countries operating this regime constitute approximately 70 percent of the entire economic size of the region. The weights of the countries and the model properties of SADC-With-SA are provided below. The model properties are calibrated in line with the most recent observations of actual data presented in Figure 1.

FIGURE 2: SADC-WITH-SA

	Weights (%)	Exchange Rate Regime	Long-Rung Equilibrium Model Properties
Angola	13.9	Managed float	
Botswana	2.2	Crawling peg	
Comoros	0.1	-	
DRC	4.1	Convectional peg	
Lesotho	0.4	Convectional peg	
Madagascar	1.4	Floating	
Malawi	1.2	Convectional peg	
Mauritius	1.7	Floating	
Mozambique	1.9	Floating	
Namibia	1.9	Conventional peg	
Seychelles	0.2	Floating	
South Africa	58.5	Floating	
Eswatini	0.7	Conventional peg	
Tanzania	5.9	Free Floating – craw like	
Zambia	3.6	Floating	
Zimbabwe	2.3	Floating	

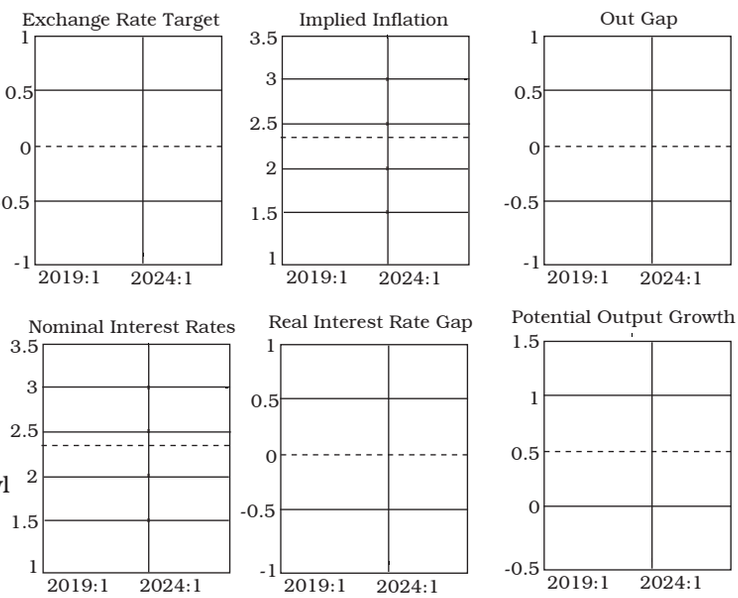


Source: IMF annual report on Exchange arrangements and Exchange Restrictions 2019

(b) SADC-Without-SA: measured as the economic size or GDP weighted average of all variables used in the study for all the SADC member states, excluding South Africa. This SADC identity is modeled under a fixed exchange rate regime since SADC countries operating this regime constitute approximately 80 percent of the entire economic size of the region, when South Africa is excluded from the analysis. The weights of the countries and the model properties of SADC-Without-SA are provided below. As is the case with the SADC identity above, the model properties for SADC- Without-SA are calibrated in line with the most recent observations of actual data.

FIGURE 3: SADC-WITHOUT-SA

	Weights (%)	Exchange Rate Regime	Long-Run Equilibrium Model Properties
Angola	33.6	Managed float	
Botswana	5.4	Crawling peg	
Comoros	0.4	-	
DRC	9.8	Conventional peg	
Lesotho	1.0	Conventional peg	
Madagascar	3.4	Floating	
Malawi	2.8	Conventional peg	
Mauritius	4.0	Floating	
Mozambique	4.5	Floating	
Namibia	4.7	Conventional peg	
Seychelles	0.4	Floating	
Eswatini	1.7	Conventional peg	
Tanzania	14.2	Free floating – crawl like	
Zambia	8.6	Floating	
Zimbabwe	5.6	Floating	

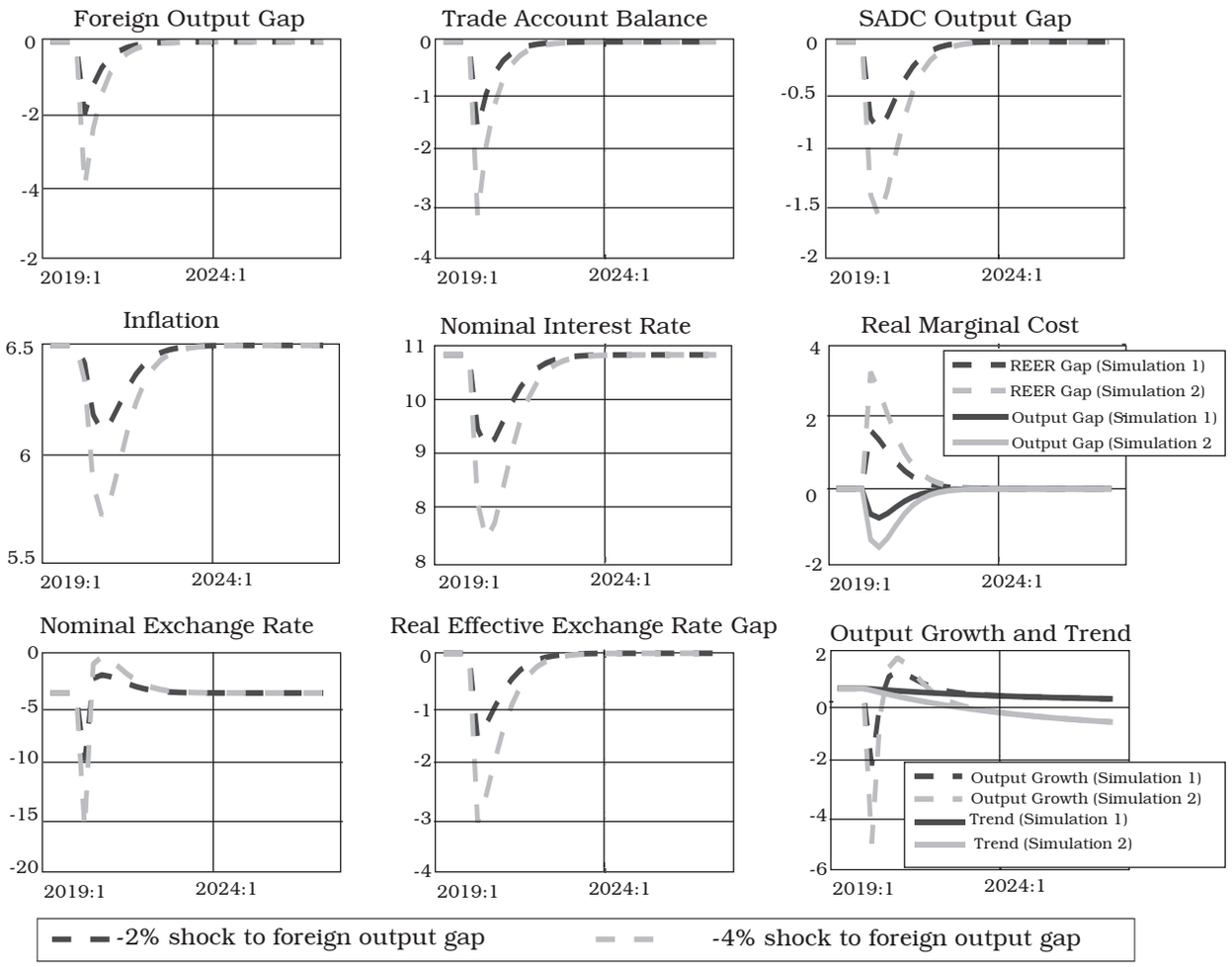


Source: IMF annual report on Exchange arrangements and Exchange Restrictions 2019

6. MODEL SIMULATIONS RESULTS

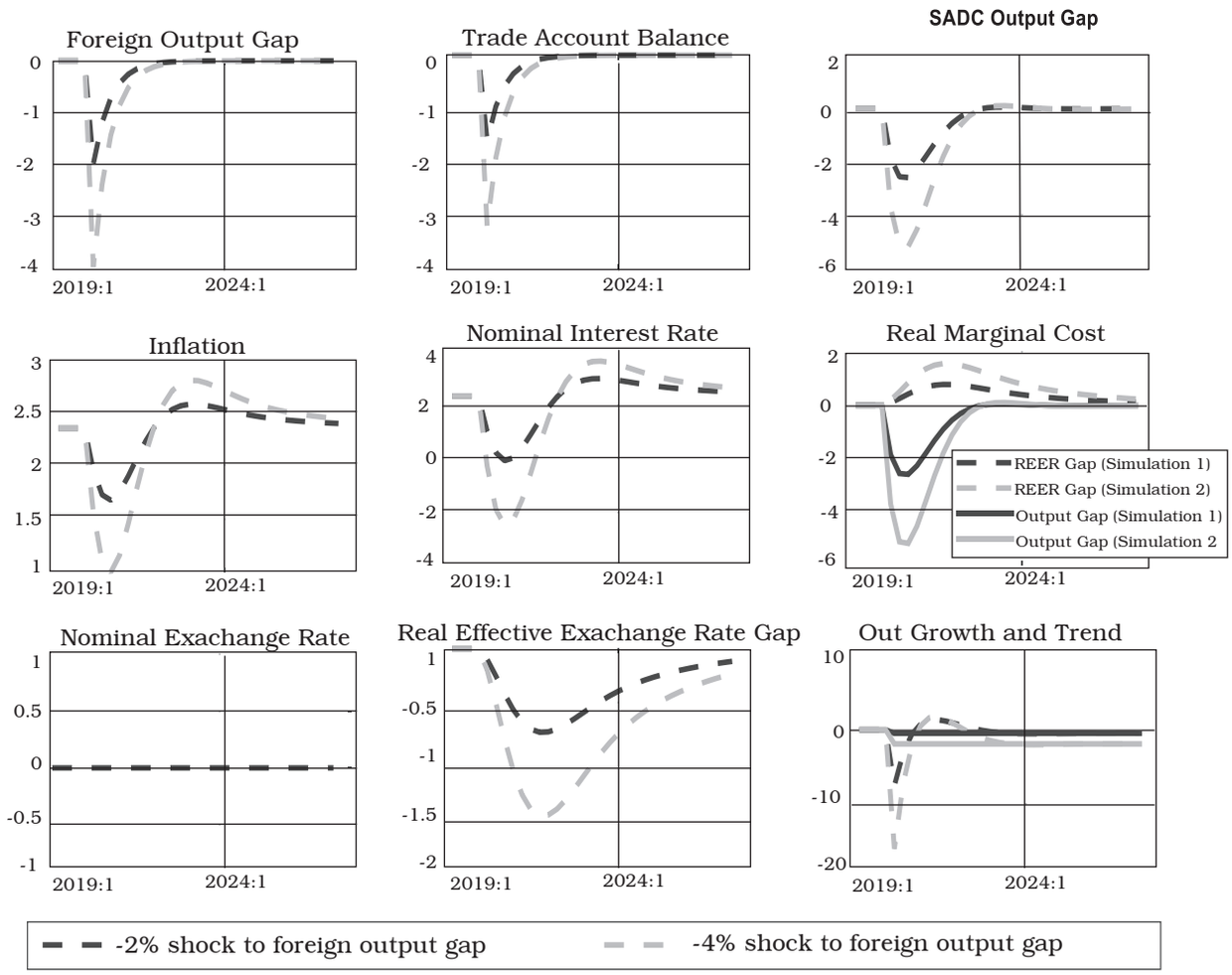
The potential impact of the escalation in the trade war on the SADC region is quantified under different assumptions pertaining to the extent to which the war will affect global output, SADC trade flows and its overall macroeconomic wellbeing. Two main shocks are applied to foreign output gap to observe how the impact propagates through the SADC macroeconomic fundamentals of interest in the study. The first simulation assumes the escalation in the trade war will lead to a fall in global output by half the magnitude observed during the 2008/09 GFC. A shock of negative 2 percentage point is applied to foreign output gap in this simulation. The second simulation assumes a full-scale trade war, in which global output is anticipated to fall by the same magnitude observed during the 2008/09 GFC. A shock of negative 4 percentage points is applied to foreign output gap.

FIGURE 4: SHOCK TRANSMISSION – SADC-WITH-SA



The fall in the foreign output gap leads to subdued demand for SADC exports. SADC exports therefore decline and total output falls below its potential level. The impact is more severe for a full-scale trade war scenario, where SADC output gap falls by almost -1.5 percentage points. Disinflationary pressures from the negative output gap push headline inflation below its target of 6.5 percent, to approximately 6.2 percent for the 2 percentage points fall in foreign output gap simulation and 5.7 percent for the -4 percentage points simulation. Nominal and real interest rates therefore, decrease to boost economic activity and drive inflation back to target. The low interest rates environment in the SADC region and high market risk aversion on developing and emerging markets financial assets (given the global economic recession) triggers depreciation in SADC's nominal and real exchange rates. The depreciation helps, somewhat, to boost the competitiveness of the region's exports, particularly export services such as tourism (which is one of the principal economic sectors in many countries across the region and, hence, expedite economic recovery. On the supply side, the depreciation in the nominal exchange rate and the fall in the differential between SADC and foreign inflation will lead to a rise in real marginal cost of imported commodities or depreciation of the real exchange rate gap. The increase in real marginal costs helps to mitigate the disinflationary impact of the fall in SADC output gap and it also provides upward inflationary impetus necessary to swiftly drive inflation to target in the medium term. The SADC economy glides back to equilibrium (full scale recovery) within a space of 3 years; inflation reverts to target and all the gaps are closed. The shock however, as was the case with the 2008/09 GFC has a permanent impact on the long run growth potential of the SADC economy, potential growth falls from 0.5 percent to around -0.5 percent within 5 years.

FIGURE 5: SHOCK TRANSMISSION – SADC-WITHOUT-SA



For this model, the nominal effective exchange rate is fixed and hence the inflation target is implicitly determined by the nominal exchange rate target, real effective exchange rate trend and foreign inflation target, from the purchasing power parity function, equation (17) in the methodology section of the paper. SADC's inflation target implied by these economic fundamentals is 2.4 percent.

The propagation of a negative shock on foreign output is similar to the one discussed above, for a flexible exchange rate model. The difference between the two models emanates largely from the real exchange rate movements triggered by the shock. For this model, the depreciation in SADC's real exchange rate induced by a negative shock to foreign output gap is marginal. This is mainly because the nominal effective exchange rate is fixed (does not change or the changes, if any, are negligible) and therefore, movements in the real exchange rate are almost entirely coming from the inflation differential. As such, the fall in output gap and inflation for these SADC countries is relatively steeper and economic recovery takes quite longer. In these simulations, SADC output gap is predicted to fall by -2 percentage points and -5 percentage points from a 2 percentage points and 4 percentage points negative shock to foreign output gap, respectively. The fall in output gap dampens headline inflation to around 1.8 percent and 1 percent respectively, for the two simulations.

The effects of the shock take a protracted length of time to dissipate because transmission to restore long term equilibrium state is largely through a single channel, being the interest rate channel. However, similar to the flexible exchange rate model, potential output growth is permanently suppressed after the shock, potential growth falls from 0.5 percent to around -0.8 percent in a space of 5 years. Meanwhile, foreign exchange reserves of SADC countries operating this exchange rate regime may also come under severe stress mainly due to the fall in export earnings, which is the primary source of foreign exchange for most of these countries. It is therefore, highly probable that exchange rate policy formulation and implementation for SADC countries

which rely heavily on foreign exchange reserves to support their fixed exchange rate systems may be a bit challenging, especially given that the current economic and health shock (caused by the COVID-19 pandemic) may necessitate excessive drawdowns in reserves by some member states to supplement their budgets in cushioning livelihoods, improving public health systems and supporting distressed industries in the economy.

7. CONCLUSION AND RECOMMENDATIONS

This paper assessed the potential macroeconomic impact of the escalation in the US-China trade war on the SADC region and used the New Keynesian model for a small open economy to quantify the impact. The key finding of the paper is that the escalation of the trade war will have detrimental macroeconomic ramifications for the region. The effects vary with the estimated severity of the impact of the war on global output; the worst- case scenario being a full-scale trade war which is postulated to have the same impact on global output as the 2008/09 global financial crisis. SADC countries operating a flexible exchange rate regime are, however, not acutely impacted as those operating fixed exchange rate regimes. For counties operating flexible exchange rate systems, the depreciation in their nominal effective exchange rate helps to partially mitigate the dampening effects of the war on the regions' output and inflation. Fixed exchange rate countries, however, do not have the privilege of a free moving nominal effective exchange rate; the impact is therefore more pronounced for these countries. Exchange rate policy implementation for SADC countries which rely heavily on foreign exchange reserves to support their fixed exchange rate systems may also be a bit challenging as export earnings deteriorate with subdued foreign demand. This deterioration in foreign exchange earnings is compounded by the low returns from investment of official foreign exchange reserve as all currencies in which most SADC countries invest have depreciated significantly against the USD since the start of the trade war and more profoundly after the outbreak of Covid-19.

In the long run however, the economic potential of all SADC countries, irrespective of the exchange rate framework employed, is significantly dampened. Opportunities for intra-regional trade diversions with evenly distributed benefits are also somewhat indiscernible (especially in the short term) given the region's current intra-regional trade patterns, presented in Section 3 of the paper. Regarding interest rates intervention, even though both models recommend an interest rate cut for all the simulations, this policy action should however be weighed against the build-up of financial vulnerabilities that comes with keeping interest rates too low for a long period of time. Thus, policy intervention should be applied with caution, particularly in the context of the possibility of a 'cease fire' agreement between the two countries at war, which may reverse all the macroeconomic consequences predicted in this paper.

Nonetheless, irrespective of how the war manifests, be it escalation or a 'cease fire' agreement, this paper advises that SADC countries should strive to deepen and strengthen intra-regional trade, with evenly distributed benefits across all the member states. This will foster regional industrial development, boost the region's deteriorating productive capacity (potential output growth) and also limit the region's macroeconomic exposure to foreign political and economic developments. This can be achieved through development of strong and deeply integrated regional value chains with the capacity to fully transform the region's resource-intensive exports into finished products of high value. This will first and foremost limit the region's exposure to foreign political and economic developments that threatens to undermine the region's economic progress. Furthermore, efficient and deeply integrated value chains will immensely enlarge the regional market, attract foreign investment and draw significant trade relocations to the region. Such inflow of FDI will help to avail the skills, technology and financial capital necessary to foster regional infrastructural and industrial development, support the region's employment creation endeavours and enhance the pace of convergence for most the member states to the SADC macroeconomic targets.

Therefore, in addition to existing regional trade agreements, SADC should develop a regional industrial development policy/strategy that will encapsulate all the dynamics discussed above and facilitate the course to strong and deep regional trade integration. The policy should comprehensively outline how the process of value addition of SADC exports can be efficiently regionalised with wide-spread gains across the region. The policy should also establish ways to address deficiencies identified in past CCBG studies as major impediments to regional trade integration and the inflow of FDI. These should include, ways to improve transportation and communication infrastructure to overcome geographical barriers; pragmatic measures to remove trade barriers to ensure smooth and free cross boarder movement of goods and services, and ways to simplifying and harmonising administrative

requirements for business registration, licensing and work permits for foreign workers. Furthermore, the policy should identify opportunities the region can harness from the impending African Continental Free Trade Area[9] and provide ways for the region to strategically position itself for such opportunities.

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9 African Continental Free Trade Area is an African Union initiative which will be the world's largest free trade area by number of countries once it is fully operational.

POSTSCRIPT

Below is a timeline of events that have taken place ever since the paper was written in 2020 at the height of the US-China trade war:

APPENDIX

MODEL PROPERTIES

Description	Parameter	Steady State/Target
Output Gap		
Persistence	0.65	-
Real interest rate gap	0.3	-
Real exchange rate gap	0.3	-
Foreign output gap	0.7	-
Inflation (Philips Curve)		
Past inflation	0.4	-
Expected inflation	0.55	-
Output gap	0.35	-
Real exchange rate gap	0.2	-
Policy Rule		
Persistence	0.65	-
Policy neutral rate	0.35	-
Deviation of expected inflation from target	1.75	-
Output gap	0.2	-
Inflation target	-	6.5
Nominal interest Rate	-	10.8
Long-Term Trends		
AR(1) process for real interest rate trend	0.85	4.3
AR(1) process for real exchange rate trend	0.6	0.5
AR(1) process for potential output growth	0.9	0.5
Foreign/External Sector Target		
AR(1) process for foreign output gap	0.6	-
AR(1) process for foreign inflation	0.3	2
AR(1) process for foreign interest rates	0.9	1.6
Fixed Exchange Rate Model (SADC without South Africa)		
Nominal exchange rate target	-	0
Implied Inflation	-	2.4
Nominal interest rate	-	2.4
Real interest rate trend	0.85	0
Real exchange rate trend, AR(1) process	0.7	-1.05
Foreign inflation target (South Africa - 60 percent and US - 40 percent)	-	3.5

Notes:

I. Parameterisation based on estimations/calibration in line with economic theory and trends exhibited by data.
II. Parameters set to satisfy the long-term properties of both classifications or identities of the regional economy.
III. A number of shocks were considered to determine the behaviour of the model after parameterisation.

Impact of Selected Macroeconomic Variables on Economic Growth in Botswana: An ARDL Approach

Malebogo Ntsosa and Basimane Powder[10]

ABSTRACT

This paper investigated macroeconomic variables that affect economic growth in Botswana, employing quarterly time series data from 2000 to 2020. Using the autoregressive distributed lag (ARDL) model, the paper finds that inflation, interest rates, money supply and trade openness influence domestic economic growth. Inflation and interest rates have a negative relationship with economic growth while money supply and trade openness exert a positive impact on output growth. Furthermore, the influence of these variables was found to hold on both short and long-term basis.

1. INTRODUCTION

Investigating factors influencing economic growth is an important research area, but there is little consensus on the variables that uniquely influence growth (Odhiambo and Chirwa, 2016). The analysis of economic growth theory can be traced back to the work of Schumpeter (1934) who postulated that innovation and creativity of entrepreneurs determined economic growth and development. The theory of economic growth has since received a lot of attention and later developed by several other theorists (Lewis, 1954; Kuznets, 1955 and 1976; Rostow, 1960 and 1971), and summarised by Pietak (2014).

According to theory, economic growth of any country is influenced by various factors that change over time. Thus, different economic growth models have been developed to capture the variety and dynamics of these factors (Pietak, 2014). Work by Solow and Swan (1956) developed the neoclassical growth model, advocating for the importance of the accumulation of physical capital development as an important factor in the short run, and technological advancement as a growth determinant in the long run. Mankiw *et al.* (1992) later augmented the Solow-Swan model by including accumulation of human capital as one of the factors to consider. The post-Keynesian demand-driven model revealed that investment and savings are important determinants of growth and development. This finding was later supported by the vast empirical literature, (for example, Fischer, 1992; Agrawal, 2000; Mohan, 2006), while Odhiambo and Chirwa (2016) highlighted that factors affecting the efficiency of savings and investment are important determinants of economic growth.

The endogenous growth theorists (Romer, 1986 and 1990; Stokey, 1995) postulated that improvements in productivity are linked to faster innovation and more investment in human capital and advocated for the government and private sector to nurture innovative initiatives and to offer incentives such as research and development funding to promote creativity among individuals and businesses. Meanwhile, recent literature emphasises the importance of macroeconomic stability and predictive value of macroeconomic variables on economic growth (Fischer, 1992; Barro, 1990; Bleaney, 1996; Sanchez-Robles, 1998). Just like in other economies, Botswana considers different macroeconomic variables in influencing economic growth and development. This study focuses on five macroeconomic variables, namely, the exchange rate, inflation, interest rate, money supply and trade openness to determine their impact on growth. The choice of these variables is influenced by data availability and frequent mention in the literature.

Meanwhile, Botswana has experienced positive economic growth during most of the review period (from 2000 to 2020) influenced by, among others, a combination of prudent management of natural resource revenues, particularly from diamonds, and sound implementation of macroeconomic policies. For example, the country, through the central bank (the Bank), undertakes prudent monetary policy with the objective of achieving price stability (low, predictable and stable inflation). Stable prices help attain the national objective of sustainable economic growth through promoting savings and investment and enhancing international competitiveness of domestic producers (Monetary Policy Statement, 2012). The Bank uses the Monetary Policy Rate as a monetary policy instrument.[11]

10 Senior Economists, Money and Financial Markets Unit and National Economics Unit, respectively, Research and Financial Stability Department. The views expressed in this paper are those of the authors and do not necessarily reflect those of Bank of Botswana.

11 Effective April 28, 2022, the Bank Rate has since been replaced by the Monetary Policy Rate, following implementation of monetry policy reforms.

This study contributes to the empirical literature on growth determinants using the autoregressive distributed lag (ARDL) bound model and employing quarterly time series data from 2000 to 2020.

This paper is divided as follows. Section 2 discusses the empirical literature; Section 3 highlights the variables of interest; Section 4 covers data description and methodology; Section 5 presents empirical results and Section 6 concludes.

2. LITERATURE REVIEW

Mbulawa (2015a) studied the effect of macroeconomic variables (trade openness, foreign direct investment (FDI) and inflation) on economic growth in Botswana, using annual data from 1975 to 2012. The study employed the Vector Error Correction Model (VECM) and Vector Auto-Regression techniques and found that FDI and inflation had important influences on economic growth (the signs of coefficients were both positive). The key driver of economic growth was reported as its previous performance, explaining about 89 percent of variations. The study concluded that causality was unidirectional, moving from economic growth to FDI and from gross fixed capital formation to GDP growth. The study recommended that low inflation within the 3 – 6 percent target should be maintained and high levels of FDI are vital for economic growth in Botswana.

Sentsho (2000) conducted a study of export revenues as a determinant of economic growth in Botswana, with the main objective of assessing whether export revenues derived from an 'enclave sector', such as the case of mining in Botswana, led to positive economic growth of the country. The paper used an Aggregate Production Function Model to test the causal relationship between exports and economic growth using annual data from 1976 to 1997. The results indicated that primary export revenues led to positive and significant economic growth in Botswana.

Other studies have conducted causality tests as well as examined the influence of single variables on economic growth in Botswana. This includes the study by Malefane (2020) which pointed to the significance of total trade and exports in promoting economic growth in Botswana using annual time-series data for Botswana from 1975 to 2014. Furthermore, using annual data between 1975 and 2016, Phiri and Mothuti (2018) found that exports and the exchange rate are correlated with steady-state GDP growth, while Koitsiwe and Adachi (2015) using quarterly data from 1994 to 2012, concluded that exchange rate granger caused economic growth.

Mbulawa (2015b), using time series data for Zimbabwe from 1975 to 2012, studied the link between economic growth and four macroeconomic variables, namely, FDI, volume of trade, inflation and capital accumulation. By employing the VECM approach, the study suggested that inflation and trade openness had significant negative and positive impact on economic growth, respectively.

Examining the long-run macroeconomic factors influencing economic growth in Ghana, Samuel *et al.* (2013) used the Johansen approach to cointegration, employing annual data from 1980 to 2010. The study found a cointegrating relationship between real GDP per capita (used as proxy to economic growth) and physical capital, labour force, FDI, inflation and government expenditure.

Enu *et al.* (2013) studied the macroeconomic determinants of economic growth in Ghana using annual data for the period 1970 to 2011, by applying the Johansen method of cointegration. Physical capital and foreign aid were found to have a positive effect on growth in real GDP per capita. In the long run, physical capital, labour force, FDI, foreign aid, consumer price index (CPI), government expenditure and military rule were found to be important determinants of growth in real GDP per capita. FDI and government expenditure were found to be the determinants of economic growth in real GDP per capita terms in the short run. Moreover, the results showed that there was a uni-directional causality between labour force and physical capital, physical capital and FDI, foreign aid and physical capital, physical capital and CPI, physical capital and military rule, labour force and FDI, CPI and labour force, FDI and foreign aid. Bi-directional causality was established between CPI and FDI.

Based on a panel data of 19 Sub-Saharan African (SSA) countries for the period 1982 to 2000, Ndambiri *et al.* (2012) analysed the determinants of economic growth in the region, using Generalised Method of Moments (GMM). The study found that physical capital formation, a vibrant export sector and human capital formation significantly contributed to economic growth. On the other hand, government expenditure, the nominal discount rate and foreign aid were found to be inversely related to economic growth.

Khungwa (2007) analysed the determinants of economic growth in Malawi. The study employed a growth framework that followed the Cobb-Douglas

production function, using annual data from 1970 to 2003. The study found that terms of trade, openness, and human capital have a significant effect on economic growth in Malawi.

Ghura and Hadjimichael (1996) investigated long-run growth in SSA using quarterly data for 1981 to 1992. Using feasible generalised least squares techniques on a panel of 29 SSA countries, (employing the following variables: private investment, government investment, inflation, human capital development and public policies), the study found support for conditional convergence. Both private and government investment were found to have a positive and significant impact on long-run economic growth.

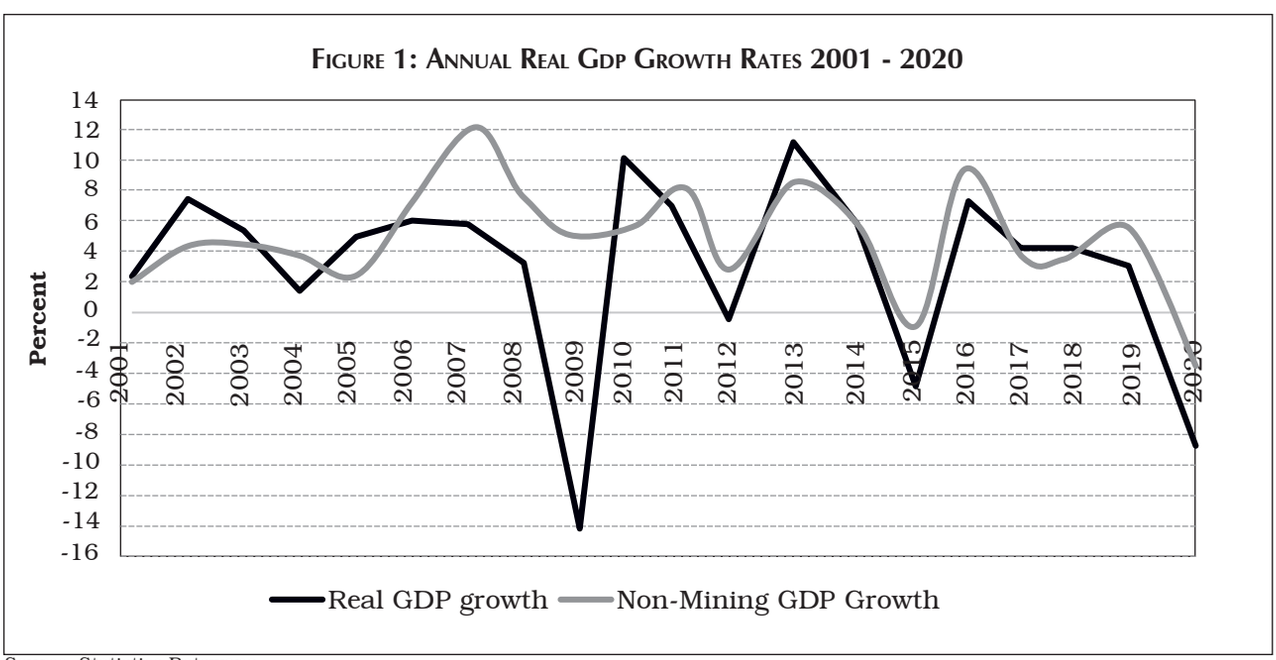
3. BACKGROUND TO BOTSWANA'S ECONOMIC GROWTH AND THE SELECTED MACROECONOMIC FACTORS

3.1 Economic Growth

Botswana has experienced significant economic transformation since independence in 1966 from a least developed country to a middle-income status. The country has generally recorded positive real Gross Domestic Product (GDP) growth over the years (Figure 1), attributable to, among others, sound macroeconomic policies, good governance and prudent management of the diamond revenues.

However, in 2009, 2012, 2015 and 2020, the economy contracted by 14.1 percent, 0.2 percent, 4.9 percent and 8.7 percent, respectively. The economic contraction of 2009 emanated from the 2008/9 global financial crisis[12], while for 2015, the decline was primarily attributable to the weakened mining sector, as a result of reduced international demand for diamonds and relatively low domestic copper/nickel production. Meanwhile, the contraction of output in 2020 resulted from the decline in both the mining and non-mining sectors, resulting from the negative impact of the COVID-19 pandemic containment measures.

FIGURE 1: ANNUAL REAL GDP GROWTH RATES 2001 - 2020



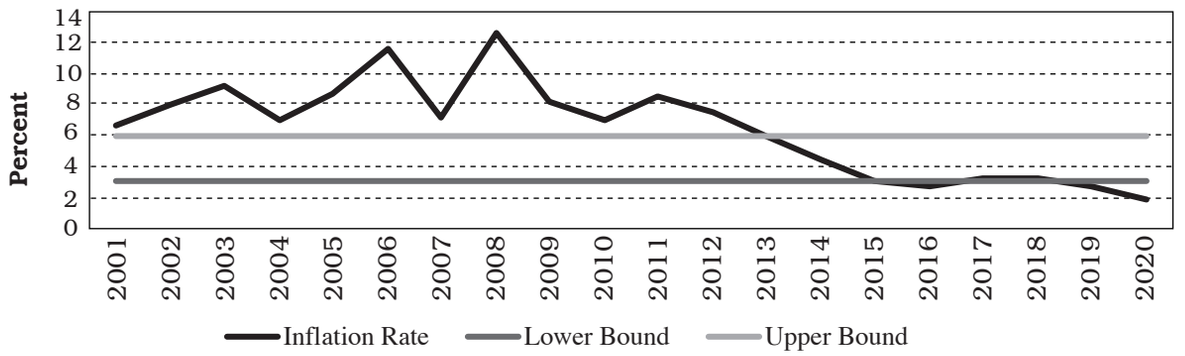
Source: Statistics Botswana

3.2 Inflation

The primary objective of the Bank's monetary policy is to achieve price stability, which is defined as a sustainable level of inflation that is within the medium-term objective range of 3-6 percent. With low, stable and predictable inflation, the broader national objectives of economic diversification and sustainable economic growth and development are met through the utilisation of savings to finance productive investments, (Bank of Botswana Annual Report, 2012). Lower levels of inflation may also increase the country's international competitiveness, by making its exports relatively cheaper (this holds when Botswana's inflation rate is lower than that of its trading partners), hence impacting positively on balance of payments.

12 The 2008/9 global financial crisis lowered the international demand for Botswana's diamonds, which caused the balance of payments to deteriorate, eventually reducing government revenues from the mining sector, in turn leading to larger current account and budget deficits.

FIGURE 2: ANNUAL CONSUMER PRICE INFLATION IN BOTSWANA (2001) - 2020)



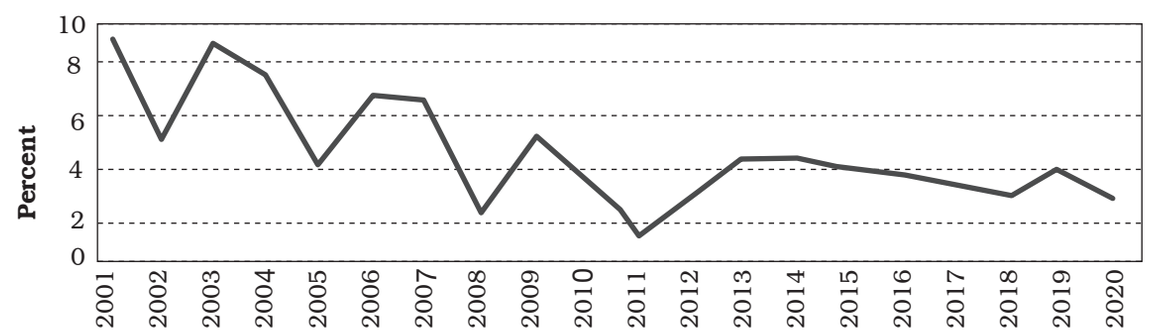
Source: Statistics Botswana

Following the adoption of a forward-looking monetary policy framework in 2008, inflation trended downwards, falling within the 3 – 6 objective range in 2013 (Figure 2). Inflation became less volatile, remaining within the objective range for most of the time, and was slightly below the lower bound of the objective range in 2016, 2019 and 2020, mainly because of downward adjustment of administered prices.

3.3 Interest Rates

The Bank uses the Monetary Policy Rate to affect demand conditions in the economy and influences the rate of price increases (inflation) in pursuit of price stability. Figure 3 depicts larger changes in real prime rate (from 2001 to 2020), which is indicative of the variability in inflation over the course of these years.

FIGURE 3: BOTSWANA REAL INTEREST RATE (2001 - 2020)



Source: Bank of Botswana Annual Reports

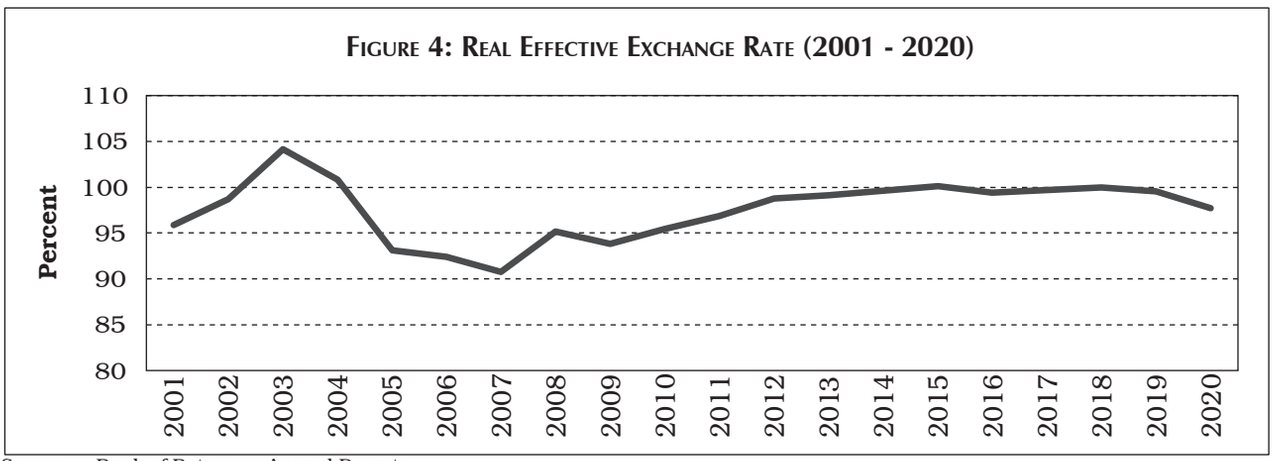
3.4 Exchange Rate

Prior to 1989, Botswana occasionally used the exchange rate as a monetary policy instrument to restrain imported inflation and preserve price stability except in 1982, 1984 and 1985 when the Pula was devalued. The strategy of using the exchange rate to combat inflation was discontinued in 1990, when it was observed that efforts to restrain increases in domestic prices by appreciating the exchange rate were not effective. The management of the exchange rate[13] remains a supportive tool for monetary policy as opposed to being a policy instrument (Setlhare, 2004). Botswana's exchange rate regime evolved from an adjustable peg to a crawling peg in 2005[14]. This regime entails small and continual adjustments of the Pula exchange rate. The crawling band aims to maintain stability of the real effective exchange rate (REER), where the rate of crawl is based on the differential between the expected average rate of inflation of trading partner countries and Botswana's inflation objective (Mpete, 2015). Figure 4 shows a stable movement of REER particularly from 2013 to 2020[15].

13 The exchange rate policy is aimed at maintaining the competitiveness of local producers of tradeable goods and services in both international and domestic markets.

14 The exchange rate of the Pula is pegged to that of its major trading partners' currencies, being the South Africa rand and International Monetary Fund's (IMF) Special Drawing Rights (SDR).

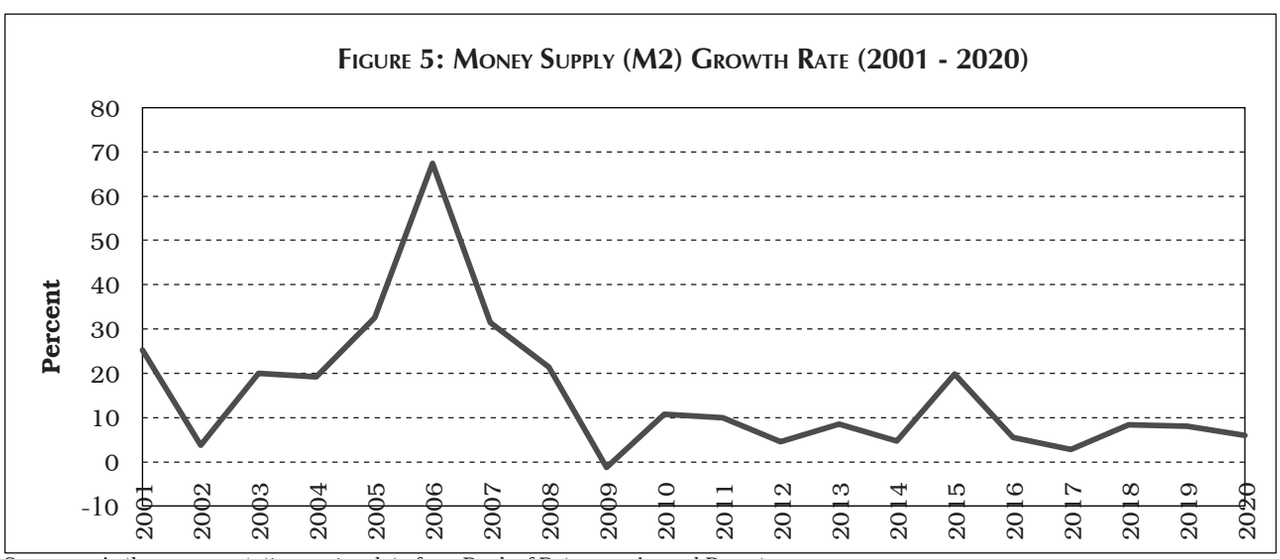
15 The upward movement of the REER is an appreciation of the exchange rate, while the downward movement shows a depreciation of the exchange rate.



Source: Bank of Botswana Annual Reports

3.5 Money Supply

Theoretically, low interest rates result in increases in money supply in the economy, leading to more consumption and lending or borrowing. In the short run, this should, but does not always, correlate with an increase in total output and spending. Figure 5 illustrates the growth of money supply (M2) from 2001 to 2020 in Botswana.

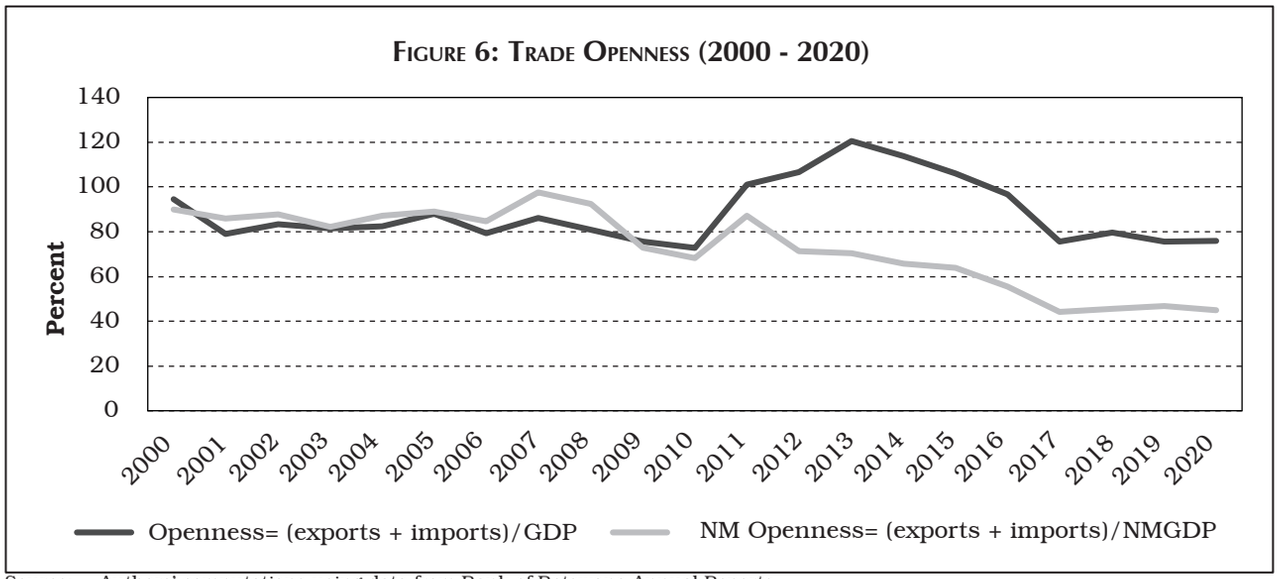


Source: Authors computations using data from Bank of Botswana Annual Reports

3.6 Trade Openness

Realising that Botswana has a small domestic market, the domestic authorities resolved to promote international trade to support economic growth. Indeed, Botswana is a member of the Southern African Development Community (SADC) and the Southern African Customs Union (SACU), and participates in the Tripartite Free Trade Area negotiations for the Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC) and SADC. Botswana remains a largely open economy with a trade-to-GDP ratio of 76 percent; exports and imports amounting to approximately 30 percent and 40 percent of GDP, respectively.

Exports of mineral products dominate Botswana's external trade pattern, with diamonds accounting for approximately 88.1 percent of total export earnings in 2020. Botswana's trade openness, measured by the ratio of exports plus imports to GDP, was relatively stable between 2000 and 2008 but declined in 2009 (Figure 6), reflecting a decline in diamond exports as a result of the global financial crisis.



Source: Authors' computations using data from Bank of Botswana Annual Reports

4. DATA AND METHODOLOGY

4.1 Variable Description and Data Sources

This study uses quarterly time series data for 2000 to 2020[16]. All data was sourced from the Bank of Botswana various publications and Statistics Botswana. The dependent variable, that is economic growth, is measured as a growth rate of the non-mining real GDP (RGDPG) and trade openness (Trd), one of the explanatory variables, is measured by the ratio of the sum of non-mining exports and imports to non-mining GDP.

Other explanatory variables are measured as follows: Inflation (inf) is measured by the year-on-year percentage change in Botswana's Consumer Price Index (CPI)[17]. Change in real interest rate (int) is proxied by the real prime rate. Broad money stock (M2) proxies money supply (MS), and the real effective exchange rate indices[18] measures the exchange rate (ER). The broad money stock and real effective exchange rate index are converted into logarithms to allow for interpretation of coefficients as elasticities.

4.2 Methodology

The study uses an ARDL approach to analyse the impact of selected macroeconomic variables on economic growth, following Tas and Orhunbilge (2014). The ARDL method has several advantages over other econometric techniques as it accommodates a variety of lag structures (Oxera, 2010), and can yield consistent estimates of the long-run coefficients that are asymptotically normal, irrespective of whether the underlying regressors are I(0) or I(1) or a combination of both[19]. ARDL relates the current and lagged effects of independent variables to the dependent variable, as well as its lagged effect. In this case, non-mining real GDP growth is expressed as a function of all current and lagged selected macroeconomic variables, including the lagged effect of itself and expressed as follows:

$$\Delta RGDPG_t = \beta_0 + \beta_1 RGDPG_{t-1} + \beta_2 Inf_{t-1} + \beta_3 Int_{t-1} + \beta_4 ER_{t-1} + \beta_5 \ln MS_{t-1} + \beta_6 \ln Trd_{t-1} + \sum_{i=1}^{\rho} \alpha_i \Delta RGDPG_{t-i} + \sum_{i=0}^{q_1} \theta_i \Delta Inf_{t-i} + \sum_{i=0}^{q_2} \phi_i \Delta Int_{t-i} + \sum_{i=0}^{q_3} \delta_i \Delta ER_{t-i} + \sum_{i=0}^{q_4} \pi_i \Delta \ln MS_{t-i} + \sum_{i=0}^{q_5} \eta_i \Delta \ln Trd_{t-i} + V_t \quad (1)$$

Where $RGDPG$ is economic growth; Inf is inflation rate; Int is the change in interest rate; ER is exchange rate MS is money supply; Trd is trade openness; Δ is the difference operator; β_0 is a constant term while β_1.....β_6 are long-run coefficients; α_i, θ_i, ϕ_i, δ_i, π_i

16 The choice of the sample period is influenced by the data availability of one of the selected macroeconomic variables adopted in this study, the real effective exchange rate, which is only captured from 2000.

17 The monthly CPI series was transformed into a quarterly index by computing the average for three-month period.

18 Defined as the trade-weighted exchange rate of the Pula against a fixed basket of currencies, after adjusting for inflation in the different trading partners and Botswana.

19 The Phillips Peron (PP) unit root technique is adopted in this study to test for the order of integration of the variables, taking into account both their trending and non-trending behaviour.

and η_i are short-run coefficients; $\rho, q_1, q_2 \cdots q_5$ represent the optimal number of lags selected for the ARDL model by the Akaike Information Criterion (AIC); and V_t is the error term.
Short-run and long-run relationships of the variables are derived from equation (1).

The short-run restricted error correction equation of the model is obtained by estimating the association between non-mining real GDP growth and the optimal-lagged selected macroeconomic variables and optimal-lagged dependent variable as one of the independent variables.
Therefore, the short-run restricted error correction model becomes:

$$\Delta RGDPG_t = \beta_0 + \varpi ECT_{t-1} + \sum_{i=1}^{\rho} \alpha_i \, \Delta RGDPG_{t-i} + \sum_{i=1}^{q_1} \theta_i \, \Delta Inf_{t-i} + \sum_{i=1}^{q_2} \varphi_i \, \Delta Int_{t-i} + \sum_{i=1}^{q_3} \delta_i \, \Delta ER_{t-i} + \sum_{i=1}^{q_4} \pi_i \, \Delta lnMS_{t-i} + \sum_{i}^{q_5} \eta_i \, \Delta lnTrd_{t-i} + e_t \quad (2)$$

Where ϖ is the coefficient of the error correction term (ECT) and measures the speed of adjustment to the long-term equilibrium. It is required that the coefficient of the error correction term should be negative and significant, allowing for the variables to adjust in the subsequent period for the long-term equilibrium to be restored. ECT_{t-1} is the error correction term lagged one period, obtained from the ordinary least square (OLS) residuals (V_t) in equation (1).

The study adopts the ARDL Bounds test to check for the long-run association between non-mining real GDP growth and the selected macroeconomic variables. This is achieved by imposing equality to zero on all estimated coefficients of lagged level variables. That is, the null hypothesis of

$\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ is tested against the alternative hypothesis

$\beta_1 \neq 0, \beta_2 \neq 0, \beta_3 \neq 0, \beta_4 \neq 0, \beta_5 \neq 0, \beta_6 \neq 0$

The long-run model is:

$$RGDPG_t = \beta_0 + \beta_1 RGDPG_{t-1} + \beta_2 Inf_{t-1} + \beta_3 Int_{t-1} + \beta_4 ER_{t-1} + \beta_5 \ln MS_{t-1} + \beta_6 \ln Trd_{t-1} + V_t \quad (3)$$

The residuals of the estimation are then tested for serial correlation using the Lagrange Multiplier (LM) test to detect any dynamic misspecification. Serial correlation in the error term causes OLS statistics to be invalid for testing purposes, but does not affect consistency (Wooldridge, 2002). The presence of serial correlation leads to biased variance of coefficients, inefficient forecasts and invalidly high R^2. Furthermore, model stability is an important requirement for prediction and economic inference (Hansen, 1992) and hence it is tested for, using the Cumulative Sum of Recursive Residuals (CUSUM) test.

5. PRESENTATION OF ESTIMATION RESULTS

This section presents and discusses the results of the various tests applied.

5.1 Unit Root Test Results

The first step in the estimation process involves detecting the presence of a unit root to determine the appropriate modelling technique for analysis. All variables were tested using the Augmented Dickey Fuller (ADF) and Phillips Peron (PP) unit root tests. The results of the tests are presented in Table 1, using critical values at the 5 percent significance level. The null hypothesis of the existence of a unit root on the non-mining real GDP growth variable is rejected. Likewise, the inflation and interest rate variables are determined to be stationary based on the PP test. On the other hand, the rest of the explanatory variables are I(1) considering their trending and non-trending behaviour.

TABLE 1: UNIT ROOT TEST RESULTS USING ADF AND PP TESTS

	ADF Test				PP Test			
	With Trend		Without Trend		With Trend		Without Trend	
Variables	Level	First difference	Level	First difference	Level	First difference	Level	First difference
RGDPG	0.0017*		0.2632	0.0000*	0.0025*		0.0033*	
Inf	0.4828	0.0000*	0.2785	0.0000*	0.1426	0.0001*	0.2350	0.0000*
Int	0.7752	0.0000*	0.0421*		0.0138*		0.1593	0.0000*
ER	0.2517	0.0000*	0.7228	0.0000*	0.2324	0.0000*	0.7286	0.0000*
MS	0.9558	0.0034*	0.9974	0.0102*	0.9713	0.0000*	0.9999	0.0000*
Trd	0.8858	0.0000*	0.4132	0.0000*	0.8342	0.0000*	0.2569	0.0000*

Notes: *Denotes the rejection of the null hypothesis of non-stationary at 5 percent level of significance.

Source: Authors' own computations

5.2 ARDL Bounds Test

The next estimation step involves the ARDL bounds test for cointegration. Critical values for the lower bounds and upper bounds are presented in Table 2. K is the number of regressors in the ARDL model. The calculated F-statistic for the Bounds test is 5.28. This value is compared with critical values for the lower and upper bounds to ascertain the existence of a long-run relationship among the variables.

TABLE 2: BOUNDS TEST RESULTS FOR COINTEGRATION ANALYSIS

Critical value	Lower Bound	Upper Bound
10%	2.49	3.38
5%	2.81	3.76
2.5%	3.11	4.13
1%	3.5	4.63
Calculated F-statistic=5.28, K=5		

Source:Authors' computations

The calculated F-statistic is greater than the upper bound critical value at all levels of significance. Therefore, the null hypothesis of no cointegration among the variables is rejected. This confirms the presence of a long-run relationship between non-mining real GDP growth and its explanatory variables. Since the variables are cointegrated, this study proceeds to estimate the ARDL model in equation 1 to obtain both the short and long-run coefficients.

5.3 Lag Length Determination Results

Following the cointegration test, the optimal lag length was determined using the Akaike Information Criteria (AIC). According to Rachevet *et al.* (2014), the model with the smallest values of AIC is considered optimal. In this case, the lag length of 4 is the most suitable (Table 3).

TABLE 3: LAG LENGTH SELECTION RESULTS USING AIC TEST

Lag	AIC
1	3.992825
2	3.479547
3	3.808452
4	3.446483*
5	3.514182
6	3.744042

Note: *Denotes the lowest AIC value for all the estimated lag structures.

Source: Authors' own computations

The AIC selected ARDL (4, 4, 3, 0, 3, 3) for estimation of coefficients of the short and long-run ARDL model.

5.4 Estimation Results from the ARDL Model

Overall, the results of this study are consistent with the findings of the studies that have investigated factors affecting economic growth in Botswana (Mbulawa, 2015a; Phiri and Mothuti, 2018; and Malefane, 2020). It is found that in the short and long run, inflation and interest rates exert a negative and significant impact on non-mining real GDP growth, while money supply (M2) and trade openness were found to have a positive and significant impact.

Based on the short-run results presented on Table 4, there is strong evidence of a negative and significant relationship between inflation and non-mining real GDP growth in Botswana, implying that low inflation rate contributes to higher economic growth. Similarly, there is an indication that decreases in interest rate (as measured by the real prime rate) influence non-mining growth in the short run.

The results also show that an increase in money supply has a significant positive effect on non-mining growth. Likewise, trade openness was found to have a positive and significant impact on non-mining real GDP growth in the short run. The result coincides with the findings by Phiri and Mothuti (2018) and Malefane (2020).

TABLE 4: SHORT-RUN RESTRICTED ERROR CORRECTION MODEL OF ARDL

Regressor	Coefficient	P-value
D(RGDPG(-1))	0.000830	0.9952
D(RGDPG(-2))	0.037148	0.7742
D(RGDPG(-3))	0.377358	0.0092**
D(INF)	-0.205126	0.8444
D(INF(-1))	0.401979	0.1672
D(INF(-2))	0.202876	0.2044
D(INF(-3))	-0.087656	0.0002**
D(INT)	-0.321457	0.1533
D(INT(-1))	-0.619247	0.0901**
D(INT(-2))	-0.417118	0.0044**
D(LNM2)	-0.262545	0.8868
D(LNM2(-1))	0.000257	0.1006*
D(TRADE)	0.627576	0.8143
D(TRADE(-1))	0.877763	0.0060**
D(TRADE(-2))	0.6377947	0.1771
ECT (-1)	-0.609853	0.0000**
R^2 = 0.566648	$\bar{R}^2$ = 0.447826	Prob(F-stat) = 0.000003

Note: * * and * denote the 5 percent and 10 percent level of significance, respectively.

Source: Author's own computations

Like the short-run results, the long-run estimations show that the coefficients of inflation and interest rates are negative, while that of money supply and trade openness are positive, and statistically significant (Table 5). The results imply that in the long run, maintaining low and stable inflation, decreasing interest rates, as well as increasing money supply and the degree of trade openness may enhance growth of Botswana's non-mining sector. The long-run negative relationship between inflation and non-mining GDP growth indicates that the low inflation objective range policy adopted by Botswana is conducive for economic growth. Likewise, remaining open to trade facilitates long-term economic growth. Overall, the error correction term is estimated at -0.61 (has the expected sign) and is statistically significant (Table 4), validating the result of the bounds test for cointegration. This implies that approximately 61 percent of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

TABLE 5: ESTIMATED LONG-RUN COEFFICIENTS OF ARDL MODEL

Regressor	Coefficient	P-value
INF	-0.302961	0.0856*
INT	-0.707137	0.0357**
LNREER	-0.142051	0.3904
LNM2	0.000736	0.0871*
TRADE	0.109416	0.0384**

Note: ** and * denote the 5 percent and 10 percent level of significance, respectively.

Source: Author's own computations

5.5 Diagnostic Test Results

The study uses the Lagrange Multiplier (LM) test for diagnosing serial correlation and the cumulative sum of recursive residuals (CUSUM) for testing the stability of the model. The model passes the serial correlation diagnostic test as the null hypothesis of no serial correlation is not rejected (Table 6).

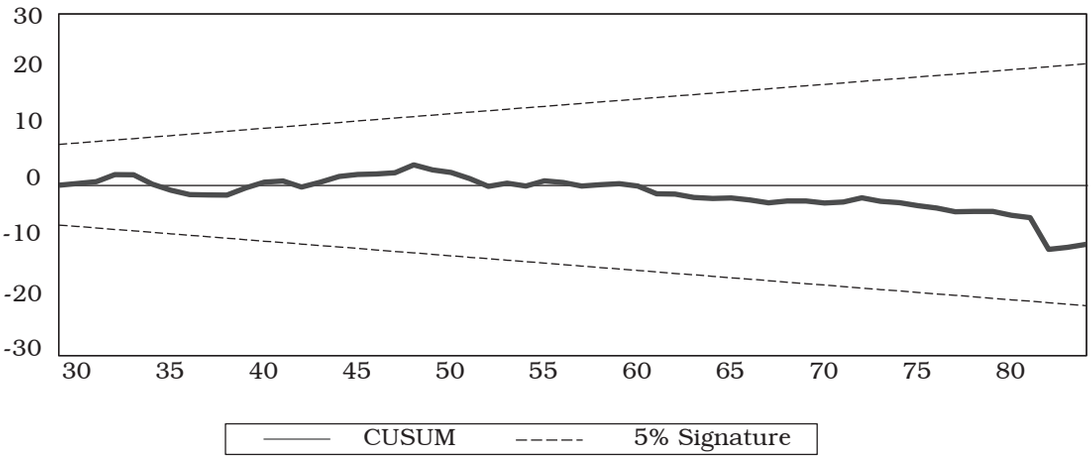
TABLE 6: SERIAL CORRELATION TEST RESULTS USING LAGRANGE MULTIPLIER

Null Hypothesis	LM Statistic	P-value
Noserial Correlation	0.329528	0.8567

Source: Authors' own calculations

Figure 7 shows that the CUSUM line falls within boundaries at the 5 percent level of statistical significance, indicating that the estimated ARDL model is stable.

FIGURE 7: STABILITY TEST RESULTS BASED ON CUSUM TEST



6. CONCLUSION AND POLICY IMPLICATIONS

This paper used quarterly time series data for 2000 to 2020 to investigate the impact of the exchange rate, inflation, interest rate, money supply and trade openness on economic growth in Botswana. In analysing this relationship, an ARDL model was adopted to test for both the short-run and long-run impact of the variables of interest. The choice of the empirical method was influenced by the differentiated integration structures of the variables. The results showed that inflation, interest rates, money supply and trade openness influence short to long-term growth of the Botswana's non-mining sector. Inflation and interest rates have an inverse relationship with output growth, while money supply and trade openness exert a positive impact on output growth. Overall, the results of this study imply that short and long-term growth prospects of Botswana's non-mining sector can be facilitated by maintaining low, stable and predictable levels of inflation; pursuing appropriate monetary policy designed to moderate borrowing expenses; increasing money supply prudently; as well as remaining open to trade.

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Macroeconomic Management of Diamond Wealth: The Case of Botswana

Malebogo Ntsosa[20]

ABSTRACT

Botswana's economic wealth is closely tied to the performance of its diamond sector. However, revenue from diamonds is volatile and extremely vulnerable to external economic conditions, requiring expenditure-smoothening policy interventions. Indeed, Botswana has, over the years, implemented some counter-cyclical policy in the form of fiscal rules to help smoothen expenditure across business cycles for a sustainable budget. This paper provides a summary of such policy interventions, including the quasi-Sovereign Wealth Fund, the Pula Fund, and complementary macroeconomic policies. This study recommends strengthening of public fiscal management and policy implementation, as well as the need to foster greater economic diversification.

1. INTRODUCTION

Managing revenues from exhaustible natural resources is distinct given that they are derived from commodities that are finite and temporary, and their prices are volatile, which tend to destabilise public finances. It is generally recognised that unsustainable increases in consumption are undesirable, indicating the importance of saving some proportions of revenues from a resource boom so that increases in consumption can be sustained after the boom (Venables *et al*., 2009). Resource rich countries (RRCs) have a distinctive principle of investing certain proportion of revenues offshore or domestically (Collier, 2014). Thus, RRCs face a critical choice of how much and what to save or invest for a sustained consumption profile, despite revenue volatility.

There is a strong consensus documenting the importance of governance in management of natural resource wealth. While resource revenues have a positive effect on economic growth in countries with good governance, their effect in countries with poor governance has, on average been negative (Velasco *et al.,* 2014), which could be avoided if resource rich countries have good institutions, Torvik *et al.* (2006). Chene (2017) emphasise that several dimensions of governance are instrumental for sustainable exploitation and fair distribution to maximise the contribution of natural resources to development outcomes, while also highlighting that revenue and contract transparency through initiatives such as Extractive Industries Transparency Initiative (EITI) have been promoted as means to increase accountability in the context of natural resource management.

The empirical literature emphasises the importance of governments' implementation of counter-cyclical fiscal policies to help smooth public investment and social expenditures across the economic cycle. For example, Velasco *et al.* (2014) state that Chile saved during periods of high copper prices and used accumulated resources during the 2008/9 global economic crisis. On the other hand, Musonda and Adam (2009) are of the view that Zambia failed to exploit the potential benefits of copper price and production boom in the early 1970s and were only efficient between 2003 and 2008. Bauer (2014) states that Nauru, a country rich in phosphates, consumed its mineral wealth rather than saving or investing it. Nauru transformed from being the poorest countries in 1973 to one of the richest in 2005. However, by 2007, the economy dropped to one of the world's poorest due to mismanagement of its resource wealth and has never recovered. Meanwhile, Botswana is considered a good example of resource-exporting country with good governance (Venables, 2010) that has also adopted counter-cyclical policies (Frankel *et al.,* 2013) to ensure sustainable consumption, making it an interesting case study.

Botswana is the second largest producer of rough diamonds in the world after Russia, and continues to be dependent on diamond exports, its share averaging 84.3 percent of total export earnings between 1998 and 2019 (Botswana Financial Statistics, September 2020). However, Botswana, like other resource-rich developing economies, is facing a challenge of managing volatile diamond revenues. The country's diamond production and sales are predominantly determined by the international market, hence susceptible to external shocks. For example, the economy contracted by 14.1 percent in 2009 following the 2008 global financial crisis which lowered the demand for diamonds and mineral revenues. This is in line with the study by Velasco

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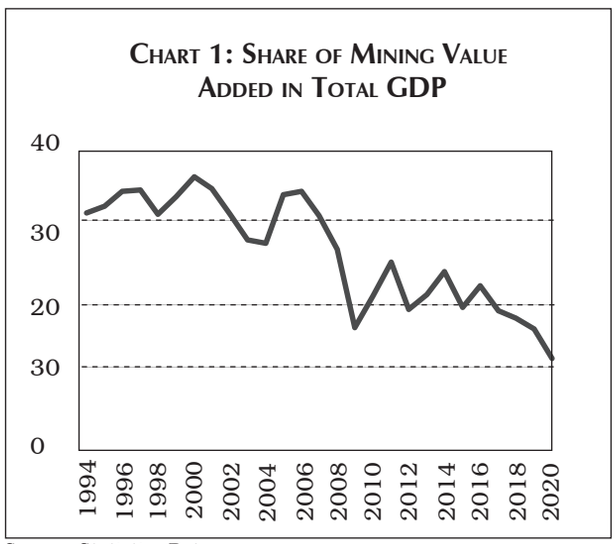
et al. (2014) who assert that managing volatile revenues is particularly challenging for natural resource-producing nations, in which revenues linked to those sources can be large (relative to the size of the economy) and unusually volatile.

Given that Botswana is dependent on volatile and unsustainable diamond revenues, the Government has put in place a number of counter-cyclical policies to smoothen government spending. The country's prudent management of its diamond resource wealth has been supported by a fiscal rule, supplemented by the operation of a quasi-Sovereign Wealth Fund, the Pula Fund (International Monetary Fund (IMF), 2016). This paper seeks to share how Botswana government is managing its boom and bust in diamond revenues. Specifically, the paper aims to discuss the fiscal rule, Pula Fund and complementary policies which have helped to manage these diamond revenues.

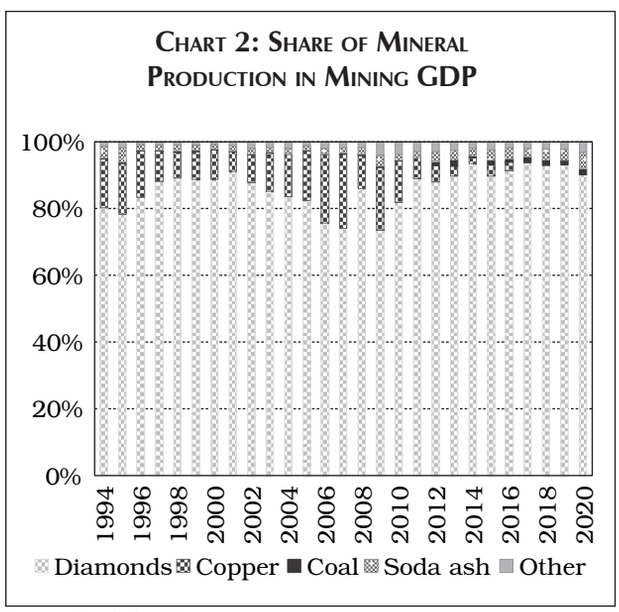
The remainder of this paper is structured as follows. Section 2 provides a brief overview of the role of diamonds in the Botswana economy. Section 3 states the empirical literature on management of resource wealth, while section 4 discusses fiscal regimes and other macroeconomic policies employed to manage diamond wealth. Section 5 concludes the paper and provides policy recommendations.

2. THE ROLE OF DIAMONDS IN THE BOTSWANA ECONOMY

As in other RRCs, Botswana's mineral resources, particularly diamonds, have been the main drivers of economic growth, transforming the economy from being one of the least developed countries in the world to an upper-middle income country within the three decades since the discovery and exploitation of diamonds in 1966. Botswana has been consistently ranked among the top producers of rough diamonds in the world and among the top performing countries in Africa, with relatively high GDP per capita since 2001 (Trading Economics, 2020), as well as on indicators, such as literacy rates, provision of education, health care and low levels of corruption. However, there has been a decline in the share of the mining sector relative to the rest of the economy (Chart 1) which has been more pronounced during most of the post 2009 global financial crisis period. In addition to diamonds, Botswana produces copper-nickel matte, soda ash, coal, gold and other minerals (Chart 2).



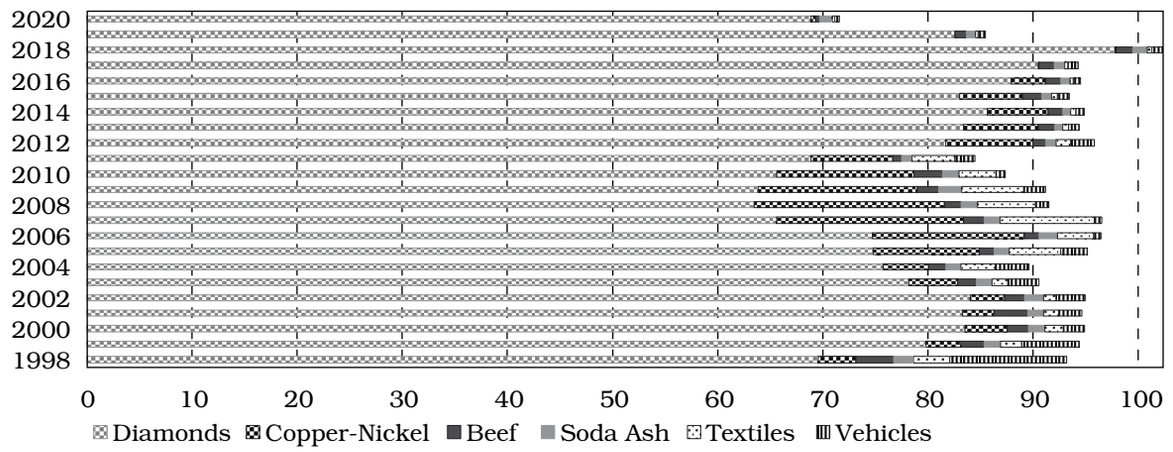
Source: Statistics Botswana



Source: Statistics Botswana

Diamond exports account for the largest proportion of total exports and total Government revenue. Chart 3 shows that the country's exports are highly concentrated and dominated by diamonds, averaging 77.8 percent between 1998 and 2020. This heavy dependence on diamonds means that the country remains volatile (Chart 4) and vulnerable to external shocks, which calls for more intensified efforts at economic diversification.

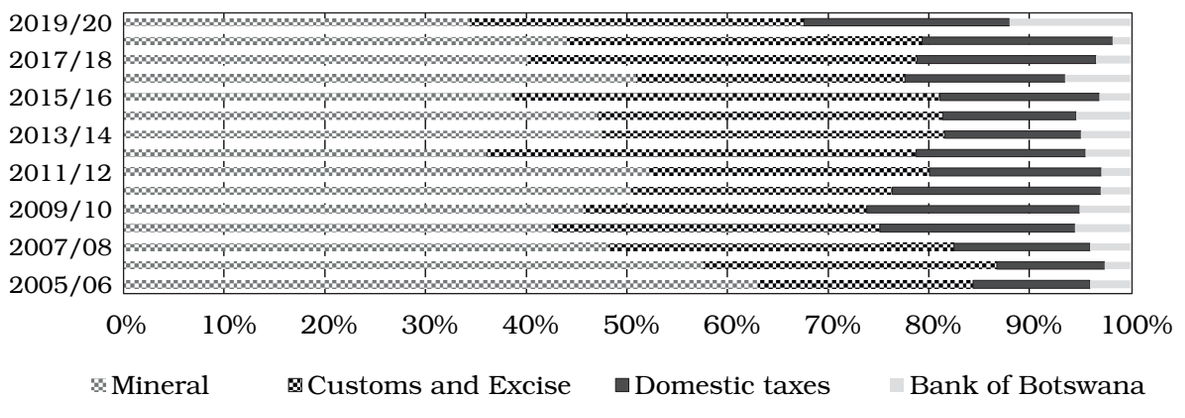
CHART 3: EXPORTS OF PRINCIPAL COMMODITIES (PERCENT OF TOTAL EXPORTS)



Source: Bank of Botswana

The second largest contributor to total government revenue, the Southern African Customs Union (SACU) receipts, have also been unpredictable and are subject to economic performance in the SACU region. The outcome of the ongoing negotiations on the revenue sharing formula are likely to also have a significant impact on SACU receipts. Overall, Botswana's reliance on volatile and externally driven revenue sources suggest the need for alternative income sources.

CHART 4: PROPORTIONS OF GOVERNMENT REVENUES BY CATEGORY (PERCENT)



Source: Ministry of Finance (MoF)

Even though Botswana has pursued economic diversification strategies over the years, the country remains less diversified compared to other resource countries (RRCs). Table 1 shows that Botswana had the highest values of Export Concentration Index (ECI) averaging 0.6734 over the period from 1996 to 2020. According to Fuentes (2009), the value close to one indicates that the economy is exporting one good, and decreases as more commodities are being exported. Some of the measures implemented to help diversify the economy include the adoption of the crawling peg framework to maintain competitiveness of the non-mining tradeable goods sectors, and investment in public goods and infrastructure, with a view to boosting productivity and, generally avoiding import substitution policies (Lewin, 2011).

TABLE 1: EXPORT CONCENTRATION INDEX (ECI) IN THE TOP RRCS IN AFRICA

	1996-2000	2001-2005	2006-2010	2011-2015	2016-2020
Botswana	0.702	0.375	0.612	0.796	0.882
DRC	0.580	0.530	0.346	0.452	0.520
Ghana	0.345	0.408	0.429	0.402	0.445
Guinea	0.626	0.525	0.520	0.454	0.528
Mozambique	0.308	0.537	0.434	0.336	0.273
Namibia	0.331	0.307	0.246	0.255	0.282
Niger	0.427	0.318	0.418	0.389	0.307
South Africa	0.127	0.131	0.149	0.134	0.143
Tanzania	0.240	0.278	0.221	0.302	0.261
Zambia	0.500	0.500	0.628	0.657	0.679

Source: United Nations (2021)

Another challenge, also calling for economic diversification is the fact that diamond production is expected to decline and exploitable deposits depleted in the 2050s.[21] This means that future mineral revenue inflows are uncertain as the mining of diamonds moves to more costly underground extraction technologies, hence reducing profits (Kojo, 2010). Furthermore, in the absence of new discoveries of diamond deposits and alternative sources of government revenues enough to offset the decline in mineral revenues, government revenues will decrease sharply in the future. Meanwhile, with the ongoing COVID-19 pandemic, the demand for rough diamonds has been affected, therefore mineral contracted by 34.2 percent in 2020/21 (MoF).

3. EMPIRICAL LITERATURE

The empirical literature emphasises the importance of macroeconomic policies, such as adjusting fiscal policy to counteract revenue volatility, as well as maintaining real exchange rate competitiveness, for better management of natural resource wealth. In particular, most of the literature highlights the importance of fiscal rules in determining how much natural resource wealth to consume, in order to manage revenue volatility.

A study by Balma and Ncube (2019) on 'Managing Natural Resource Revenue in Ghana' emphasise that RRCs face key challenges of deciding how much of the resource revenue to consume and invest in the short term and how much to save given exhaustibility and uncertainty of production horizon, as well as finding ways to delink spending from natural resource revenue, with a view to avoid boom-bust cycle. Thus, Venables *et al.* (2009) support the importance of saving some proportion of revenues from a resource boom so that increases in consumption can be sustained after the boom. Balma and Ncube (2019) also highlight that factors that come into play in allocation of oil revenues in Ghana are between spending today and saving in a sovereign wealth fund. Meanwhile, the study concludes that saving a proportion of the oil revenues minimised macroeconomic volatility in Ghana.

Velasco *et al.* (2014) highlights that Chile, the world's largest copper producer, has become somewhat the poster child for prudent macroeconomic management. The country has a fiscal policy that is both stable and sustainable, with the approach that implies saving during periods of high copper prices and using the accumulated resources during an economic crisis. The study states that this approach to fiscal policy has improved the political dynamics of Chile's budget design, making it stronger than those of many emerging markets.

Fuentes (2009) analyses the fiscal behaviour, the political economy, and macroeconomic effects of the exploitation and management of natural resources in Chile, particularly focusing on copper, the main export product of the economy. The conclusion by Fuentes (2009) is that success by Chile is due to the large role of government participation in resource exploitation and management, fiscal discipline and use of transparent funds invested abroad by the Ministry of Finance and Central Bank of Chile. The study highlights that fiscal rules and stabilisation funds work well if they rest on a good institutional

21 During the first half of 2017, Debswana extended the lifespan of its mines beyond the previously envisaged late 2020s to the 2050s.

environment (for example, transparency and accountability of the government). The study also emphasise the importance of complementary policies to avoid Dutch Disease.

Musonda and Adam (2009) conducted a study on 'Harnessing Resource Revenues for Prosperity in Zambia', a copper-rich country. The study indicates that for much of the forty years since Zambia's independence in 1964, natural resource dependence has been more of a curse than a blessing. They state that the main challenge facing the country is to find the right model for efficient exploitation of its natural resource endowment and equitable distribution of the rents from exploitation. Musonda and Adam (2009) highlight the pro-cyclicality of mining industry investment and note that Zambia has failed to efficiently manage the volatility in the copper market. The study concludes that Zambia is facing enormous challenge of overcoming past mismanagement of revenues that has resulted in deep poverty, inequality and poor public infrastructure.

Dinh and Dinh (2016) emphasise the importance of establishing special fiscal institutions such as sovereign wealth funds, fiscal rules and fiscal responsibility legislation in order to promote better fiscal management to tackle the impact of commodity prices volatility on RRCs. On the other hand, Cuddington (1989) observed that countries that managed booms well were those that did not allow fiscal variables such as exchange rates and wages to get badly out of line. That is, these countries limited increases in government spending to levels consistent with long-term trends in revenue collection and also maintained prudent external borrowing and foreign exchange reserve policies.

4. PLANNING AND MANAGEMENT OF BOTSWANA'S DIAMOND WEALTH

Botswana has had fairly good governance over the years. It was ranked fifth, after Mauritius, Cabo Verde, Seychelles and Tunisia for overall good governance practices in Africa over the period 2010 to 2019.[22] In the management of its mineral resources, the Government of Botswana has established prudent fiscal rules for governing the use of mineral revenues. According to Moffat (2017), if a government fails to formulate and implement good resource management policies, resource wealth gets over-exploited and exhausted rapidly. This was evident in Nauru which mismanaged its phosphates receipts (Bauer, 2014), thus, indicating the importance of government in reinforcing reliable policy and strong administrative structure to transform resource wealth into economic development (Dinh and Dinh, 2016). Hence, for sound macroeconomic management, most RRCs adopt a key set of tools (fiscal rules) that help to mitigate the 'Dutch Disease', budget volatility and help save for future generations.

4.1 Botswana's Fiscal Policy Measures

Botswana's fiscal policy was highly pro-cyclical in the early 1980s, when diamond revenue increased exponentially due to significant increases in diamond prices (Joko, 2015). As fiscal revenues grew during this period, the government increased capital expenditure more rapidly, and invested more in the housing sector, as it aimed at improving the supply of residential and commercial buildings, giving rise to a construction boom. Nonetheless, the country's fiscal strategy was put to test in the 1990s as the industrial countries entered into a recession, leading to lower demand for Botswana's diamonds and hence, a decline in the country's revenues. Government responded by cutting down on development expenditure. This experience stimulated active policy discussions on the need to adopt counter-cyclical policies to restore fiscal discipline and ensure budget sustainability.

Against this background, in the mid-1990s, Botswana formally introduced a budgetary framework that requires that all revenues from diamond wealth are invested productively or saved, and not used for consumption, to ensure fiscal sustainability even during the period when mineral resources are depleted. Thus, the Sustainable Budget Index (SBI)[23], defined as the ratio of the non-investment government recurrent expenditures[24] to non-mineral revenues, was adopted in 1994, to monitor the effectiveness of mineral revenues in promoting sustainable development and economic growth. A ratio of one and below represents budget sustainability, while a ratio above one implies a state of unsustainability (National Development Plan (NDP) 11). The SBI was below one in fiscal years 2005/06 to 2019/20 (Chart 5), implying that the revenues from mineral resources were not used for consumption purposes; rather, they were re-invested to support future growth and development. Botswana's adherence to the SBI rule over the review period, was indicative of the Government's commitment to

22 2020 Ibrahim Index of African Governance.

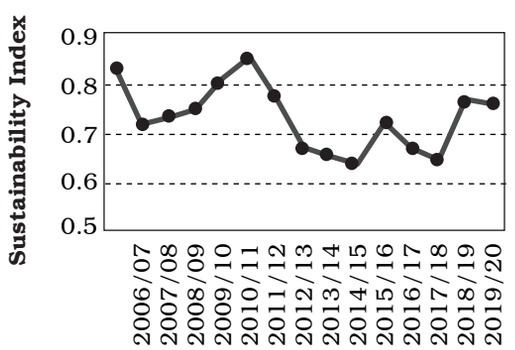
23 The rule-of-thumb for reinvestment of mineral revenues to offset depletion.

24 Non-investment recurrent expenditure excludes expenditures on health and education, which are regarded as investment in human capital.

have a sustainable budget to cushion the economy from risks associated with failure to meet future funding obligations during the time when diamonds are depleted. In the process, Botswana has been effective in the conversion of natural capital wealth to investment in human and productive capital, infrastructure, as well as provision of basic services to the population (World Bank, 2015).

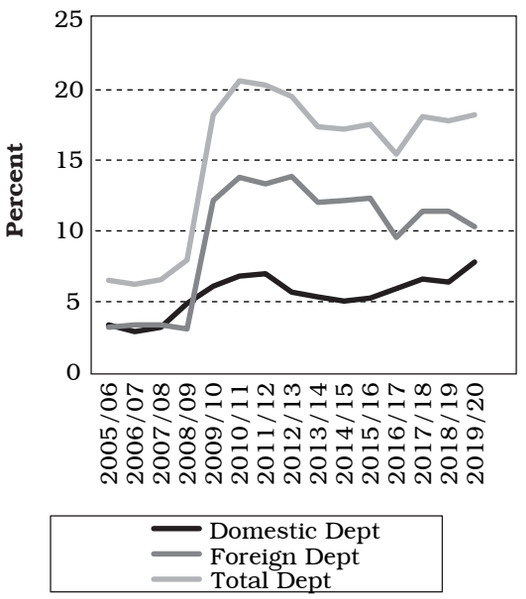
In 2005, the Government introduced a statutory fiscal rule limiting public debt to GDP ratio at 40 percent, 20 percent for domestic debt and 20 percent for foreign debt.[25] As depicted in Chart 6, government debt has been within the statutory ceiling of 40 percent of GDP, and there has generally been a consistent decline in the debt to GDP ratio from the fiscal year 2010/11 to 2019/20, reflecting the healthy financial position that has generally prevailed. However, the Public Financial Management Performance Assessment Report (2013) has suggested that debt sustainability analysis be used as an additional measure to monitor the evolving capacity of the country to cope with the debt servicing burden, rather than solely relying on debt to GDP ratio, which is a static measure.

CHART 5: SUSTAINABLE BUDGET INDEX (SBI)



Source: MoF

CHART 6: PROPORTION OF GOVERNMENT DEBT TO GDP

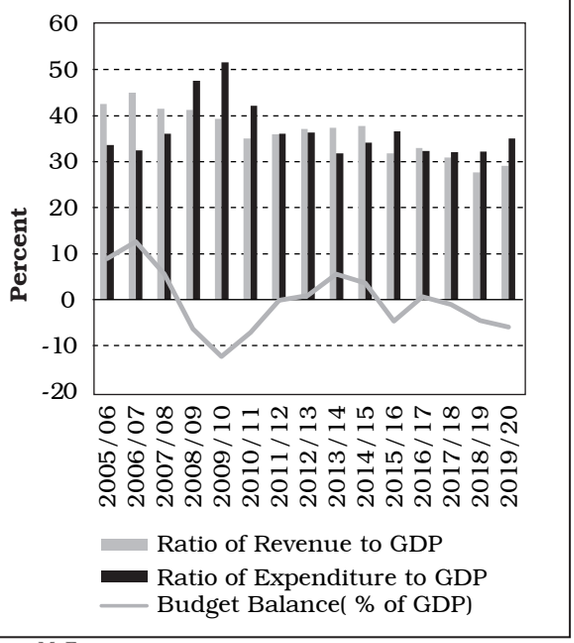


Source: MoF

In 2006, an expenditure rule based on anticipated revenues was introduced as part of the Mid-Term Review of NDP 9 to strengthen commitment to sustainable economic growth (Bank of Botswana Annual Report, 2012). This fiscal rule set a ceiling on government expenditure at 40 percent of GDP, consistent with the projected medium-term government revenue. However, the expenditure rule was breached during the global financial crisis, due to lower export earnings and GDP, leading to large budget deficits (Chart 7). The ceiling on government expenditure was later reduced to 30 percent of GDP during NDP10 (2009-2016) showing the Government's commitment to balance the budget over a medium-term horizon.

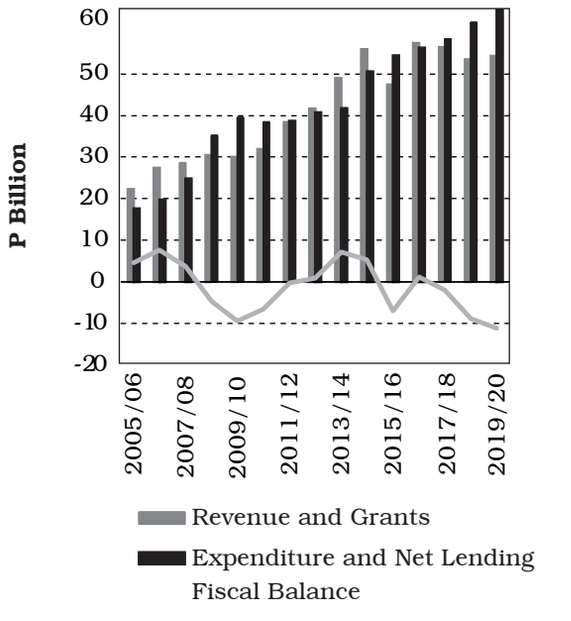
25 Stock, Bonds and Treasury Bills Act (Chapter 56:07). 2005. Part IV. Limitation on Borrowing.

CHART 7: FISCAL BALANCE AS A PROPORTION OF GDP



Source: MoF

CHART 8: BOTSWANA'S FISCAL OPERATIONS

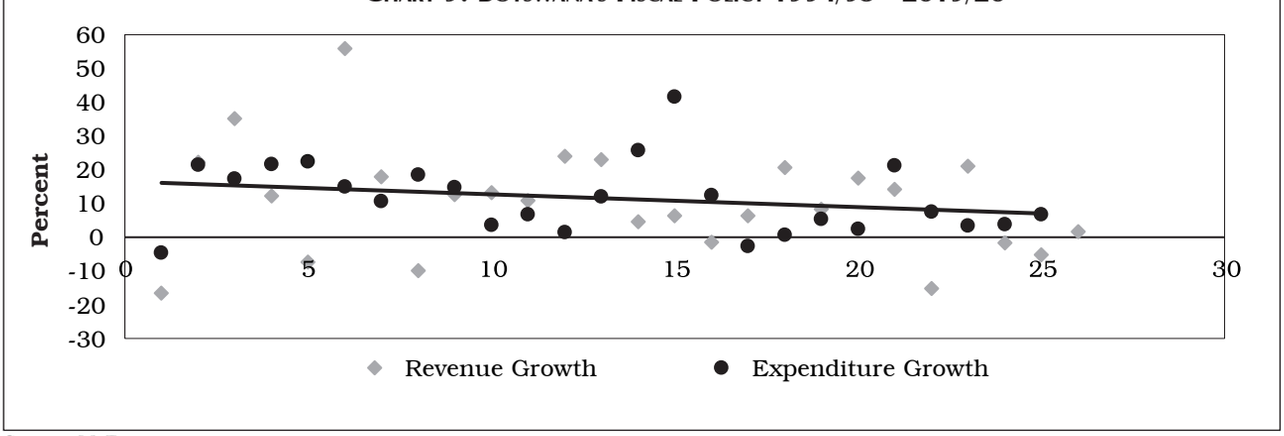


Source: MoF

Over time, a continuous reform of Botswana's fiscal policy was considered necessary, given the challenging circumstances associated with the inevitable depletion of diamonds. As such, the Government has been making amendments to existing fiscal rules and, where necessary, introducing new fiscal rules to ensure sustainable economic growth and development. For example, for NDP 11 the Government proposed a fiscal rule of splitting the government receipts from mineral revenues between investment in physical and human capital and financial savings for future generations at 60 percent and 40 percent, respectively. Excluding debt ceilings, the abovementioned fiscal rules are budget targets, rather than institutionalised budget constraints.

Overall, Botswana's fiscal policy has been counter-cyclical, for example, as shown by a strong negative relationship between revenue and expenditure growth (Chart 9) from 1994/95. This implies that Botswana saves during periods of higher revenues to ensure smooth expenditure across the cycle for sustainable growth and development.

CHART 9: BOTSWANA'S FISCAL POLICY 1994/95 - 2019/20



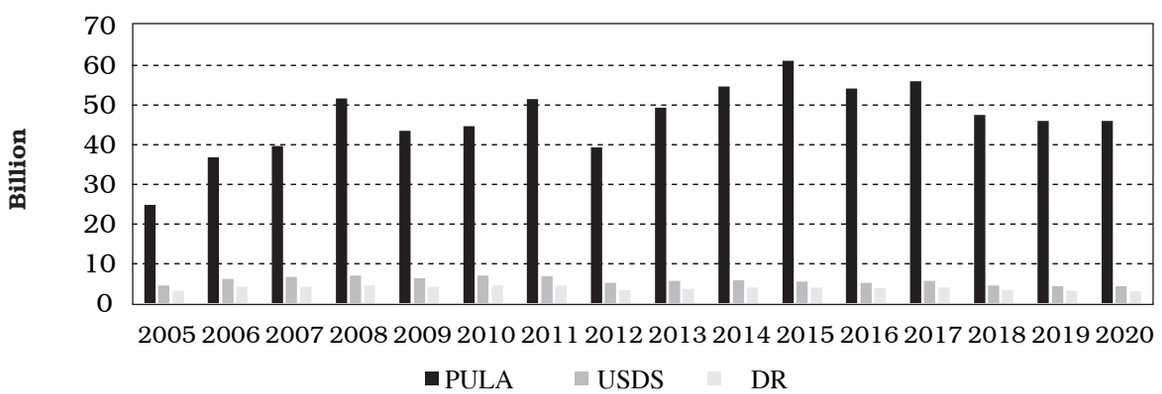
Source: MoF

4.2 Botswana's Government Funds

While the first diamond mine, Orapa mine, was still under construction in 1972, the Government established two special funds, the Revenue Stabilisation Fund (RSF) and the Public Debt Service Fund (PDSF) to help manage the expected increases in mineral and customs union revenues. The RSF was created to even-out revenue fluctuations by saving budget surpluses to supplement revenues in future years if needed, while the PDSF was established to cater for the future government debt obligations to avoid debt arrears and debt crisis[26]. The RSF helped Botswana to smooth its expenditures by avoiding large fiscal adjustments. As in Norway and Chile, Botswana's RSF was later discontinued as it was drawn down to lend to statutory corporations and local authorities, following the accumulation of budget surpluses. According to the Bank of Botswana Annual Report (2005), the RSF and PDSF[27] grew substantially during the 1980s as the country recorded large budget surpluses, such that their intended secondary functions as a lender to parastatals and local authorities became their primary operations.

In 1994, the long-term investment portfolio, named the Pula Fund (akin to a Sovereign Wealth Fund), was established with the objective of enhancing the yield on international reserves through investment in longer-dated assets abroad. The Pula Fund preserves part of the income from diamond exports that cannot be absorbed domestically for productive purposes. Its investment policies and guidelines are underpinned by the need to preserve the international purchasing power of the reserves (in SDR terms)[28], maintain liquidity at all times and to maximise return within acceptable risk parameters (Bank of Botswana Annual Report, 2012). The fund consists of two accounts: the Government Investment Account (GIA) and foreign exchange reserve account of the Bank of Botswana. Fiscal surpluses not used for the small amount of external debt repayments have been transferred to the GIA and withdrawn to expand fiscal policy in lean years in which revenue fell short of expenditure. The Pula Fund has effectively served as a revenue stabilisation fund, providing a cushion in the event of an external shock. It is this cushion, rather than the statutory debt limits, that has prevented Botswana from borrowing externally for budget support purposes.

CHART 10: BOTSWANA'S RESERVES IN THE PULA FUND



Source: Bank of Botswana

Since its inception up to 2008, the Pula Fund increased substantially as a result of balance of payments surpluses and its investment strategy. However, the Pula Fund was somewhat under strain in late 2008 following the global financial crisis due to adverse market conditions (Chart 10). Between 2008 and 2009, in Pula (USD) terms, Government savings in Pula Fund declined substantially from P51.6 billion (USD6.9 billion) to P43.5 billion (USD6.3 billion), while public debt to GDP ratio rose considerably (but within the set limit) from 7.9 percent in 2008/09 to 18.2 percent in 2009/10 as there was borrowing undertaken to mitigate the impact of the crisis on the economy.

26 Over the years, the usage of the two funds deviated from their original primary roles.

27 In 2004, much of the PDSF loan book was sold to Debt Participation Capital Funding (DPCF) and securitised on the Botswana Stock Exchange through the issuance of seven DPCF bonds, a reflection of the growth of the Botswana financial sector and the Government strategy to wean parastatals from Government financing (Bank of Botswana Annual Report, 2012).

28 The Standard Drawing Rights (SDR) is the IMF's unit of account, currently comprising the US dollar, euro, Japanese yen, British pound and the Chinese renminbi.

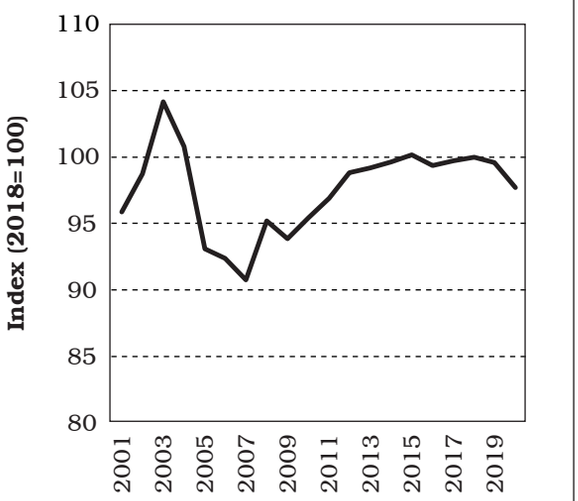
The level of reserves in 2009 was equivalent to 17.8 months of import cover of goods and services, a decline from 21 months of import cover in 2008. More recently, Botswana was listed among the seventeen RRCs in the world that entered the coronavirus crisis with enough fiscal space to cushion the impact of COVID-19 pandemic (Natural Resource Institute, August 2020). During the first quarter of 2020, Botswana withdrew from the Government Investment Account to, among others, provide wage subsidies to firms affected by COVID-19 lockdowns and movement restrictions, purchase medical equipment, and build fuel and grain reserves, to lessen the impact of the coronavirus on the economy (Natural Resource Institute, August 2020). Meanwhile, the Government has recognised the possible depletion of the fund due to further withdrawals and has since proposed to tap into various foreign sources to finance expenditures, notably the African Development Bank, World Bank and International Monetary Fund, which have introduced new financing facilities to assist developing countries in dealing with the economic impact of COVID-19 (Economic Recovery and Transformation Plan (ERTP), July 2020).

4.3 Complementary Macroeconomic Policies

In 2005, Botswana adopted a crawling peg exchange rate framework[29] which allows for automatic gradual nominal adjustment of the Pula exchange rate with the view to stabilise the real effective exchange rate (REER). A stable REER implies maintenance of competitiveness of domestic producers of tradable goods and services (Bank of Botswana Annual Report, 2019). Given that the economy had remained less diversified, with less employment capacity, it was deemed appropriate that a stable REER would support international competitiveness of firms and contribute to macroeconomic stability.

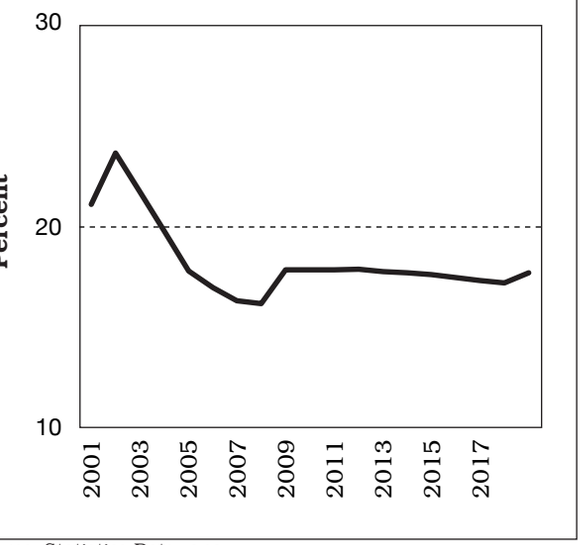
Chart 11 shows that indeed the adjustment of the crawl has helped to stabilise the REER. In line with stable REER and other policies (for example, Industrial Development Policy, Special Economic Zones Policy, Economic Diversification Drive) implemented to diversify the economy, unemployment rate in Botswana declined from 19.8 percent in 2004 to 17.7 percent in 2020 (Chart 12). Furthermore, the managed exchange rate has helped to prevent potential 'Dutch Disease' problem resulting from growing mining exports (Lewin, 2011; Barclay, 2009; Hillbom, 2008;), and has contributed to the accumulation of foreign exchange reserves enabling the economy to adjust to exogenous shocks (Barclay, 2009; Jefferis, 2008).

CHART 11: REAL EFFECTIVE EXCHANGE RATE



Source: Bank of Botswana

CHART 12: UNEMPLOYMENT RATE



Source: Statistics Botswana

29 With this mechanism, the value of the domestic currency is adjusted on a regular basis according to a pre-determined formula that takes into account the differential between Botswana's inflation objective range and the forecast inflation in trading partner countries, i.e., South Africa and the countries whose currencies comprise the SDR (the IMF's unit of account), which currently are the USA, UK, Japan, the Euro area and China.

4.4 Transparency in Management of the Diamond Resource

Transparency in natural resource governance is one of the fundamental tools to promote efficiency and accountability in converting natural resource wealth into sustainable economic and social development. Transparency is desirable as it sends a clear signal to investors about the business environment; hence, it is good for foreign direct investment. Botswana was ranked the most transparent country in Sub-Saharan Africa on the Transparency International Corruption Perception's Index of 2017 and ranked 34th worldwide. The Country ensures transparency in the utilisation of its mineral revenues and other natural resources through appropriate fiscal accounting, reporting and auditing. Fiscal transparency is given prominence through publication of detailed reports on government revenues and expenditures. These public finances are subject to the scrutiny of the Auditor-General, who, in turn, publishes an annual report. Public finance data are published every fiscal year that runs from April to March.

Furthermore, Botswana is a member in good standing, of the Kimberly Process, an international initiative formed in 2003, aimed at eradicating 'conflict diamonds', with a view to make the trading of diamonds transparent and secure. The country has been compliant with the Kimberly Process Certification Scheme since 2004 and has undergone its second and third Kimberly Process reviews in 2011 and 2017, respectively. However, Botswana is yet to implement the EITI[30] , as the country does not publicly disclose extractive industries' contracts, which is one of the requirements of the EITI.

5. CONCLUSION AND RECOMMEDATIONS

Botswana is facing a challenge of volatile diamond revenues but has been successful in employing counter-cyclical policy to smoothen expenditures, while also maintaining macroeconomic stability. Despite its dependence on the diamond revenue, the country has avoided 'Dutch Disease' and 'Resource Curse' suffered by most of the RRCs. However, there is need for the Government to diversify the economy from its dependence on the diamond resource. For example, a vibrant private sector is necessary, to broaden the revenue base and to mitigate Botswana's revenue vulnerability to external conditions. The Government also needs to establish expenditure rationalisation and project management systems that weed out unproductive expenditures. Thus, the creation of Major Projects Unit as envisaged in ERTP (July 2020) is a step in the right direction. Continuous reform of Botswana's fiscal policy is also necessary, given the inevitable depletion of diamonds. Finally, the Government should consider disclosing extractive industries' contracts, a necessary condition for implementation of the EITI, as it would improve transparency, efficiency and fiscal outcomes.

30 EITI was established in 2003 as the global standard to promote open and accountable management of extractive resources.

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Money Demand Function in Botswana and Implications for Monetary Policy

Princess Puskas[31]

ABSTRACT

This study estimates a money demand function, using an autoregressive distributed lag model (ARDL) approach, and determines its stability for Botswana as well as examining its implications for monetary policy. Quarterly data for the period 1995 to 2019 on inflation, the exchange rate, interest rates, real gross domestic product (GDP) per capita, the ratios of demand deposit to time deposits and currency to demand deposits, as well as stock market capitalisation to nominal GDP are used. The results find the presence of stable short and long-run relationships among the variables of interest. Therefore, the findings suggest that in the formulation and implementation of monetary policy in Botswana, there is need to consider the level of money demand in the economy.

1. INTRODUCTION

The Quantity Theory of Money (QTM) explains the relationship between the quantity of money in an economy and the level of prices of goods and services (Alimi, 2012). The effect of monetary growth on economic performance has important implications for prudent monetary policy planning. The rate of growth in money supply that is more than adequate to finance real growth is more likely to cause inflationary pressures, while insufficient money supply may hinder economic growth (Sanusi and Meyer, 2018). The intensity of the use of stock of money or velocity of money is a fundamental mediating force in this relationship. Therefore, determination of the adequate stock of money in the economy to foster economic growth should encompass, as a matter of necessity, an incisive assessment of the extent of use or velocity of circulation of that stock of money. Velocity of money is defined as the total amount of money that firms and households desire to hold relative to their level of income (Higgins, 1978). By implication therefore, velocity of money measures demand for money in the economy. In this context, if the velocity of money is stable or its fluctuations are easily predictable, then demand for money can also be assumed to exhibit the same behaviour, and this inference has far reaching monetary policy implications which are explored below.

According to Parikrama and Naser (2019), if the change in demand for money, that is, the variation in the money demand function, arising from shifts in all its primary determinants, is stable over the short and long-term horizon, then a stable relationship exists between money supply and price movements. Existence of this relationship enables the monetary policy authority to effectively control price movements by adjusting money supply in line with the level of money demand and its perceived behaviour. In contrast, if the money demand function is unstable, the standard relationship between money supply and price movements collapses and monetary policy endeavours to control inflation may be quite slow, if not ineffective. The tight monetary policy conditions in 2014 amid shortage of liquidity[32] in the financial system in Botswana was testament to the need for the monetary authority to consider the speed and scale of absorption of the liquidity it avails in the economy. In this instance, a corrective measure was taken by reducing Primary Reserve Requirement from 10 percent to 5 percent in April 2015, which released P2.3 billion to augment the banks' loanable funds based on assessment of liquidity and demand conditions. Therefore, determination of the money demand function and its stability is crucial in guiding monetary policy actions and the appropriate timing thereof.

The money demand function refers to a framework or model that captures the relationship between changes in money demand or velocity of money and its principal determinants, mainly the level of interest rates, inflation, per capita real gross domestic product (GDP), exchange rate, the ratio of stock market capitalisation to GDP and the rate of financial innovation. This study, therefore, seeks to estimate the money demand function in Botswana and its stability. The study employs an autoregressive distributed lag model (ARDL) cointegrating technique to establish whether there is a linear combination of variables that explain the behaviour of money demand in the Botswana context. The estimated model is then subjected to

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32 For further information, refer to the Botswana Confederation of Commerce, Industry and Manpower (BOCCIM) 13th National Business Conference on Current State of Banking System Liquidity (2014) and the Bank of Botswana, Press Briefing on Banks' Liquidity Condition (2015).

several diagnostic tests including stability tests, before drawing the implications of the findings on the conduct of monetary policy in Botswana.

The remainder of this paper is organised as follows: Section 2 reviews the literature. Section 3 describes the data. The model specification and empirical results are discussed in Section 4 and Section 5, respectively, and Section 6 concludes.

2. THEORETICAL AND EMPIRICAL LITERATURE

2.1 Theoretical Issues

The quantity theory of money states that money supply determines the price level, holding velocity and real national income constant. This conclusion is derived from the "income" version of the equation of exchange; PQ = MV (Friedman, 1970).[33] Here P is the price level, Q is the measure of annual real national income, M is the measure of money supply and V is the velocity of money or velocity of circulation, which is equal to the average number of times the unit of money is spent during the year. However, the velocity of money is not expected to remain constant in both the short and long run, as there are factors such as inflation, interest rates and the level of real GDP per capita that affect the rate at which money circulates in the economy (Syrotian, 2012). As noted by Khan and Gill (2013), interest rates represent the opportunity cost of holding money. Therefore, a rise in interest rates leads to a fall in the demand for money, which increases the velocity of money. Meanwhile, the impact of per capita income on velocity depends upon the income elasticity of demand for money. If it exceeds one, the impact of per capita income on money velocity is negative, and vice versa. The effect of inflation on velocity is ambiguous and the coefficient may take either a positive or negative sign (Omer, 2009).

2.2 Empirical Issues

The velocity of money has continued to be of keen interest in both advanced and emerging economies. Tsheole (2006) estimated the money demand function (M2) for Botswana using a vector error correction model (VECM) for the period 1978 to 2005. The study determined the money demand function to be stable and that the existence of a stable money demand function is important as it implies that the growth rates in broad money (M2) are important when monitoring and forecasting the developments in inflation levels. Furthermore, the study observed that an effective monetary policy seeks to influence money, credit and prices through the liquidity position of banks and similar financial institutions. Since the demand for money function helps to ascertain liquidity needs of an economy, knowledge of the factors that determine this function and the existence of a stable long-run relationship between these factors and the money stock, constitute valuable information to the monetary authorities.

Mosweu (2003) estimated a long-run demand for the narrow money function (M1) using the Johansen vector error correction mechanism. The study found the existence of a theoretically consistent and stable cointegrating relationship among money, income, interest rates and inflation that can be interpreted as a demand for money function in Botswana. The cointegrating relationship showed high income elasticity, which indicated the strong transaction motive for holding real money balances in Botswana. Therefore, the study concluded that the money demand function represents one of the most important components of the monetary process in the economy as it links money, interest rates and real economic variables and, thus, plays an important role in the decision-making process of central banks.

Kganetsano (2001) estimated a money demand equation for the narrow money, M1 and M2, using a single equation error correction model. The study found cointegrating relationship for both functions of the two monetary aggregates of M1 and M2. The cointegrating relationship showed high income elasticity, which indicates the strong transaction motive for holding real money balances in Botswana. Furthermore, the significant inflation rate coefficient reflected the high opportunity cost of holding money and that physical or real assets were a significant substitute as a form of wealth in Botswana. The study found a stable demand for money, implying predictable fluctuations in the demand for money.

Sharma and Syarifuddin (2019) examined the determinants of Indonesia's income velocity of money through employing the ARDL methodology for the period spanning 2000 to 2017. The study found that, in the long run, tax revenue, short-term

33 Originally, it was the Cambridge equation M=kPY, where M is the nominal money supply, k is the proportion of real income consumers wish to hold as money, P is the price level and Y is the level of real income (Okafor *et al.*, 2013). In questioning it, what Keynes had pointed out was that in the long run, such naïve quantity theories only explain inflation if there is full employment. However, if there is slack capacity in the economy, then an increase in money supply can cause a rise in real GDP.

interest rates and industrial production, significantly determine the income velocity of money. Accordingly, monetary policy action will impact tax revenue and industrial production and will have a direct effect on velocity through the short-term interest rate. The authors recommended that in formulating policy interventions aimed at stabilising income velocity, considerations should not only be limited to the direct impact of these policy interventions on primary target variables, but rather, expand their scope of focus to include potential indirect policy outcomes.

Sanusi and Meyer (2018) investigated structural breaks in money demand and its determinants in South Africa. The study employed the Bai-Perron multiple breakpoint test in conjunction with an ARDL model on data from 2003 to 2017. The study found that the money demand function in South Africa has not experienced regime shifts (i.e., large, abrupt, persistent changes) during the period under study. This was further confirmed by means of a cumulative sum of recursive residuals test. Furthermore, they found that money demand was cointegrated with interest rates; inflation; real GDP; exchange rate; and credit to the private sector (as a measure of financial innovation). Interest rates and inflation had a negative and significant effect on money demand function in the long run, while real GDP had a positive and significant relationship. The paper concluded that the money demand function in South Africa could be effectively employed in predicting and forecasting monetary policy outcomes.

In another contribution, Kjosevski and Petkovski (2017) studied the long and short-run determinants of money demand (M1) and their stability in seven South Eastern European countries using monthly data from 2005 to 2014. Through employing a pool mean group estimation of ARDL, the study found that the exchange rate, industrial production and a dummy variable of the effect of the European debt crisis explained most of the variations of money demand in the long run, while the exchange rate was significant only in the short run. The study also showed that the real money demand was relatively stable during the analysed period in the South Eastern European countries, despite their turbulent transition from socialist to market economies. The results provided useful policy guidelines to the regional central banks in their quest for price stability. Specifically, the study concluded that central banks of the selected South Eastern European countries should carefully monitor the exchange rate as the most influential monetary policy indicator because it was among important drivers of money demand.

Using the broader definition of money (M2), Khan and Gill (2013) employed the Johansen cointegration procedure through a VECM to find factors affecting the velocity of money in Pakistan using annual data from 1978 to 2010. The results concluded that real income, financial development, inflation and interest rates positively and significantly affected money velocity and that there existed a long run cointegration relationship among the variables. The velocity of money was found to be stable during the period under review. The study noted that the critical concern of monetary authorities was to ensure adequate supply of money to spur economic growth without causing inflation. Therefore, the authors recommended that in estimating the optimal amount of money for monetary policy, monetary authorities should take into consideration the crucial role of these variables. In particular, the monetary authorities should be careful in employing expansionary monetary policy as it could overheat the economy, an eventuality that may result in the build-up of undesired inflationary pressures. Khan and Gill also noted that the inflation rate had a significant influence on money velocity and, therefore, policies designed to control inflation should be applied prudently to avoid stifling the economic growth process.

Okafor *et al*. (2013), investigated the determinants of income velocity of money in Nigeria using quarterly data for 1985 to 2012. Applying the VECM and Engle-Granger cointegration approaches, a long-run relationship linking income velocity of money to income growth, interest rates, exchange rate and inflation was found. The paper found a positive and statistically significant relationship between the growth of income and velocity of money, which supports the quantity theory of money. Furthermore, interest rates were also found to have a positive and significant relationship with the income velocity of money. The financial sector development variable and the growth rate of stock market capitalisation had a negative relationship with the income velocity of money. The variance decomposition and impulse response results identified the inflation rate as a salient variable to innovations in income velocity. The results showed that the monetary authority cannot obtain additional leverage by issuing more money without generating inflationary pressures.

Using cointegration and vector autoregression (VAR) techniques, Akhtaruzzaman (2008) identified the determinants of the income velocity of money in Bangladesh for the 1973 to 2007 period. The study

found that the velocity for M1 and M2 was inversely related to real GDP and financial development (proxied by the ratio of demand deposits to time deposits), reflecting the early stages of economic and financial development in the country. The two variables jointly accounted for about half of the variance of the speed of velocity of money for M1 and M2, followed by price expectations. The study showed that the demand for money behaviour in Bangladesh is stable and predictable. Furthermore, the results showed that it was important for the monetary authorities to consider both stages of economic and financial development in forecasting velocity of money in designing monetary policy in Bangladesh.

It can be concluded from the literature review that inflation, interest rates and real GDP, as well as the ratio of demand deposits to time deposits, affect the rate at which money circulates in the economy. This implies that there tends to be a variation in the money demand function, arising from shifts in its primary determinants. However, most of the studies reviewed in this paper neglected the ratio of stock market capitalisation to GDP, which is another determinant of financial innovation. This paper's contribution is to include this variable to consider how investment in stocks affect the velocity of money in Botswana.

3. DATA DESCRIPTION

This study examines factors determining the money demand function in the economy of Botswana by analysing quarterly data from 1995:Q1 to 2019:Q4. The choice of the period under study was, in part, driven by availability of data on all variables of interest. The data were sourced from the Bank of Botswana and Statistics Botswana.

The empirical estimation of the model employed in this study uses data on the following variables: velocity of money (the ratio of nominal GDP to M2[34]); interest rates (proxied by the 91-day Bank of Botswana Certificates (BoBCs); real GDP per capita (y_t), computed as real GDP divided by the total population; inflation - measured by the consumer price index (CPI), and using December 2018 as the base period; the nominal effective exchange rate (NEER) - measured as the adjusted weighted average rate of the Pula against the South African rand and Special Drawing Rights (SDR)[35] currencies; market capitalisation divided by nominal GDP (MC_NGDP) to capture the opportunity cost of holding money; the ratio of currency to demand deposits (C_DD) and the ratio of demand deposits to time deposits (DD_TD) as proxies of financial development in Botswana.

Natural logarithms were applied on velocity and real GDP per capita variables to facilitate interpreting their coefficients as elasticities and assist in scaling down the data. A dummy (1 = global financial crisis and 0 = none) for all quarters in 2009 was added in the model to account for the 2008/09 global financial crisis, which had a significant impact on Botswana through a contraction in GDP (Bank of Botswana, 2010).

4. MODEL SPECIFICATION

The existence of a long-run relationship between velocity of money in Botswana and selected variables is represented by the equation provided below:

$$lnV_t = \beta_0 + \beta_1 lny_t + \beta_2 r_t + \beta_3 \pi_t + \beta_4 \varepsilon_t + \beta_5 c\_dd_t + \beta_6 dd\_td_t + \beta_7 mc\_ngdp_t + \beta_8 d_t + \mu_t \quad (1)$$

Where V_t is velocity of broad money; y_t is Real GDP per capita; r_t is Interest rate; π_t is Inflation rate; ε_t is nominal effective exchange rate; c_dd_t is Ratio of currency outside depository corporations (in circulation) to demand deposits; dd_td_t is Ratio of demand deposits to time deposits; mc_ngdp_t is Market capitalisation to nominal GDP; d_t is Dummy. d_t is = 1 for the period 2009 Q1-Q4 and 0 elsewhere; and μ_t = White noise error term.

The coefficients $\beta_1, \beta_2, \beta_4$ are expected to be positive, while the coefficient β_7 is expected to be negative, a priori. However, the coefficients β_5 *and* β_6 may be positive or negative, but are expected to be positive for Botswana during the period covered by the study, because there has been noticeable financial development in Botswana, which should be associated with an increase in the velocity of money. Furthermore, the impact of β_3 on velocity is similarly ambiguous and the coefficient could take either positive or negative sign (Omer, 2009).

34 M2 is made up of the summation of currency outside depository corporations and transferable deposits (M1), as well as other deposits included in broad money. It is calculated as the average of stock of money to compile quarterly data.

35 The SDR is the official unit of account (currency) of the International Monetary Fund. It comprises a weighted combination of the US dollar, British pound, euro, Chinese yuan and Japanese yen.

An ARDL model is employed to examine the determinants of the money demand function in Botswana as specified in Equation (1). This model, developed by Pesaran *et al.* (2001), is considered superior to other cointegration methods because of its several econometric advantages. Among others, it allows for simultaneous estimation of both long-run and short-run parameters; it can be applied whether the regressors are stationary at levels (I(0)), stationary at first difference (I(1)) or a combination of both; it avoids endogeneity problems; and it provides better results with a small sample than other methods. The ARDL model estimated in this study is as follows:

$$\Delta \ln V_t = c_1 + \sum_{i=1}^{p} \varphi_1 \Delta lnV_{t-i} + \sum_{i=0}^{q} \varphi_2 \, lny_{t-i} + \sum_{i=0}^{q} \varphi_3 \Delta r_{t-i} + \sum_{i=0}^{q} \varphi_4 \Delta \pi_{t-i} + \sum_{i=1}^{q} \varphi_5 \Delta \varepsilon_{t-i} + \sum_{i=1}^{q} \varphi_6 \Delta c\_dd_{t-i} + \sum_{i=1}^{q} \varphi_7 \Delta \, dd\_td_{t-i} + \sum_{i=1}^{q} \varphi_8 mc\_ngdp_{t-i} + \rho_1 lnV_{t-1} + \rho_2 lny_{t-1} + \rho_3 r_{t-1} + \rho_4 \pi_{t-1} + \rho_5 \varepsilon_{t-1} + \rho_6 c\_dd_{t-1} + \rho_7 dd\_td_{t-1} + \rho_8 mc\_ngdp_{t-1} + \rho_9 d_t + \omega_t \quad (2)$$

Where coefficient c_1 is the drift, while ω_t represents the white noise error. The symbol Δ represents the first difference operator, p and q are used to represent the optimal lag length for the equations. The summation signs represent the error correction dynamics in the short run, while the second part, (terms with ρ_i in Equation 2) correspond to the long-run relationship. The cointegration approach places emphasis on the long run, particularly the time reaction and the speed of adjustment to long-run equilibrium.

To determine the existence of a long-run relationship between the variables in the specified model, the study uses the bounds test. This is a joint test of all the lagged levels of the regressors (Shin *et al.*, 2013). The study uses the Pesaran *et al.* (2001) F-statistic tests and the null hypothesis that $\boldsymbol{\rho} = \rho_1 = \rho_2 = \rho_3 = \rho_3 = \rho_4 = \rho_5 = \rho_6 = \rho_7 = \rho_8 = 0$. That is, the null hypothesis is that there is no cointegration or long-run relationship between the velocity of money and its independent variables. Therefore, the rejection of the null hypothesis suggests the presence of a long-run relationship between the velocity of money and its independent variables.

The value of the F-statistic is compared with 2 critical values (upper and lower bounds) provided by Pesaran *et al.* (2001). The first critical value assumes that all the variables are integrated of the order zero and it corresponds to the lower bound; while the second critical value assumes that all variables are integrated of order one and corresponding to the upper value. If the F-statistic exceeds the upper bound, the null hypothesis of no cointegration among variables is rejected; if it falls below the lower bound, then the null hypothesis of no cointegration cannot be rejected. However, the implications of values between the lower and upper bounds is that the results are inconclusive.

5. EMPIRICAL RESULTS AND INTERPRETATION

5.1 Stationarity Test

Although the ARDL approach to cointegration is applicable whether the regressors are stationary at levels I(0), stationary at first difference I(1) or a combination of both, it is still necessary to examine the statistical characteristics of variables in the money demand function. This is done to ensure that variables integrated of second order [I(2)] are excluded because their presence renders the F-statistic for testing cointegration invalid (Sanusi and Meyer, 2018). The procedure is done through employing the Augmented Dickey-Fuller (ADF) and Phillips-Perron tests to ensure the function is appropriate for analysis. Table 1 indicates that variables are either I(0) or I(1).

TABLE 1: UNIT ROOT TEST

	ADF		Phillips-Perron		
Variable	**Levels**	**First Difference**	**Levels**	**First Difference**	**Order of Integration**
Velocity	-1.6053 (0.7840)	-7.3037*** (0.0000)	-1.3800 (0.8610)	-7.2639*** (0.0000)	I (1)
Log of real GDP per capita	-6.7933*** (0.0000)		-6.9341*** (0.000)		I (0)
Inflation	-2.1525 (0.5102)	-7.3654*** (0.0000)	-2.2164 (0.4752)	-7.9208*** (0.0000)	I (1)
Interest rates	-1.8821 (0.6566)	-6.6874*** (0.0000)	-1.5123 (0.8193)	-6.5109*** (0.0000)	I (1)
NEER	-1.3893 (0.8585)	-6.8613*** 0.0000	-1.3556 (0.8680)	-6.9094*** (0.0000)	I (1)
Currency to Demand Deposit	-3.9832** (0.0121)		-3.9392** (0.0138)		I (0)
Demand Deposit to Time Deposit	-3.5201** (0.0425)		-3.6179** (0.0331)		I (0)
Stock Market Capitalisation to NGDP	-1.9584 (0.6164)	-5.6711*** (0.0000)	-1.4446 (0.8418)	-11.2281*** (0.0000)	I (1)

Notes:
1. *** and ** denote statistical significance at 1% and 5% level of significance, respectively.
2. The numbers in parenthesis represent probability values.

5.2 ARDL Bounds Test for Cointegration

Prior to drawing conclusions and inferences about the estimated coefficients, it is imperative to check if the variables are cointegrated. Therefore, the ARDL bounds test procedure is used to ascertain the existence of a long-run relationship among the variables. Table 2 presents the results of the bounds test for cointegration amongst the variables.

TABLE 2: BOUNDS TEST

F-Bounds Test	**Value**	**0.010**	
		I(0)	**I(1)**
F-statistic	5.0309		
n (number of observations)	98	2.79	4.10
k (number of parameters)	8[1]		

Notes:
1. The number of parameters in the bounds test include the dummy variable.
2. Lower and Upper-bound critical values are taken from Pesaran et.al (2001).

It is found that the F-statistic is approximately 5, which is greater than the upper bound value of approximately 3.2 at the 1 percent critical value. This result suggests a rejection of the null hypothesis of no cointegration and implies the presence of a long-run relationship between the velocity of money and the independent variables. That is, the income velocity of money is cointegrated with the other independent variables. The study, therefore, proceeds to estimate the ARDL model in Equation 2 to obtain both the long-run and short-run coefficient, along with their asymptotic standard errors as shown in Table 3.

5.3 Short and Long-Run Model Results

TABLE 3: SHORT AND LONG-RUN RESULTS

Variable	Short-Run Results	Long-Run Results
Log of real GDP per capita	0.0487 (0.6653)	0.5036** (0.0378)
Inflation	-0.0079* (0.0808)	-0.0255*** (0.0012)
Interest rates		0.0205** (0. 0285)
NEER	-0.0004 (0.8466)	-0.0015 (0.6004)
Currency to Demand Deposit	0.9876*** (0.0000)	2.8773*** (0.0000)
Demand Deposit to Time Deposit	1.1094*** (0.0000)	2.5440*** (0.0000)
Stock Market Capitalisation to NGDP	-0.0409 (0.3488)	-0.1595** (0.0191)
Dummy		-0.0223 (0.6821)
CointEq (-1)	-0.4595*** (0.0000)	

Notes:
1. ***, ** and * denote statistical significance at 1%, 5% and 10% level of significance, respectively.
2. The variables in the short run are all in differences.

(i) Long-Run Model Results

The results indicate that real GDP per capita has a significant and positive relationship with velocity of money in the long run. That is, a percentage increase in income leads to a 0.5 percentage point upsurge in the velocity of money in the long run. This relationship indicates that the economy of Botswana is at a later stage of economic growth (see footnote 6) as suggested by Khan and Gill (2013). Khan and Gill (2013) posit that the relationship between real income and the velocity of money depends on the level of financial development. They argue that velocity of money is likely to fall with higher income growth at the early stages[36] of economic growth, but later increase with growth in income.

According to Akhtarruzzaman (2008), financial development is likely to increase the collection of time deposits (TD) at a higher rate than demand deposits (DD), implying declining DD/TD ratio with financial development. Ramsaran (1992) notes that the ratio of demand deposits to time deposits (DD/TD) is commonly used to proxy financial development and has a positive effect on velocity of money. The authors state that at advanced stages, financial development affects the velocity of money positively so that the velocity of money increases with financial development. These stages are characterised by transaction efficiency, financial innovation and technological progress which ensure the availability and use of money substitutes reducing the demand for money, ultimately raising the velocity of money.

As presented in Table 3, the ratios of demand deposits to time deposits and currency to demand deposits have a positive and significant association with velocity in the long run, implying that Botswana's economy is progressing towards the later stages of financial development, although there is room for growth. Matambo (2019) noted that the economy of Botswana has financial sector development, access and inclusion gaps. Furthermore, there are opportunities availed by the fast changes in the financial landscape driven by advancements in technology and innovation that could be harnessed, and ultimately result in larger economic and society-wide benefits. Botswana has since embraced financial technology, commonly referred to as Fintech, as another channel of financial services delivery to help with an increase in the evolution of the financial sector, which would result in improved access to financial services as well as promoting financial inclusion, while also managing their risks, inter alia, cyber threats. Fintech avails cheaper and more

36 According to (Khan and Gill, 2013), early stages of economic growth are characterised by increasing monetisation, spread of banking system and relatively fast expansion of monetary transactions that contribute to higher demand for money and, thus, making money velocity fall down. Meanwhile, the later stage of development is characterised by transaction efficiency, financial innovation and technological progress that contribute to the reduction in the demand for money, ultimately causing a rise in the velocity of money.

proficient financial services to consumers, which will contribute more to the increase in the velocity of money as people turn towards the use of new technologies in conducting banking transactions.

The ratio of the stock market capitalisation to GDP has a negative long-run relationship with velocity of money. A unit change in the ratio leads to a 16 percent decrease in velocity. As alluded to by Okafor *et al.* (2013), since investment in stocks is another opportunity cost of holding money, especially when returns are high, a rise in this investment would reduce the volume of cash and, hence, reduce the velocity of money. However, it is worth noting that, although there are financial assets available in the Botswana financial market, they are inadequate substitutes of money. Hence, the choice of wealth holders being limited between money and real assets, and not so much between money and financial markets as assets held in the form of liquid money depreciate with, among others inflation, while real assets appreciate with inflation[37].

Interest rates (proxied by the yield on 91-day BoBCs) and the velocity of money are positively correlated in the long run. As expected, the increase in interest rates leads to a decrease in the demand for money and a rise in the velocity of money. Moreover, interest rates represent the opportunity cost of holding money. When this cost increases, money holders are likely to hold less amount of money, which increases the velocity of money. These results are similar to those of Khan and Gill (2013) and Okafor *et al.* (2013).

On the other hand, inflation has a significant long-run negative relationship with the velocity of money. As Okafor *et al.* (2013) indicated, when prices increase, velocity of money declines as the payment pattern and spending habits alter. Although with a minimal impact, a 1 percent increase in inflation reduces the rate of income velocity by 0.03 percent, implying that inflation is a significant variable that negatively impacts velocity. This is consistent with theory and empirical studies by Aruna (2016) for Sierra Leone and Okafor *et al.* (2013) for Nigeria.

The nominal effective exchange rate and dummy variables have an insignificant relationship with the velocity of money in the long run. The latter implies that the 2008/09 global financial crisis had no effect on the velocity of money. Finally, the lagged error correction term, cointeq (-1), is statistically significant at 1 percent level with the expected sign. This validates the result of the bounds test for cointegration. Its value is estimated at -0.46 which implies that, approximately 46 percent of disequilibria from the previous quarter shock converge back to the long-run equilibrium in the next quarter.

(ii) Short-Run Model Results

The results presented in Table 3 suggest a short-run relationship between velocity of money and inflation as well as the ratios of currency to deposits and demand deposits to time deposits. Also, as in the case of long-run results, the nominal exchange rate is insignificant in explaining income velocity of money. The coefficients on the ratios of currency to demand deposits and demand deposits to time deposits have a positive and significant association with the velocity of money, while inflation has an inverse relationship with the velocity of money. The ratio of stock market capitalisation to nominal GDP and the log of real GDP per capita are insignificant in explaining short-term movements in demand for money in Botswana.

The estimates provided in the analysis above show a significant negative relationship between the demand for money and inflation in the short run. Furthermore, the estimation results showed an inverse long-run relationship between money demand and inflation and the ratio of stock market capitalisation to nominal GDP. Conversely, the long-run relationship between money demand, real GDP per capita, interest rates as well as the demand to time deposit and currency to deposit ratios is found to be positive.

5.4 Diagnostic and Stability Tests

TABLE 4: DIAGNOSTIC TEST RESULTS

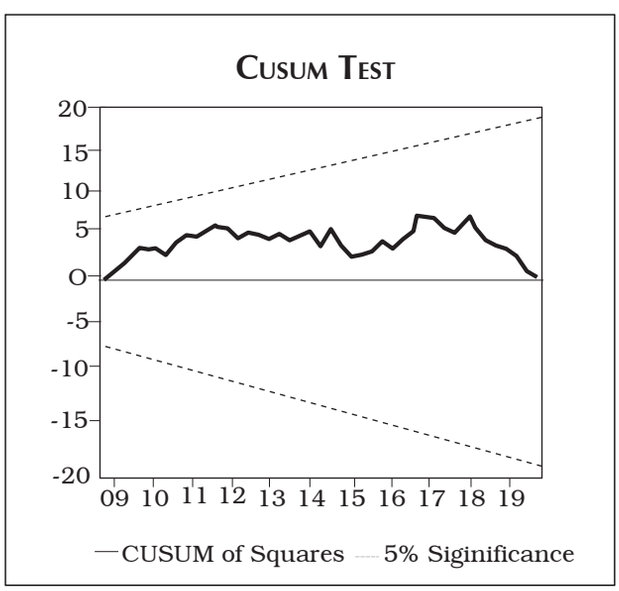
Variable	Probability Values (P-Value)
Ramsey-RESET test	0.3601
Serial Correlation	0.6638
Heteroskedasticity	0.8217
Normality	0.2934

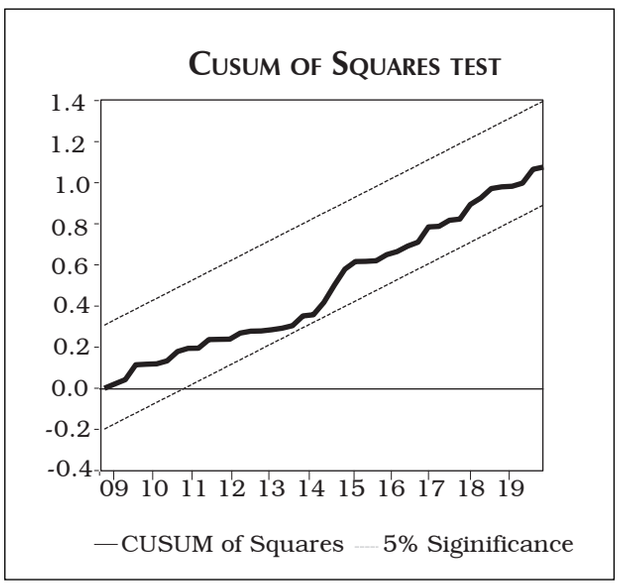
37 It is important nonetheless to note that, the performance and return on financial assets in Botswana and the related asset preferences by wealth holders is a function of a pool of demographic characteristics, investment strategies and economic factors, such as risk appetite, financial literacy, investment horizon, liquidity of the stock market, economic growth and interest rates.

The results in Table 4 indicate that the model passes all the diagnostic tests against serial correlation (Breusch-Godfrey test), heteroskedasticity (White Heteroskedasticity Test), and normality of errors (Jarque-Bera test). The Ramsey RESET (Regression Specification Error Test), which is a general test for the model specification error regarding omitted relevant variables, incorrect functional form and the correlation between explanatory variables and the error term also suggests that the model is well specified.

Furthermore, a stability check was carried out using the Brown, Durbin, and Evans (1975) model of stability verification. The Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMQ) of recursive residuals tests were used to test whether the coefficients of the estimated model remain constant over time; a property that signifies the stability of the model. As illustrated in Figure 1, the plot falls within the 5 percent critical bounds of significance, implying that the parameters of the model are stable.

FIGURE 1: STABILITY TEST





6. CONCLUSION

The stability of money demand is an important policy issue in monetary policy determination. Using an ARDL model, the paper finds a significant negative relationship between the demand for money and inflation in the short run. The ratio of stock market capitalisation to nominal GDP and the nominal effective exchange rate are, however, found to be insignificant in explaining short-term movements in demand for money in Botswana. Furthermore, there is an inverse long-run relationship between money demand and inflation and the ratio of stock market capitalisation to nominal GDP. Conversely, the long-run relationship between money demand, real GDP per capita, interest rates as well as the demand to time deposit and currency to deposit ratios is found to be positive.

Financial development, proxied by the ratio of stock market capitalisation to GDP, the demand to time deposit and currency to deposit ratios, suggests that Botswana is moving towards later stages of financial development. Therefore, since financial innovation also helps foster faster dissemination of information and easy access to information, the later stage of financial development has strong implications on changing the lending-borrowing and asset substitution behaviours of the people and, hence, the speed of income velocity of money.

The results of this study suggest that the relationship between money demand and its core determinants or the money demand function, is stable. This, therefore, implies that the formulation and implementation of monetary policy should consider information about the level of money demand in the economy.

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Household Credit Growth in Botswana: A Test of Minsky's Financial Instability Hypothesis

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ABSTRACT

This paper estimates the dynamics of household borrowing in the short run and long run, and the relationship between household credit growth and economic fundamentals in different stages of the Botswana economy. The study employs a semi-structural unobserved components model; an Autoregressive Distributed Lag model; and a Markov Switching model using quarterly data for the period 1996Q1 to 2019Q4. These models are meant to capture excessive household indebtedness, long-run and short-run dynamics of household credit growth, and the evolution of household credit growth in different stages of the economy, respectively. The results show that there is a positive relationship between household expenditure and household credit in the long run; the output gap and the credit gap only matter in the short run; and performance of the economy above potential drives up credit growth, and a positive credit gap signals credit bubbles. The credit bubbles consistently predict periods of economic and/or financial stress. In this context, it is concluded that household credit dynamics follow a Minskian pattern, where periods of prolonged economic tranquillity lead to households taking unsustainable financial positions that may result in financial crisis. However, the paper makes it clear that Botswana has not had a financial crisis at any point.

1. INTRODUCTION

According to Faulwasser *et al.* (2018), credit flows, credit fuelled booms, and the instability of credit are the major sources of financial instability. This supposition is consistent with the views of Minsky (1986), Kindleberger and Aliber (2015), Schularick and Taylor (2012) and Jordá *et al.* (2011), among others. Along the same line, Schularick and Taylor (2009) suggest that there exist boom-bust episodes for the credit cycle, and that credit growth has information about future financial crises. Using data for G10 countries, Gorton and Winton (2002) find that there is a systematic cyclical pattern in the extension of loans to the private sector by banks.

Most post-Keynesian literature on the effect of debt on macroeconomic problems are strongly linked to Hyman Minsky's financial instability hypothesis which posits that periods of prolonged economic prosperity are accompanied by the build-up of systemic vulnerabilities. Minsky's theory explains the two-sided aspects of debt-financed spending. During the boom-phase of the business cycle, debt-financed household expenditure provides a source of additional economic stimulus. However, as the economy experiences a prolonged phase of prosperity, more debt-financed spending occurs, and the debt-to-income ratio eventually rises. The balance sheets of businesses and households deteriorate, and the system becomes financially fragile and highly vulnerable to negative shocks, potentially resulting in a severe economic downturn. According to Palley (1994), the Minskian description of debt accumulation also ties in with Kaldor's (1955-56) analysis of aggregate demand in terms of the distribution of income.

The Kaldorian analytical framework focuses on the effects of household debt accumulation on consumption, whereby borrower (debtor) households have a higher marginal propensity to consume (MPC) than creditor (wealthy) households. Expounding on the framework, Palley (1994) argues that increases in debt initially stimulate aggregate demand, but the interest payments on accumulated debt stocks become a burden on aggregate demand since they transfer income from high MPC households to low MPC households. This is supported by empirical work by Schularick and Taylor (2009) who determine that historical data for the United States of America (US) supports the ideas of Minsky (1977), while Kindleberger and Aliber (2015) argued that the financial system is prone to generating economic instability through endogenous credit booms.

Data show that Botswana has been experiencing rapid credit growth in the last two decades, especially lending to the household sector and, in particular, unsecured loans (Botswana Financial Statistics publications (BFS)). This development is partly indicative of financial deepening and inclusion and is positive for economic activity and welfare. However, the rise in household debt also comes with a build-up of systemic vulnerabilities. It is observed that excessive household indebtedness makes households vulnerable to credit shocks which may

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lead to financial instability as illustrated by the 2007 US subprime lending and 2008/09 global financial crisis. The major concern with the rapid increase in the rate of credit growth is the risk of the borrowers defaulting on their payments and, in turn, leading to the collapse of the financial system.

Leading up to the financial crisis of 2008/09, household credit growth in Botswana was very high, averaging 25 percent between 2007 and 2009 (BFS). During the crisis period, credit growth slowed down significantly and averaged 14 percent (BFS). The 2011 International Monetary Fund (IMF) Article IV[39] mission report for Botswana notes that loan arrears rose rapidly in 2009. Even though household credit risk is not excessive in terms of household non-performing loans to household loans ratio, with an average of 5 percent over the study period, the fact that unsecured lending dominates total household credit represents a vulnerability and exposes the whole financial system to shocks (Botswana Financial Stability Report (FSR) 2019). The shocks could manifest through employment losses leading to increase in default rates, and at the same time putting pressure on insurance companies who insure unsecured loans. These dynamics constitute significant systemic vulnerabilities since insurance is a pooled risk business, and large employment losses would adversely affect this business segment and ultimately cripple insurance companies.

This paper estimates the dynamics of household borrowing in the short run and long run, and in the different stages of the economy. It is imperative to study the dynamics of household credit, and the relationship between household credit growth and economic fundamentals in different states of the economy. This is necessary because even though the growth in household credit presents new challenges to macro-prudential policy objectives, it is also possible that the rapid growth is spurred by the banks expanding their loan portfolios from a low base given the fact that Botswana's banking sector is relatively small by international standards[40]. In this context, rapid credit growth would not necessarily be a predictor of financial crisis that leads to collapse of the economy. This paper aims to contribute to the understanding of household credit evolution in Botswana, and to inform policy on determining and dealing with household credit bubbles. The calculation of the credit gap[41] for households will help identify periods of excessive household credit growth.

The rest of the paper is organised as follows: Section 2 covers literature on credit cycles and the Financial Instability Hypothesis. Section 3 discusses the data and its analysis, while the methodology is specified in Section 4. The results are presented in Section 5 and Section 6 concludes.

2. LITERATURE REVIEW

2.1 Credit Cycle Theory

The credit cycle refers to the periodic expansion and contraction of access to credit over time. The contraction period continues until risks are reduced for the lending institutions, at which point the cycle troughs out and then begins again with renewed credit. Some economists, including Barry Eichengreen, Hyman Minsky and other post-Keynesian economists, regard credit cycles as the fundamental process driving the business cycle. However, mainstream economists believe that the credit cycle cannot fully explain the phenomenon of business cycles, with long-term changes in national savings rates, and fiscal and monetary policy, and related multipliers also being important factors.

Schularick and Taylor (2009) studied the behaviour of money, credit, and macroeconomic indicators for 14 countries over the years 1870 – 2008 and used the data to study rare events associated with financial crisis episodes. They found that broad money and credit cycles grew together in a stable manner before 1950, and both were good predictors of financial crises. The data post 1950 showed that only credit was a good predictor of financial crises. According to Schularick and Taylor (2009), historical

39 The Mission reported in 2009 that credit growth was strong for the past two years; in 2011 they determined that credit extension was recovering following the crisis but was still below pre-crisis levels. Credit growth continued to rise in 2014, averaging 24 percent. The 2014 Report noted that the rate of growth posed potential vulnerabilities for the financial sector and called for macro-prudential measures to be put in place to curtail the expansion. The 2018 Report raised concerns about the concentration of lending to households, while in 2020, they reported that strong household borrowing was attributable to higher public sector wages.

40 Household debt to GDP was 18.5 percent for Botswana in December 2018, compared to 77 percent for the US and 43 percent for South Africa.

41 In this paper, the credit gap has two definitions: for the Unobserved Components model, the credit gap is the estimated household credit gap; otherwise the term refers to the difference between the actual credit to GDP ratio and its trend, estimated using a Hodrick-Prescott filter.

data for the US support the ideas of Minsky (1977) and Kindleberger and Aliber (2015), who are of the view that the financial system is prone to generate economic instability through endogenous credit booms.

Gersbach and Rochet (2011) followed a different (but complementary) route, focusing on the notion of credit cycles. They proposed an explanation for the phenomenon that banks tend to lend more during economic booms, and less during recessions. They showed that credit markets are dysfunctional. Instead of dampening productivity shocks, the banking sector tends to exacerbate them, leading to excessive fluctuations of credit, output and asset prices. This finding is explained by moral hazard, banks' high exposure to aggregate shocks, as well as the ease with which banks can reallocate capital between different business entities. Gersbach and Rochet (2011) argued that banks offer privately optimal contracts to investors, but these are not socially optimal as reallocation of capital reacts strongly to aggregate shocks as banks do not internalise the impact of these decisions on asset prices. This tends to generate fluctuations of credit, output and asset prices. Gorton and He (2005) posit that the performance of banking institutions relative to each other are a major source of macroeconomic fluctuations, leading to what they call bank credit cycles. They argue that swings between high and low credit allocations are a normal part of banking due to the manner in which banks compete for borrowers.

In their contribution to the credit cycle theory, Hellwig and Lorenzoni (2009) argue that unsecured credit is a bubble sustained by self-fulfilling beliefs such that transitions from a good macroeconomic environment with plenty of unsecured credit to a bad outcome with low volumes can be amplified by widespread scepticism about the ability and willingness of financial markets to continue the credit expansion. Similarly, Azariadis (2018) finds that unsecured firm credit is highly pro-cyclical and often followed by periods of economic expansion, while secured credit is acyclical.

Adrian and Shin (2010) argue that availability of credit and credit expansion varies over the business cycle. They posit that some degree of cyclical variation in lending is inherent in the financial system, and this holds even in a frictionless utopia of Modigliani and Miller (1958). In this context, it should be expected that total credit expansion increases in economic upswings and declines in economic downswings.

Kiyotaki and Moore (1997) studied how credit constraints interact with aggregate economic activity over the business cycle. They constructed a model of a dynamic economy in which lenders are unable to force borrowers to repay their debts unless the debts are secured. In the economy, durable assets like land, buildings and machinery played a dual role as factors of production and collateral for loans. Borrowers' credit limits are affected by the value of the collateralised assets, and, in turn, the prices of the assets are affected by the credit limits. Thus, the interaction between credit limits and asset prices was a powerful transmission mechanism by which the effects of a shock persist, amplify and spill over to other sectors. They showed that small, temporary productivity shocks to technology or income distribution could generate large, persistent fluctuations in output and asset prices. When borrowers are unable to obtain credit, a negative shock can make them sell their assets, which reduces their net worth. Unable to borrow more, the credit-constrained entities would reduce the level of their investment in the current period. In the subsequent period, they earn less revenue, leading to a further fall in net worth and a further reduction in investment. The knock-on effects continue and are amplified by the change in asset prices.

2.2 Minsky's Financial Instability Hypothesis

This section gives an overview of the literature on financial crises and/or macroeconomic (in)stability, with a view to relate the dynamics of financial crises to Minsky's Financial Instability Hypothesis (FIH). The purpose is to give an overview of the literature on the manifestation and transmission of economic and/or financial risks. Oura and Schumacher (2012) demonstrate that macroeconomic or financial shocks can manifest through credit losses, deterioration of asset values and direct losses of income, with feedback effects on the asset side of the real sector, as well as liquidity shortages in the financial sector. A combination of these factors ultimately leads to systemic losses, with idiosyncratic impacts on financial sectors and institutions.

Most of the literature on the manifestations of financial crises associate them with the presence of credit and asset price booms, driven largely by rapid debt accumulation. Laeven *et al.* (2016) argue that sudden and rapid credit expansion sows the seeds for economic crises. They argued that this creates vulnerabilities and/or exacerbates existing ones if accompanied by lax lending standards, excessive leveraging and asset bubbles. Most of the literature attempting to explain the origins of financial crisis

are linked to Keynes (1930), Minsky (1976)[42], and Kindleberger and Aliber (2015). Caverzasi (2014) gives a two-dimensional exposition of Minsky (1976)'s FIH: a pure FIH perspective and an augmented financial Keynesianism perspective. The FIH takes a financial economy structured argument based on an endogenous theory of the business cycle within which periods of economic tranquillity lead the system towards instability.

Minsky (1976) argues that a prolonged period of tranquillity leads to economic agents' expectations becoming more and more optimistic. In turn, this behaviour leads to narrowing of margins of safety, and speculative and Ponzi finance[43] become the norm. In the case of external or internal shocks, due to revised expectations associated with poor macroeconomic conditions and/or higher interest rates, households and businesses default on their loan obligations and/or sell their assets. According to Laeven *et al.* (2016), the hypothesis suggests that increasing fragility makes the macroeconomic systems more susceptible to shocks due to impairment of borrowers' ability to service their loan obligations. As a result, financial relationships are viewed as sources of cycles and instability, and this notion provides useful insights into the dynamics of modern macroeconomies.

Caverzasi (2014) investigates whether the 2008/09 crisis was a Minsky moment, and borrows from Davidson (2008), Kregel (2008), Wray (2012) and Dymski (2010). Davidson (2008) argues that the financial crisis resulted from an attempt to securitise illiquid assets, which was accommodated by the deregulation of financial markets in the US through the repeal of the Glass-Steagall Act. The paper states that under the Glass-Steagall Act, financial institutions had to choose to either be a bank or an underwriter. This kept lending institutions and underwriters legally separated. It is further argued that if the Act was in place, mortgage loans extended by banks would have been classified as illiquid assets and couldn't have been traded once originated. In this context, originators of mortgages leading up to the financial crisis did not worry about the risks of default as they sold the debt to underwriters after 30 days, who then sold to investors looking for safe returns. From this point of view, underwriters' guarantees of securitisation caught unsuspecting investors off-guard.

Caverzasi (2014) states that analysis of Minsky (1976) can be adapted beyond the caveats of investment. In this context, the FIH can be taken as a wholesome framework for understanding how the financial system interacts with the real economy in line with Dymski (2010) and Wray (2012). A purely Minskian view relates to the finance of investments by means of loans from banks. Caverzasi (2014) augments Minsky's thinking with the theory of Capital Market Inflation (CMI) of Toporowski (1999).

From the analysis of Toporowski (1999), it is deduced that firms' indebtedness is counter cyclical as they shift from debt financing in upswings to equity financing, leading to deleveraging in booms contrary to the FIH. Caverzasi (2014) argues that this does not invalidate the FIH if equity is treated as debt in the balance sheet of firms. A breakdown of these dynamics shows that due to financialisation[44], banks lost their best customers in firms, leading them to seek other sources of revenue and, ultimately, taking up more risky customers and diversifying into property markets. Therefore, combining the FIH and the CMI allows for the identification of endogenous forces which made financial instability inevitable in the real estate market.

Following Keynes (1937), banks are regarded as the drivers of economic activity due to their capacity to create money, fuelling business cycles by supplying credit during booms and reducing it during economic recessions. In line with the exposition of the FIH, banks are the units which allow economic agents to undertake increasingly fragile positions. Due to the shared optimism between banks and other economic players, Minsky (1986) argues that banks actively seek business in a Schumpeterian manner[45], making them the engine that drives the whole economic system towards an unsustainable path.

Leading up to the sub-prime crisis, institutional factors, such as securitisation, drove the optimism

42 See Minsky (1992).

43 Minsky (1992) defines Ponzi units as economic agents whose cash flows from operations are not sufficient to fulfil either the repayment of principle or the interest due on outstanding debts by their cash flows from operations. They can sell assets or borrow. In this context, Ponzi finance refers to borrowing to pay interest or selling assets to pay interest (and even dividends). The same definition applies to mortgage refinancing.

44 Palley (2007) defines financialisation as process through which finance, financial markets, and financial institutions gain prominence over the workings of the economy. See Palley (2007): Financialisation: What it is and why it matters. Levy Economics Institute Working Papers.

45 Joseph Schumpeter (1883-1950) describes Creative Destruction as a process of industrial mutation that continually transforms the economic structure from within, destroying the old and creating new ones. See https://www.econlib.org/library/Enc/CreativeDestruction.html.

surrounding the risk perceived by both borrowers and lenders, as houses were considered a highly secure asset, and securitisation protected banks against lenders' risk. Given these dynamics, Caverzasi (2014) posits that refinanced debt was used to finance personal consumption in the face of low wages and high inequality. From this exposition, it is concluded that the fundamental features of the FIH were unchanged with households refinancing mortgages as new Ponzi units of the taxonomy[46], while the euphoric expectations resulting from a period of prolonged tranquillity led to an overall decline in prudential behaviours across the economic system. It is concluded that when the burden of Ponzi households became unsustainable, the housing bubble burst and there was ultimately a Minsky moment.

3. DATA DESCRIPTION AND ANALYSIS

The paper uses quarterly time series data from 1996Q1 to 2019Q4. The primary purpose of the paper is to model household credit and explore the dynamics of credit growth in different stages of the economy. The variables used in the analysis are shown in Table 1.

TABLE 1: STUDY VARIABLES

Variable	Purpose	Source of Data
Household Credit (Growth)	Primary Variable	Botswana Financial Statistics (BFS)
Household Expenditure (Growth)	Use of Credit	Statistics Botswana
Real Gross Domestic Product (GDP) Growth	Aggregate Demand	Statistics Botswana
Real Interest Rate	Cost of Borrowing	BFS
Output Gap[47]	Economic Conditions	Authors' Calculation
Credit Gap	Credit Developments	Authors' Calculation
Household Default Rate[48]	Credit Risk	Authors' Calculation
Inflation Rate	Cost of Living	Statistics Botswana
Household Deposits (Growth and Net Deposits[49])	Household Savings	BFS

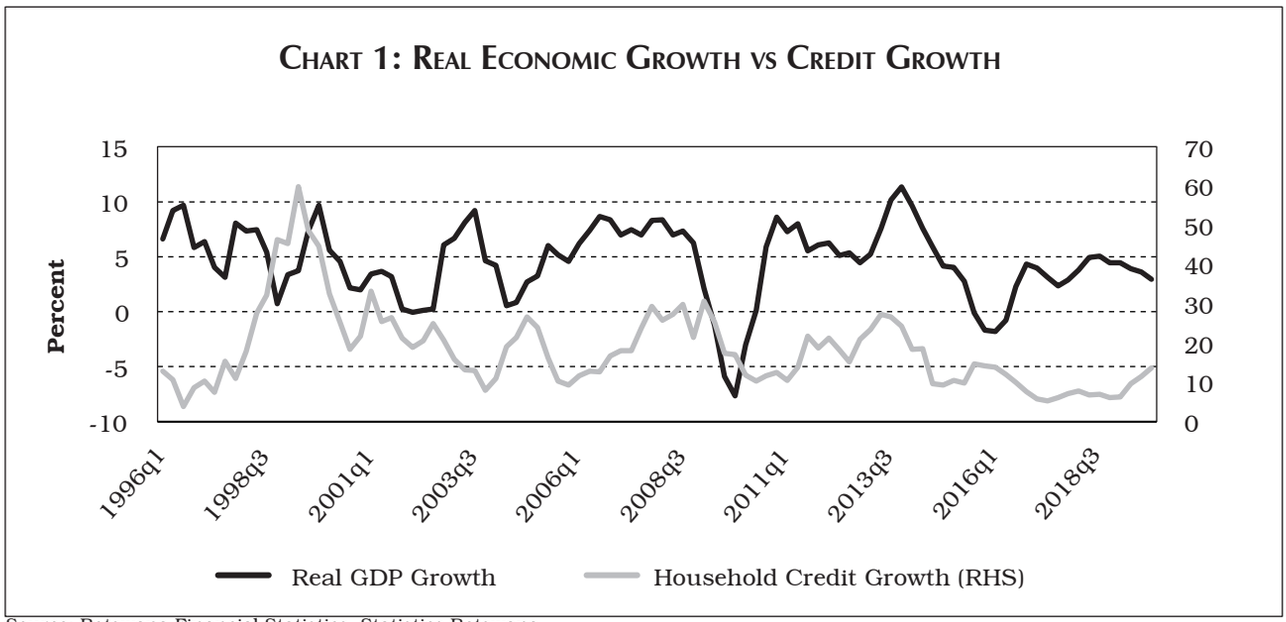
Chart 1 shows real GDP growth and household credit growth for the period March 1996 to December 2019. In general, periods of economic slowdown are accompanied by lower growth rates in household borrowing, and periods of economic growth are characterised by expansion in household borrowing. According to the data, average household credit growth was 21 percent between 1996Q1 and 2006Q4, and 16 percent between 2007Q1 and 2019Q4. Actual household credit grew from P770 million in 1996Q1 to P40 billion in 2019Q4. During the same period, nominal GDP grew from P13 billion to P190 billion. It is apparent from the data that household credit growth is consistent with the overall increase in economic activity.

46 In this context, the taxonomy means classification of economic activity (ies), as it is not always the case that households behave in this way. For further reading see Pol, E, Carroll, P and Robertson, P: A New Taxonomy of Economic Sectors with a View to Policy Implications, Working Paper 01-01, Department of Economics, University of Wollongong, 2001.

47 The output gap is derived as deviation of real output growth from its trend using the Hodrick-Prescott (HP) filter.

48 Default Rate is calculated as ratio of household non-performing loans to total household loans.

49 Household net deposits is calculated as household deposits minus household loans.

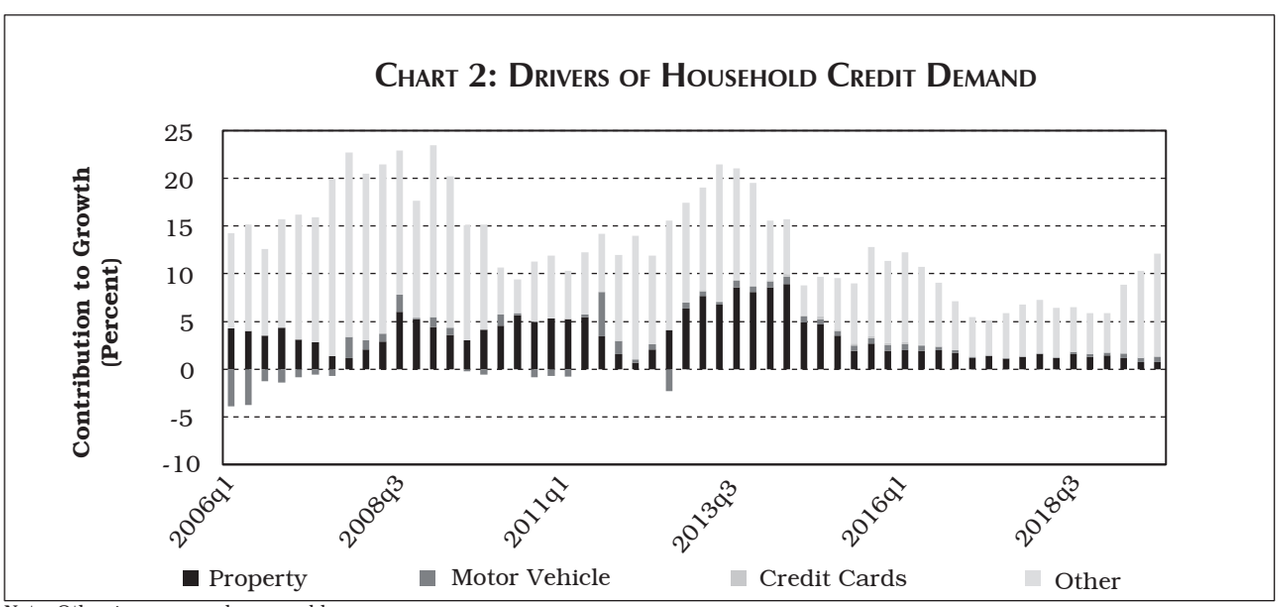


Source: Botswana Financial Statistics, Statistics Botswana

3.1 Drivers of Household Credit

Chart 2 presents contributions of different components of household credit to total household credit growth between March 2006 and December 2019. The chart shows that household credit is largely driven by unsecured lending (Other), making up more than 50 percent of total household borrowing, followed by property or mortgage financing. Given that household credit in Botswana tends to move with economic growth in general (see Chart 1), it can be deduced that unsecured firm credit moves pro-cyclically and tends to lead GDP, while secured credit is acyclical.

This is in line with Azariadias (2018)'s findings on credit and business cycles for the US. These results are plausible since banks are likely to adopt strict lending standards during periods of economic downturn if overall lending criteria are largely based on employment security. This is because a slowdown in economic activity is associated with increased incidence of unemployment and stagnant household income.



Note: Other is unsecured personal loans.

Source: Authors' own calculations

3.2 Gap Analysis

Gap analysis involves studying the evolution of the calculated output and credit gaps. According to Drehman and Tsatsaronis (2014), the credit gap is the single most robust indicator for the build-up of financial vulnerabilities. However, its role is generally to inform decision making with regard to counter-cyclical capital buffers. Drehman and Tsatsaronis (2014) found that the credit gap is negatively correlated with real GDP growth for a group of countries, including the United Kingdom, US, Germany, France, Japan and Spain, in the years 1980 to 2013. It captures the ideas of Kindleberger and Aliber (2015) and Minsky (1986), who argue that periods of tranquillity lead to build-up of unsustainable credit growth which, in turn, leads to crises.

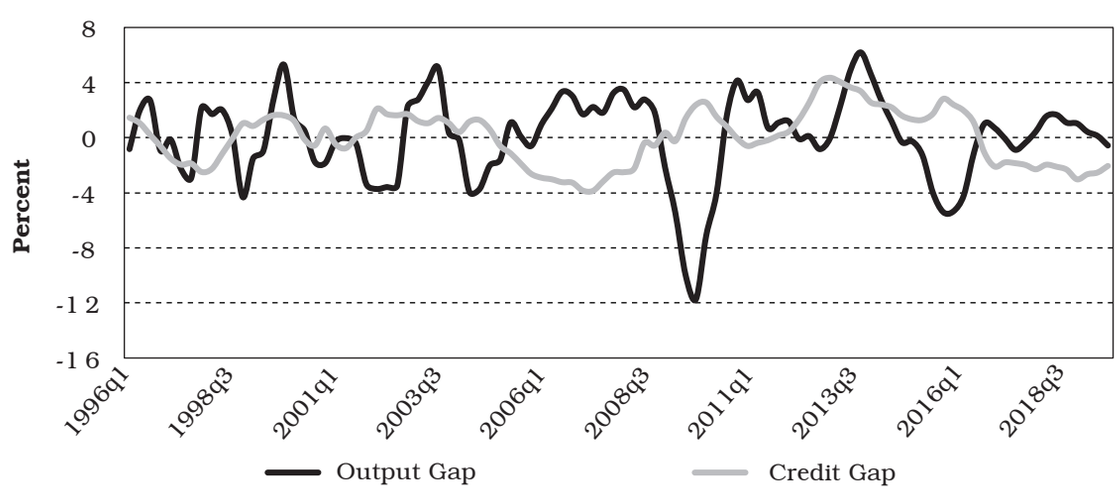
The Hodrick-Prescott (HP) filter is the simplest methodology for the calculation of both the output gap and the credit gap, but some studies have found it to perform very poorly. According to Hamilton (2017), the patterns exhibited by the cyclical component of the HP filter do not define the data-generating process, but rather are just a result of having applied the filter to the data.

Alichi (2015) explores a multivariate Kalman filter for the US output gap and concludes that the method is more robust than other filters which are commonly used, including single-variate and hybrid methods associated with the HP filter. The paper argues that this kind of filtering gives structure to the output gap and is also flexible enough to include a suitable number of economic variables.

Mohr (2005) argues that the HP filter confines the stochastic trend to a second order random walk, while the Trend-Cycle (TC) filter generalises the trend to any order. Mohr (2005) argues that, even though the TC filter is an advancement of the HP filter, the fact that it yields cyclical neutrality is a significant gain. The HP filter is also known for its poor end-of-sample properties, and the TC filter has better end-of-sample properties and can be adapted to the data, according to Mohr (2005).

With these limitations in mind, this paper employs the HP filter to estimate the output gap and the credit-to-GDP gap, in line with Basel Committee on Banking Supervision (BCBS) guidelines. A smoothing parameter of 1 600 is employed for the output gap while 400 000 (as recommended by BCBS) is used for the credit gap. Chart 3 shows that, in general, a credit gap of more than 2 percentage points corresponds to periods of economic distress - the global financial crisis of 2008/09 and the fall in diamond prices in 2015. During those periods, the output gap is consistently and significantly less than zero.

CHART 3: OUTPUT GAP VS CREDIT GAP



Source: Authors' own calculations

4. METHODOLOGY

This paper employs three models; a semi-structural unobserved components model; an Autoregressive Distributed Lag model; and a Markov Switching model. These models are meant to capture excessive household indebtedness, long-run and short-run dynamics of household credit growth, and the evolution of household credit growth in different stages of the economy, respectively. We believe that studying household credit in this way makes it possible to get close to conclusively determining whether household credit follows a Minskian pattern or not.

4.1 Unobserved Components Model (UCM)

This approach is based on the unobserved components approach of Lang and Welz (2017). Lang and Welz (2017) develop a theory-based approach to identifying excessive household credit developments. They use a modified version of the overlapping generations model developed by Eggertsson *et al.* (2017) to motivate the factors that should affect the trend component of household credit. The paper derives an equilibrium relationship for the trend level of real household credit using a structural economic model. The structural model implies that the equilibrium real household credit stock is driven by four fundamental economic factors, namely, real potential GDP, the equilibrium real interest rate, the population share of the middle-aged cohort and the level of institutional quality. They derive theory-based household credit gaps as deviations of the observed household credit stock from the credit trend. The seminal findings show that estimated theory-based household credit gaps tend to increase many years ahead of systemic financial crises and they possess superior early warning properties compared to a number of established statistical credit gaps, notably the commonly used Basel total credit-to-GDP gap and its household credit-to-GDP gap variant.

The unobserved components formulation decomposes a variable into trend and cyclical components, with each of them having a specific equation. Following conventional UCM representation, this paper casts the UCM directly in state space form shown by equations 1, 2, and 3 below. In the specified set-up, equation 1 is the observation equation which decomposes household credit into trend and cyclical components, while equations 2 and 3 are state equations expressing the unobserved components of household credit to be estimated, the trend and the cyclical component. The cyclical component is the deviation of credit levels from the long-run values and defines the household credit gap. Institutional quality and population dynamics which are believed to explain the evolution of the trend or equilibrium level of household credit (equation 2) in Lang and Welz (2017) are not included in this paper due to data constraints. Nevertheless, the relationship between credit and the remaining economic fundamentals should make economic sense.

$$c_t = c_t^* + \hat{c}_t \quad (1)$$

$$c_t^* = \beta_0 + y_t^* + \beta_1 r_t^* + \varepsilon_t^* \quad (2)$$

$$\hat{c}_t = \alpha_1 \hat{c}_{t-1} + \alpha_2 \hat{c}_{t-2} + \hat{\varepsilon}_t \quad (3)$$

Where: β's and α's are parameters and c_t is real household credit, c_t^* is the long-run real household credit or trend, $\hat{c}_t$ is the cyclical component of household credit, y_t^* is long-run real GDP or real potential GDP, r_t^* is long-run real interest rate[50] and the $\mathcal{E}$'s are the white noise error terms.

As in Lang and Welz (2017), the system of equations is estimated based on a state-space set-up by means of a maximum likelihood algorithm which employs Kalman filtration to compute the likelihood function.

4.2 Autoregressive Distributed Lag Model (ARDL)

The baseline model for the empirical analysis of this relationship is a multivariate regression captured by equation 4 below. Intuitively, the current level of household credit growth is explained by contemporaneous values of the selected macro-financial variables, which themselves can be explained by linear combinations of past values, including lags of the dependent variable, having a persistent long-run relationship. The ARDL formulation works from this representation to estimate short-run and long-run relationships between household credit growth and the specified macro-financial variables using the ARDL bounds approach as discussed below. The Unrestricted Error Correction Model (ECM) specified in equation 5 illustrates how equation 4 is cast into an ARDL representation, and equation 6 specifies the final ARDL model showing the short-run and long-run dynamics.

$$c\_g_t = \varphi_0 + \varphi_1 e_t + \varphi_2 g_t + \varphi_3 is_t + \varphi_4 g\_gap_t + \varphi_5 c\_gap_t + \varphi_6 def\_rate_t + \varphi_7 dg_t + \varphi_8 \pi_t + \varepsilon_t \quad (4)$$

50 The paper uses an equilibrium interest rate calculated based on the Fisher equation using the 91-day BoBC rate as the reference rate.

Where: φ's are parameters and c_g_t is household credit growth; e_t is household expenditure growth; is_t is the 91-day BoBC rate; g_gap_t is the output gap; c_gap_t is the credit gap; $def\ \_rate_t$ is the household default rate; dg_t is growth in household deposits; π_t is the inflation rate and ε_t is the error term.

To empirically estimate the multivariate relationship implied by the baseline model, this study employs the bounds test ARDL approach developed by Pesaran and Shin (1999) and Pesaran *et al.* (2001).

Pesaran and Shin (1999) introduce the bounds test for cointegration that can be employed within an ARDL framework. Pesaran and Shin (1999) argue that the bounds eliminate the uncertainty associated with pre-testing the order of integration. Secondly, the approach can be used in small sample sizes, whereas the Engle-Granger and the Johansen procedures are not reliable for relatively small samples.

The ARDL approach involves two steps. The first step is to examine the existence of a long-run relationship among all variables in the equation under examination. Conditional upon cointegration being confirmed, in the second stage, the long-run coefficients and the short-run coefficients are estimated using the associated ARDL and ECMs. To test for cointegration in equation 4 by the bounds test, the following conditional Unrestricted ECM is constructed:

$$\Delta c\_g_t = \alpha + \sum_{i=0}^{m} \beta_i \Delta c\_g_{t-i} + \sum_{i=0}^{m} \beta_i \Delta e_{t-i} + \sum_{i=0}^{m} \partial_i \Delta g_{t-i} + \sum_{i=0}^{m} \theta_i \Delta is_{t-i} + \sum_{i=0}^{m} \gamma_i \Delta g\_gap_{t-i} + \sum_{i=0}^{m} \emptyset_i \Delta c\_gap_{t-i} + \sum_{i=0}^{m} \emptyset_i \Delta def\_rate + \sum_{i=0}^{m} \omega_i \Delta dg_{t-i} + \sum_{i=0}^{m} \delta_i \Delta \pi_{t-i} + \varphi_1 e_{t-1} + \varphi_2 g_{t-1} + \varphi_3 is_{t-1} + \varphi_4 g\_gap_{t-1} + \varphi_5 c\_gap_{t-1} + \varphi_6 def\ \_rate_{t-1} + \varphi_7 dg_{t-1} + \varphi_8 \pi_{t-1} + \mu_t \quad (5)$$

Or compactly:

$$\Delta c\_g_t = \alpha + \sum_{i=0}^{m} \beta \Delta X_{t-i} + \sum_{i=0}^{n} \varphi_i X_{t-1} + \mu_t$$

Where: X is a matrix of exogenous variables and lags of household credit growth; β and φ_i are matrices of coefficients; and Δ denotes the first difference of a variable.

The bounds test methodology entails investigating the null hypothesis of no cointegration through a joint significance test of the lagged variables based on the Wald or F-statistics:

$H_0: \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = \varphi_7 = \varphi_8 = 0$
$H_1: \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq \varphi_6 \neq \varphi_7 \neq \varphi_8 \neq 0$

According to Pesaran and Shin (1999), under the null hypothesis of no cointegration and regardless of the degree of integration of the variables, the asymptotic distribution of the obtained F-statistic is non-standard. This depends upon: whether variables included in the ARDL model are I(0) or I(1); the number of regressors; whether the ARDL contains an intercept and/or a trend; and the sample size. Two sets of critical F-values, representing the lower bound and the upper bound, have been provided by Pesaran and Shin (1999) for large samples. Narayan (2004) presents the F-values for sample size ranging 30-80. If the computed F-statistic for a chosen level of significance lies outside the critical bounds, a conclusive decision can be made regarding the cointegration of the regressors. If the statistic is higher than the upper bound, the null hypothesis of no cointegration can be rejected, and the next step is to estimate the ARDL ECM, where the short-run and long-run coefficients can be determined. If the statistic is below the critical value, we cannot reject the null hypothesis of no cointegration and if it lies within the bounds, a conclusive inference cannot be made without knowing the order of integration of the underlying regressors. In this case, Unit root/stationarity tests are performed. If there is evidence of a long-run (cointegration) relationship between variables, a long-run model is estimated. After performing the Wald test for cointegration, the Augmented Dickey-Fuller test for unit roots is used to test for stationarity and ascertain the level of integration. This is to ensure the variables are not cointegrated of order two and move forward with estimation of short-run dynamics.

Orders of the lags in the ARDL model are selected either by the Akaike Information Criterion or the Schwarz Bayesian Criterion (SBC), before the selected equation is estimated by Ordinary Least squares. For annual data, Pesaran and Shin (1999) recommended a maximum of 2 lags. From this, lag length that maximises SBC is selected. The ARDL specification of the short-run dynamics can be derived by constructing an error correction model of the form:

$$\Delta c\_g_t = \alpha + \sum_{i=0}^{m} \beta_i \Delta c\_g_{t-i} + \sum_{i\ 0}^{m} \beta_i \Delta e_{t-i} + \sum_{i=0}^{j} \partial_i \Delta g_{t-i} + \sum_{i=0}^{q} \theta_i \Delta is_{t\ i} + \sum_{i=0}^{n} \gamma_i \Delta g\_gap_{t-i} + \sum_{i=0}^{j} \emptyset_i \Delta c\_gap_{t-i} + \sum_{i=0}^{j} \emptyset_i \Delta \text{def\_rate} + \sum_{i=0}^{k} \omega_i \Delta dg_{t-i} + \sum_{i=0}^{p} \delta_i \Delta \pi_{t-i} + \vartheta ecm_{t-1} \quad (6)$$

Where: ecm_t is the error correction term, defined as

$$ecm_t = c\_g_t - \varphi_1 e_{t-1} - \varphi_2 g_{t-1} - \varphi_3 is_{t-1} - \varphi_4 g_{gap_{t-1}} - \varphi_5 c_{gap_{t-1}} - \varphi_6 \text{def}\_rate_{t-1} - \varphi_7 dg_{t-1} - \varphi_8 \pi_{t-1}$$

All coefficients of the short-run equation are coefficients relating to the short-run dynamics of the model's convergence to equilibrium and represents the speed of adjustment.

4.3 Markov-Switching Model

According to Piger (2007), a Markov-Switching (MS) model is a regime-switching model in which the shifts between regimes evolve according to an unobserved Markov chain. The general approach to Markov-Switching modelling follows the work of Goldfeld and Quandt (1973) and Hamilton (1989) who illustrate a tractable way to modelling changes in regimes. The seminal work of Hamilton (1989) distinguishes between different states of the economy by relying on a continuous dependent variable that captures the intensity of crises. Transition between different regimes is modelled as a hidden Markov chain. The underlying assumption is that the data are generated by a mixture of two distributions, one for the phases of expansion and the other for the phases of recessions.

Duprey and Klaus (2017) adopt this approach and use a transition matrix to perform differentiated analysis of dynamics of entering and exiting a crisis regime. They examine the ability of the MS framework to identify leading indicators of financial market stress and discover that credit and property market variables are the major indicators explaining the high probability of entering high financial stress regime.

The MS approach presumes that the data generating process is non-linear and the non-linearities are due to discrete shifts in regime-episodes across which the dynamic process of the series is markedly different. For example, credit growth may either be in a fast growth or a slow growth phase. In this context, credit growth dynamics can be estimated with respect to economic and financial variables in every state, and in relation to period of economic and/or financial distress. In line with the theory behind Markov-Switching models, these states are not observed, and transition probabilities will be used to identify them in the time series.

The consideration of a non-linear approach in this paper is meant to capture non-linear interactions associated with regime switching. This makes it possible to assign proper economic interpretations to different states of the world and enables structural analyses. The argument for this approach centres around the notion that economic dynamics vary between economically or financially stressful times and normal times. The primary interest is to capture non-linearities induced by the switches in economic regimes in line with Brunnermeier and Sannikov (2014). Hamilton (1989), Kim and Nelson (1999), Piger *et al.* (2005), Primiceri (2005) and Mishkin (2010a) also advocate for non-linearities. Drehmann *et al.* (2007) argues that linear approximations might be sufficient in the middle of distributions, but are likely to perform badly at the tails, and this would make it hard to perform all structural analyses[51]. They further contend that the use of regime switching models explicitly addresses this issue.

Martin (2011) uses a Markov-Switching model in an attempt to identify credit cycle dynamics using US data, with particular interest in describing them, and periods of low credit growth. The paper argues that the credit cycle can be best described through a three-state model: low, intermediate and high growth periods. Asea and Blomberg (1997) use a Markov-Switching panel model to study what they call a banking credit cycle. They determine that banks relax their lending standards during boom periods and tighten them during periods of stress, influencing overall credit cycle dynamics.

This paper adopts a dynamic regression version of the Markov-Switching framework and the estimated model is as presented:

$$c\_g_t = \beta_{s_t} + \delta_t c\_g_{t-1} + x_t \alpha_t + \epsilon_t \quad (7)$$

Where: c_g_t is household credit growth, c_g_{t-1} is the lag of the household credit growth, x_t is a

51 In case of performing impulse response analysis and forecasting.

vector of exogenous variables with state-dependent coefficients α_t and ϵ_t is a state-dependent Gaussian error-term. The states are governed by transition probabilities which follow a Markov process: the probability of the current state, say j, only depends on the previous state. The process is described as:

$$P(c\_g_t, S_t = j|S_{t-1} = i, S_{t-2} = k, S_{t-3} = w..., x_t, c\_g_{t-1}) = P(S_t = j|S_{t-1} = i) = p_{ij}$$

Where: S is the state variable or regime, and p_{ij} is the probability of being in state j in the current period given that the process was in state i in the previous period. The latent regimes are assigned as S = 1, 2. The switch between these latent states is governed by a transition matrix, P:

$$\begin{pmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{pmatrix}$$

Where: p_{ij} $prob(S_t = i|S_{t-1} = j)$ shows that regime i precedes regime j. The regime switches are not restricted.

The variables in the Markov-Switching model estimation are as defined for the ARDL model.

5. ESTIMATION RESULTS

5.1 Unobserved Components Model

This paper estimates a random walk model (see Tables 2 and 3) and a semi-structural unobserved components models (see Table 4) following Lang and Welz (2017). The random walk model is used to estimate the cycle of credit growth. Results show that credit growth has a cycle of between 6 to 9 years. When the same model is estimated using logarithm of real household credit, the cycle is estimated to be between 15 and 25 years. Lang and Welz (2017) state that applying a smoothing parameter of 400 000 when estimating credit gaps using the HP filter, in line with Basel Committee on Banking Supervision (BCBS) and European Systemic Risk Board (ESRB) guidelines, is the same as assuming that credit cycles are four times longer than business cycles. This kind of estimation gives a credit cycle ranging between 25 and 30 years.

The primary objective of estimating this model is to calculate the credit gap. Minsky's FIH postulates that periods of economic downturns are preceded by credit booms and/or asset price booms. In this context, positive credit gaps are expected to lead up to periods of financial crises. The theory is that vulnerabilities build up during periods of expansion, and the resilience of the financial system to exogenous and endogenous shocks is compromised, leading to financial collapse if risk factors materialise.

The estimated household credit gap (see Chart 4) is consistent with the FIH. The credit gap is generally positive leading up to the global financial crisis and the diamond price collapse of 2014/15, in line with overall optimism in the domestic and global markets before these crises. The gap is significantly less than zero during periods of distress. The gap then widens again during periods of recovery until the end of the study period. This semi-structural model tells us that households borrow extensively during periods of economic expansion, and household credit slows down significantly during periods of distress. The slowdown during crises is attributable to both credit supply and demand sides, as unemployment increases, incomes fall and banks tighten lending conditions to safeguard against impending credit risks.

The results also show that the long-run relationship between real household credit and real potential output and the real interest rate is significant, albeit with an opposite sign for the interest rate. Economic theory posits that there is a negative relationship between credit growth and the cost of borrowing. This anomaly can be explained by the fact that credit growth in Botswana was at its highest when the interest rate levels where quite high over the last two decades, signalling the expansion of credit supply due to new entries into the credit market as new banks started operations in Botswana. However, the credit gap resulting from the state space model is consistent with expected results, as explained above.

TABLE 2: RANDOM WALK MODEL

Household Credit Growth	Coefficient	Standard Error	95% Confidence Interval	
			Lower Limit	Upper Limit
Frequency	0.26***	0.08	0.10	0.41
Damping	0.83***	0.06	0.72	0.94

Notes:
1. Typical of a Random Walk model, the estimated model is not stationary.
2. Tests of variances against zero are not one sided, and the two-sided confidence intervals are truncated at zero.
3. *,** and *** indicate statistical significance at 10 percent, 5 percent and 1 percent level of significance, respectively.

TABLE 3: ESTIMATED CYCLE

Cycle	Coefficient	Standard Error	95% Confidence Interval	
			Lower Limit	Upper Limit
Period	25	7.6	10	40
Frequency	0.26***	0.08	0.10	0.41
Damping	0.83***	0.06	0.72	0.94

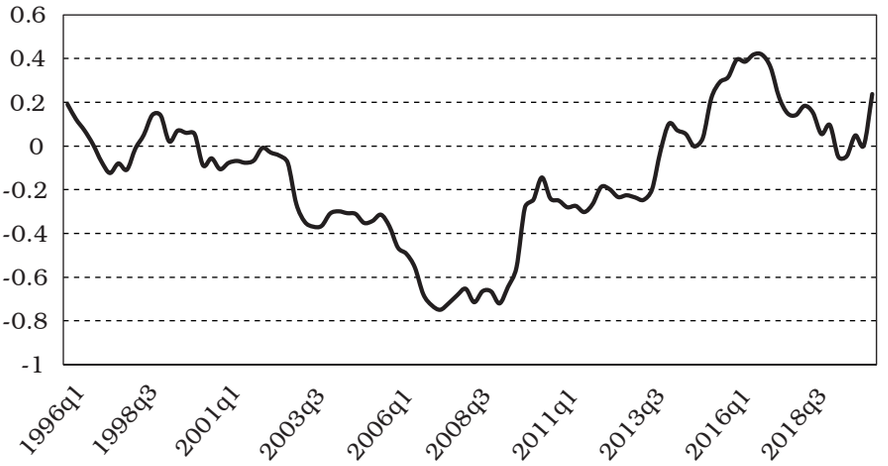
Notes:
1. Cycle time unit is quarterly.
2. *,** and *** indicate statistical significance at 10 percent, 5 percent and 1 percent level of significance, respectively.

TABLE 4: ESTIMATED SEMI-STRUCTURAL MODEL

Equation		Coefficient	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
Household Credit Trend	Potential Output	5.35***	0.38	4.95	6.32
	Real Interest Rate	0.12***	0.01	0.10	0.13
Household Credit Gap	First Lag	0.97	0.02	0.91	1.00
Household Credit	Household Credit Trend	Constrained to 1			
	Household Credit Gap	Constrained to 1			

Notes:
1. Tests of variances against zero are not one sided, and the two-sided confidence intervals are truncated at zero.
2. *, ** and *** indicate statistical significance at 10 percent, 5 percent and 1 percent level of significance, respectively.

CHART 4: ESTIMATED HOUSEHOLD CREDIT GAP (PERCENT)



5.2 Autoregressive Distributed Lag Model (ARDL)

The ARDL model is used to study the relationship between credit growth and macro-financial variables, both in the long run and the short run. The results show that increase in household consumption in the long run is associated with increase in household credit growth. This is expected if households borrow to smooth their consumption over their entire life cycle. This result is therefore consistent with Franco Modigliani's Life Cycle Hypothesis.

The results also show that an increase in nominal interest rates is associated with growth in household indebtedness. This is not supported by economic theory as household indebtedness is expected to move in opposite direction with interest rates as they are the cost of borrowing.

Furthermore, long-run increases in household deposits are found to lead to an increase in credit growth. This result is consistent with an assumption that the economy is comprised of net borrowers and net savers. In this context, the net savers finance the borrowers' appetite for spending in the long run. In the long run, an increase in the inflation rate is associated with lower credit growth. Higher inflation discourages savings, resulting in lower levels of deposits, thus less available funds to lend leading to lower credit growth.

An estimation of short-run dynamics shows that the relationship between household credit growth and household expenditure growth is insignificant in the short term. Increases in real GDP growth, the credit gap and nominal interest rate leads to higher credit growth. Increases in the output gap, default rate and household deposits growth are associated with a fall in household credit growth in the short run. It is worth noting that both the output gap and the credit gap are significantly related to household credit growth in the short run, but not in the long run. This is due to the fact that gaps are generally associated with deviations from a long-term trend and should thus explain household credit deviations from trend in the short term.

Notable results from the short-run estimation relate to the output gap, credit gap and the default rate. The results show that an immediate overheating of the economy is associated with a fall in household credit growth. This result is not consistent with Minsky's FIH as in the hypothesis, expansion is associated with unsustainable credit growth. However, overheating of the economy observed in the last period is associated with higher household credit growth in the current period. This relationship is consistent with the dynamics of the FIH as households and banks grow optimistic about economic performance due to expectations derived from the last period. The estimated model implies that the economy corrects for credit bubbles during periods of short-lived expansions as households borrow less. This can be true in an economy where expansion is accompanied by general improvement in earning conditions such that households do not need to borrow to finance their consumption. Thus, breaking the link between borrowing and consumption.

On the contrary, periods of high build-up of credit vulnerabilities, as signalled by an expansion of the credit gap, are associated with high accumulation of debts by households. This result is consistent with the views of Minsky (1976) and Schularick and Taylor (2009). Even though the results do not necessarily indicate what happens during periods of financial distress, literature on credit gaps argue

that credit gaps expand leading to financial crises. In this regard, the results point to the argument that households take up compromised financial positions during periods of tranquillity in the economy.

The model further shows that increases in household defaults are associated with a fall in household credit growth. This result does not support or refute the FIH. Two scenarios are possible; it can be that credit growth slows down at the peak of the credit cycle upon the realisation that households are overburdened by indebtedness and are now unable to service their loans; or at the lower end of the credit cycle when the economy is faced with financial crises and banks tighten their lending standards. It is possible that these scenarios overlap, but transitioning between the particular states is unknown. In the end, it is important to note that, in the short run, household credit growth falls in response to increases in the default rate in the last quarter.

Results show that the speed of adjustment of the error correction model is 0.18. The existence of this adjustment parameter suggests that there is at least one cointegrating relationship between credit growth and the selected macro-financial variables. The direction of causality of this relationship is not of interest in this study. Regarding the long-run dynamics, an adjustment parameter of 18 percent suggests that the correction to equilibrium is not immediate, and this can be expected given the slow evolution of credit dynamics.

Furthermore, short-run dynamics show that household credit growth is associated with an increase in the credit gap. Increases in the default rate and net deposits in the short term are associated with a fall in household credit growth. The study obtains wrong signs for the coefficients on changes in inflation and interest rate.

TABLE 5: ESTIMATED COINTEGRATING MODEL[52]

Goodness of Fit			**Number of Observations Used: 90 R-squared: 0.48**			
ARDL Step 2 Estimation: Change in Household Credit Growthw			**Coefficient**	**Standard Error**	**95% Confidence Interval**	
					Lower Limit	Upper Limit
Error Correction Term			-0.18	0.06	-0.30	-0.06
Long-Run Equation	Household Consumption Growth		2.10**	0.98	0.14	4.06
	Real GDP Growth		N/A			
	Nominal Interest Rate		N/A			
	Output Gap		-12.24*	7.05	-26.29	1.80
	Credit Gap		N/A			
	Default Rate		N/A			
	Household Deposits Growth		0.81**	0.36	0.09	1.53
	Inflation Rate		-7.03**	3.16	-13.33	-0.73
Short-Run Equation	Household Consumption Growth			N/A		
	Output Growth	D1	10.30*	6.05	-0.23	20.83
	Nominal Interest rate	D1	4.08***	1.21	1.67	6.48
	Output Gap	D1	-10.69**	5.37	-21.39	0.01
		LD	0.62**	0.26	0.10	1.15
	Credit Gap	D1	2.59***	0.72	1.16	4.02
	Default Rate	LD	-1.73**	0.71	-3.14	-0.31
	Household Deposits Growth	LD	-0.13***	0.03	-0.20	-0.07
	Inflation Rate	D1	-1.25***	0.36	-1.96	-0.53

Notes:
1. *, ** and *** indicate statistical significance at 10 percent, 5 percent and 1 percent level of significance, respectively. N/A indicates not statistically significant.
2. D1 is the first difference and LD is lag of the first difference.

52 See ARDL Step 1 Estimation in Appendix, Table A1.

The bounds test confirms that there exists a long-run relationship between household credit and at least one of the selected variables at 1 percent significance level.

TABLE 6: PESARAN, SHIN AND SMITH (2001) BOUNDS TEST

Null Hypothesis: No long -run relationships exist.			Calculated F Statistic		4.35	
			Calculated t Statistic		-2.99	
Kripfganz and Schneider (2018) Critical Values						
Significance Level	10 Percent		5 Percent		1 Percent	
Order of Integration	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F Critical Values	1.95	3.06	2.22	3.39	2.79	4.10
t Critical Values	-2.57	-4.40	-2.86	-4.72	-3.43	-5.37

Rule: According to Giles' Blog[53] if the computed F-statistic falls below the lower bound the variables are I(0), so no cointegration is possible. If the F-statistic exceeds the upper bound, there is cointegration. Finally, if the F-statistic falls between the bounds, the test is inconclusive.

5.3 Markov-Switching (MS) Model

This approach is used to examine how credit growth is related to selected macroeconomic and financial variables in different states of the economy (Table 7 summarises the results). The unobserved components model shows that the credit gap is positive during normal periods and negative during periods of financial distress. The ARDL results are to some extent in agreement with this notion. In order to conclude on the overall dynamics, this paper goes further to study household credit growth in different states of the economy, identified by a Markov process. In the results, different states of the economy over the study period are identified using predicted transition probabilities. State 1 of the MS model is referred to as period of normal credit growth and State 2 relates to periods of credit booms. As expected, periods of booms are mostly associated with periods leading up to economic stress and during stress.

The results show that during normal periods, household credit growth is positively related to the output gap and the nominal interest rate. The credit growth is at the same time negatively related to the real GDP growth and the credit gap. The relationship with other variables is not statistically significant. During normal periods, it is expected that household credit grows according to the path of economic fundamentals and where the economy is in the business cycle. In this context, a positive output gap is associated with a booming economy characterised by credit expansion and the central bank reacts accordingly by increasing nominal interest rates. The optimism associated with this regime ultimately leads to lax credit standards that then characterise periods of credit booms. It is generally expected that household credit be positively related to real GDP growth in all periods. The estimated relationship between these variables has a negative sign. An argument for this relationship can be that economic expansion is accompanied by income gains that do not automatically translate to more household borrowing as households gradually get accustomed to the income shocks.

During periods of extraordinary expansion/growth, household credit growth is positively related to the interest rate and credit gap. Household credit growth moves in opposite directions with inflation in this state of the economy. The relationship with the interest rate is not supported by economic theory for periods of credit booms. However, when household credit growth is fuelled by extraordinary income gains, households' expectations render monetary policy interventions ineffective as they continue to borrow more even with higher interest rates. This transition follows from the relationship between household credit growth and the output gap in normal periods. According to the reviewed literature, the credit gap has been found to be a good predictor of credit booms and/or crises, and it is, consistently, positively related to household credit growth during periods of extraordinary credit growth.

It is important to note that this state also identifies periods of economic distress, during which household credit expansion is generally low, implying the possibility that households lower consumption and

53 See https://davegiles.blogspot.com/2013/06/ardl-models-part-ii-bounds-tests.html.

borrowing during tough times. Recessions are often disinflationary and accompanied by accommodative monetary policy to drive economic recovery, and household expenditure derives from the overall economic conditions. In such a case, the negative movements in interest rates and the credit gap are associated with upward pressure on household credit, and monetary policy authorities aim for a debt-financed recovery. In which case, if households are highly leveraged, credit shocks would become persistent in line with Kiyotaki and Moore (1997), and households would take up even more compromised financial positions, deepening the recession.

Chart 6 shows that the normal period is generally associated with lower predicted household credit growth, and the predicted values closely mimic actual data for longer periods of the study period. States of credit booms are associated with high household credit growth immediately followed by a deep dive. The periods correspond to the global financial crisis and the take off after the crisis which was momentarily disturbed by the diamond prices crisis in 2015. In the period leading up to the global financial crisis, the predicted household credit growth and the actual are above normal and the resultant shock to economic fundamentals lead to a slowdown in 2010/11. These dynamics are in line with general optimism associated with a booming economy, and are a precursor to a typical Minsky moment. This is also consistent with a positive household credit gap estimated by the unobserved components model, as well as the negative credit gap during period of stress.

CHART 6: PREDICTED HOUSEHOLD CREDIT GROWTH VS ACTUAL

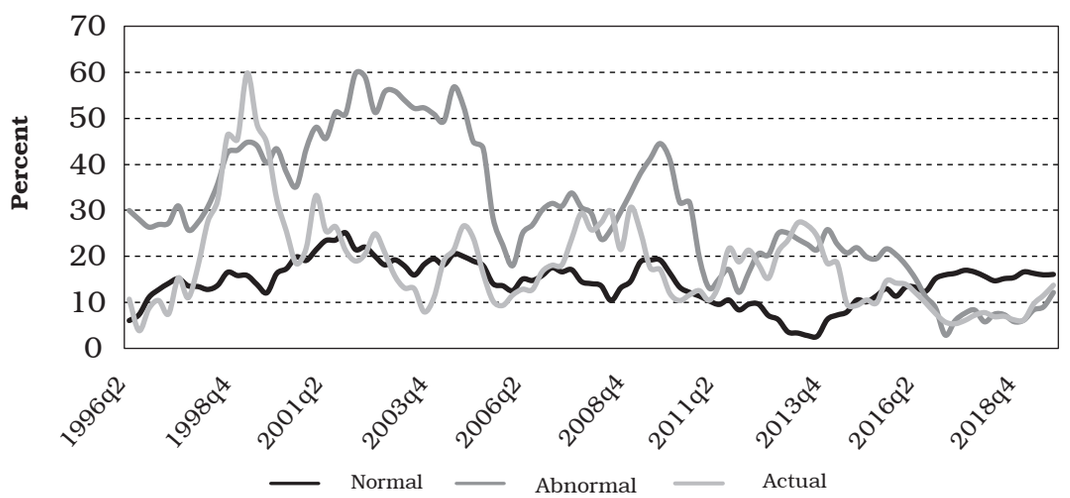


Chart 7 displays the estimated transition probabilities, and consequently identifies different states of the economy as predicted by the model. The estimated probabilities show that the economy is most likely to remain in the state of normal or abnormal growth in the current period if it was in that particular state in the previous period. The probabilities of remaining in either state average 90 percent. This means that if the economy was in a state of normal credit growth in the last period, it is most likely to remain in that period in the current period. The same applies for the abnormal state. The identified states generally correspond to periods of economic and/or financial distress for the abnormal state. However, at the end of the period, the state identifies household credit growth below average.

CHART 7: ESTIMATED STATES OF THE ECONOMY

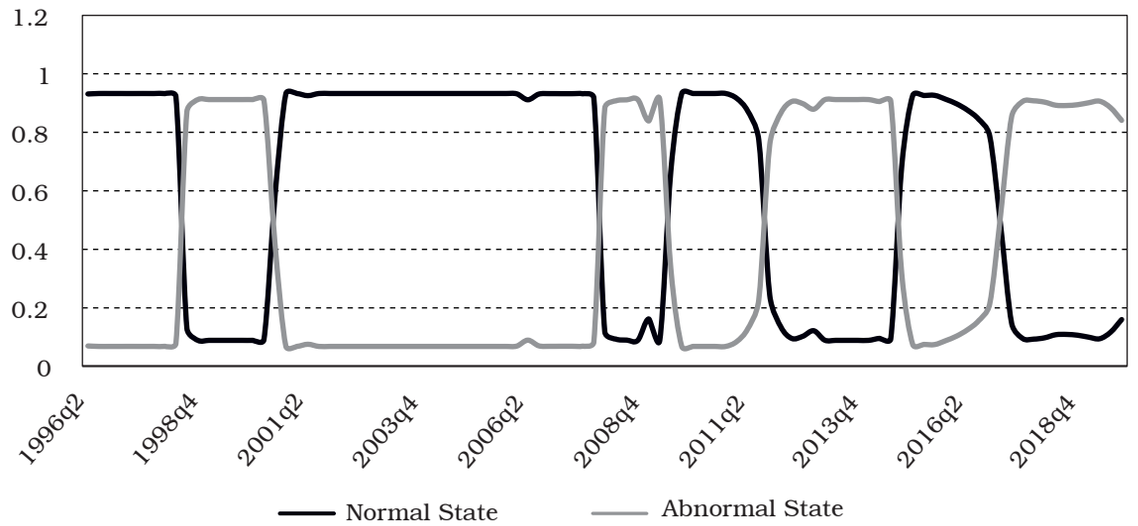


TABLE 7: ESTIMATED MARKOV-SWITCHING MODEL

Equations for Household Credit Growth		Coefficient	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
Lag of Household Credit Growth		0.69***	0.0002	-0.001	-0.0004
State 1	Household Consumption Growth	N/A			
	Real GDP Growth	-2.80***	1.05	-4.84	0.74
	Nominal Interest rate	0.98***	0.32	0.36	1.60
	Output Gap	2.39**	1.06	0.32	4.46
	Credit Gap	-1.06*	0.58	-2.20	0.08
	Default Rate	NA			
	Household Deposits Growth	N/A			
	Inflation Rate	N/A			
State 2	Household Consumption Growth	N/A			
	Real GDP Growth	N/A			
	Nominal Interest rate	3.54***	0.72	2.12	4.96
	Output Gap	N/A			
	Credit Gap	2.52***	0.74	1.06	3.99
	Default Rate	N/A			
	Household Deposits Growth	N/A			
	Inflation Rate	-2.56***	0.59	3.70	-1.40
Transition Probabilities		P_{11}	0.93	P_{12}	0.07
		P_{21}	0.91	P_{22}	0.09

Note: *,** and *** imply statistically significant at 10 percent, 5 percent and 1 percent significance levels, respectively; N/A means not statistically significant.

5.4 Summary of Results

This paper finds that household credit growth is pro-cyclical. This behaviour is shown by the estimated household credit gap. The gap is significantly positive during periods of economic expansion and negative during periods of financial and/or economic distress. The ARDL estimation shows that increases in household expenditure and household deposits are associated with positive household credit growth in the long run. Results of the Markov-Switching model show that household credit growth has two distinct states, one associated with normal or average growth and another with growth below or above average. The results show that during normal periods, increase in the output gap drives up household credit growth and the credit gap is associated with increasing household borrowing during or leading up to periods of financial distress. Household credit growth is negatively related to household credit gap in the normal state of the economy. The opposite movement during normal times might be due to the fact that households are not enticed to borrow due to overall growth in income. In general, the performance of the economy above potential matters during normal times and is associated with increase in household borrowing. However, during periods of abnormal credit growth, the credit gap is associated with pushing household credit growth up and into crisis. In this context, the transitioning of the economy through normal times to crisis is explained by optimism based on performance above potential, and through the credit gap leading up to the crisis.

The purpose of the paper is to determine if household credit growth follows a Minskian pattern. It can be deduced from the results that households borrow more during periods of economic expansion, and less during recessions. Coincidentally or conveniently, estimated periods of low credit growth overlap with known periods of economic stress. However, it is impossible to discern whether pre-crisis credit expansion is responsible for the crisis that follows. One challenge is that dynamics in the Botswana economy have not autonomously led to a collapse of the domestic financial system. Nevertheless, the build-up of vulnerabilities due to credit expansion leading to periods of stress cannot be disputed. What is clear from the estimation in different states is that optimism associated with the positive output gap drive up credit growth, and a positive credit gap drives the economy into periods of distress. These dynamics are consistent with the FIH. The evolution of the estimated household credit gap supports this notion, and the fact that household credit moves with consumption in the long run is consistent with the view that households use credit to smooth consumption over their lifetime.

It is worth noting that this paper ignores supply-side dynamics of household credit expansion. Asea and Blomberg (1997) argue that banks change their lending standards, from tightness to laxity, in a controlled manner over the financial cycle. In this context, relaxation of lending standards that tend to occur during expansions ultimately influences the dynamics of aggregate variables. Using the game theoretic approach of Akerlof (1970)[54], during a crisis it is difficult for banks to accurately estimate credit risk associated with most economic players. This would lead to a process of adverse selection in which qualifying households and businesses are unfairly rationed-out. The process of tightening credit standards would then lead to a fall in overall household borrowing during periods of distress. This would be considered for future research due to current data limitations on measurement of credit rationing by banks.

6. CONCLUSION AND POLICY RECOMMENDATIONS

Lang and Welz (2017) argue that there is no straightforward approach to determining if household credit growth is excessive at any point in time. The ability to estimate household credit dynamics for this purpose contributes to discussions on formulating macro-prudential measures to curtail, or protect the economy, against adverse effects of credit booms. The Basel III framework recommends countercyclical capital buffers (CCyB) as one of the instruments to be used to target cyclical systemic risks. The aim of the CCyB is to make the banking sector more resilient in the face of cyclical systemic risks associated with the credit cycle.

According to the Bank for International Settlements (2017)[55], the buffer is partly based on the value of the credit-to-GDP gap, which acts as the rule-based component, and an assessment of additional supporting indicators or qualitative information.

54 George A. Akerlof. The Market for "Lemons": Quality Uncertainty and the MarketMechanism. The Quarterly Journal of Economics Vol. 84, No. 3 (Aug. 1970), pp. 488-500.

55 Bank for International Settlements 2017: Range of practices in implementing the countercyclical capital buffer policy. See https://www.bis.org/bcbs/publ/d407.pdf.

The buffer guide is calculated from the credit-to-GDP gap, and is used to deliver an indication of the appropriate CCyB level. In this regard, the findings of this paper are intended to contribute to future policy discussions on the formulation of macro-prudential policy instruments targeting household credit growth, and overall setting of CCyBs for Botswana upon adoption of Basel III accords in the future. The estimation of household credit gaps provides useful information about the excessiveness of credit growth. In addition, estimation of the relationship between household credit growth and macro-financial variables in the long run and different states of the economy should be useful for forming views about macroeconomic implications. In this regard, policy makers should adopt research work such as this paper for the formulation and implementation of CCyBs, and to understand the role that household credit plays in overall economic development as well as the accompanying systemic vulnerabilities of credit expansion.

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APPENDIX

TABLE A1: LEVELS ARDL ESTIMATION[56]

Goodness of Fit				**Number of Observations Used: 90** **R-squared: 0.87**		
ARDL Step 1 Estimation			**Coefficient**	**Standard Error**	**95% Confidence Interval**	
					Lower Limit	Upper Limit
Household Credit Growth	Lag		0.83***	0.06	0.71	0.96
	Household Consumption Growth	L1	0.74**	0.30	0.15	1.33
	Output Growth	Level	10.83*	6.05	-1.24	22.90
		L2	-0.45*	0.26	-0.97	0.08
	Nominal Interest Rate	Level	4.32***	1.25	1.83	6.81
		L1	-3.96***	1.23	-6.43	-1.50
	Output Gap	Level	-11.22*	6.12	-23.43	0.99
	Credit Gap	Level	2.87***	0.76	1.36	4.38
		L1	-2.41***	0.73	-3.87	-0.95
	Default Rate	L2	-1.03***	0.39	0.26	1.81
	Household Deposits Growth	L2	-0.12***	0.034	0.49	0.18
	Inflation Rate	Level	-1.20***	0.38	-1.95	-0.45

Note:
1. *, ** and *** imply statistically significant at 10 percent, 5 percent and 1 percent, respectively.
2. L1 and L2 are first and second lag, respectively.

56 L1 and L2 are the first and second lags, respectively.

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