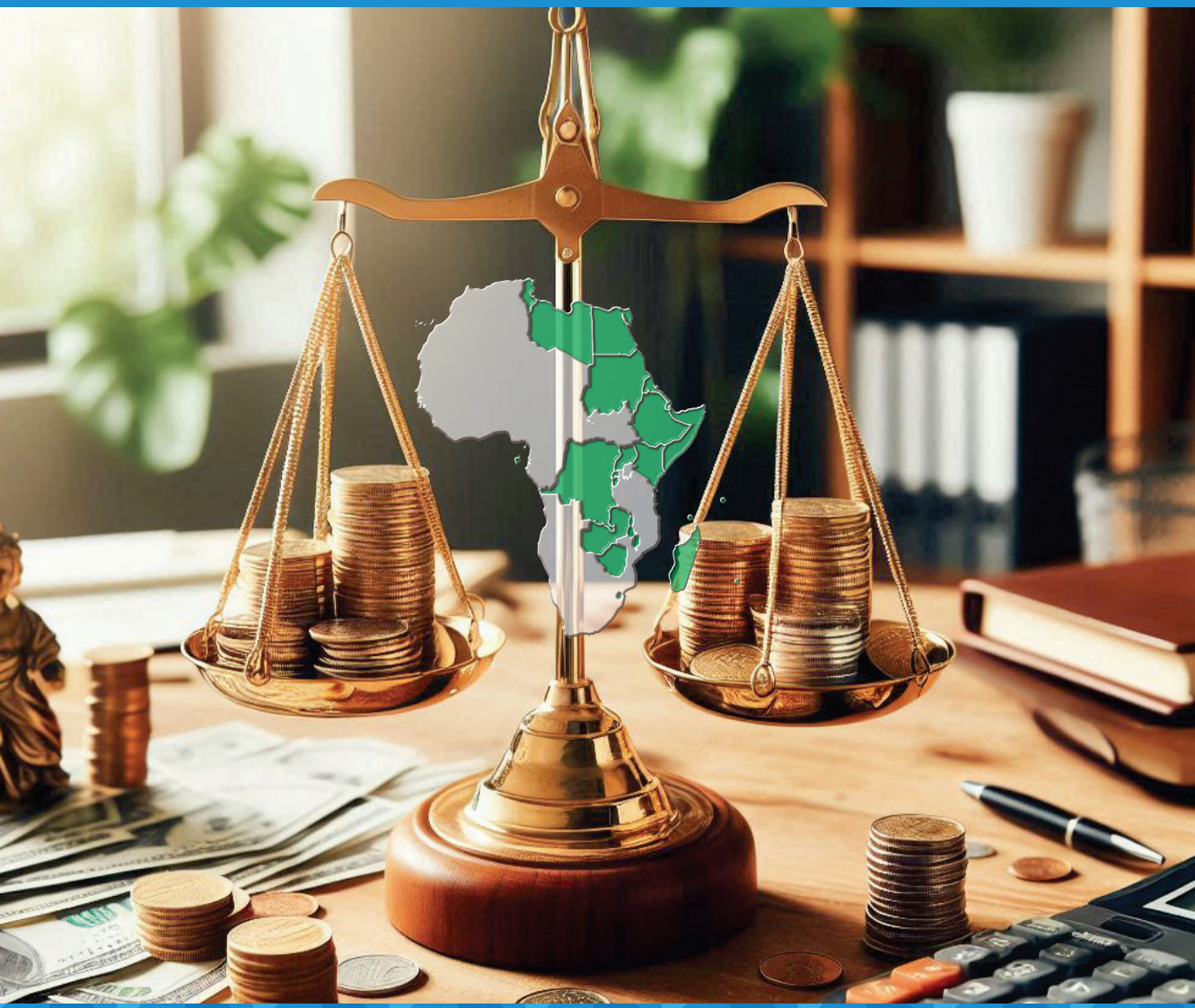
FINANCIAL SECTOR DEVELOPMENT AND MACROECONOMIC STABILITY IN COMESA COUNTRIES



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FINANCIAL SECTOR DEVELOPMENT AND MACROECONOMIC STABILITY IN COMESA COUNTRIES

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Foreword

There is a strong theoretical presumption that a well-developed and functioning financial system is a catalyst for economic growth and development. The financial sector- growth nexus is anchored on the fact that an effective financial system can ameliorate risk, mobilize savings, and reduce transaction and information costs besides acting as a source of finance for firms and households. However, this relationship has come under increasing scrutiny in recent years, particularly following the 2007-09 global financial crisis. Specifically, financial system development associated with excessive credit growth may introduce potential macroeconomic volatility. Moreover, in the last two decades, technological advancements have transformed the financial landscape in many COMESA countries leading to the development of financial technology (FinTechs) and wide usage of digital financial services. FinTech has introduced new financial services and expanded financial access to segments that were previously excluded from the financial system. Whereas this development has expanded financial inclusion, its advancement could be a source of financial eco systems instability with possible new significant risks in terms of consumer protection and market integrity, necessitating the need to understand the implications of FinTech services on financial stability in the COMESA region.

In addition, the concept of equilibrium real effective exchange rate (REER) has been a policy concern over time due to its implication on a country's relative price competitiveness. The REER reflects the stance of the economy in terms of economic growth and the degree of external balance. The REER can be a source of economic vulnerability, particularly when it is misaligned. With increasing financial integration of COMESA member states with the rest of the world and with each other, understanding determination of REER is thus important especially given that most economies in the region have flexible exchange rates regimes. There is therefore a need to constantly assess relative price competitiveness and stability of the exchange rates including understanding the REER, its misalignment and implication to implementation of monetary policy.

This book offers an analysis of the implications of the linkages between financial system development and macroeconomic stability, potential implications of FinTech on financial stability as well as a determination of the equilibrium exchange rate and degree of exchange rate misalignment in the COMESA countries. The findings from this analysis provide useful insights for reference and policy application in the COMESA region.

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Executive Summary

Since the onset of 1990s, COMESA countries have undertaken substantial reforms geared towards financial systems development. A stable and well-functioning financial system can reduce macroeconomic volatility by providing firms and households with instruments to manage risk and adverse shocks and resources to foster productivity, diversification and sustainable growth. However, some of the COMESA countries have witnessed episodes of prolonged macroeconomic instability, mainly in economic growth and inflation in the past. Moreover, no consensus exists in the literature on the financial development-macroeconomic stability nexus.

It is against this background that an analysis of the impact of financial development on macroeconomic stability for six countries in the COMESA region was conducted using different approaches. The results show that financial development has a significant impact on macroeconomic stability in Zimbabwe, Rwanda, Kenya and Mauritius, regardless of the indicators used to measure financial development and macroeconomic stability. Specifically, in Rwanda, evidence shows that financial system development stabilizes inflation and the exchange rate while in Kenya, mobile money innovations positively influence macroeconomic environment in the long run. However, in Mauritius, the Granger-causality findings indicate a bi-directional relationship between financial sector development and macroeconomic stability implying the need to quantitatively establish the determinants of financial development in Mauritius. In Sudan, the impact of financial development on macroeconomic stability is sensitive to the indicator of financial development used. Specifically, the results show that money supply as a share of GDP has a significant positive impact on real GDP but insignificant negative impact on inflation while bank deposits have a significant negative impact on real GDP and inflation. The results for Sudan further show that domestic credit to the private sector has an insignificant effect on real GDP and inflation. This result would be reflective of the fact that most of the credit in the banking sector is channeled to the government and not the private sector. Similarly, in Eswatini, VAR results indicated an insignificant relationship between financial system indicators and macroeconomic stability except when financial depth and trade openness were respectively, used as indicators of financial system development and macroeconomic stability.

Similarly, in the last two decades, new non-traditional financial players have entered the financial sector of many countries on account of technological advancements leading to a wide usage of digital financial services but at the same time creating vulnerability in the financial system to new risks. Thus, to provide insights and lessons for other countries in the COMESA region, an analysis of the implications of FinTech on financial stability in Zambia was conducted. The results show that fintech promotes financial stability by facilitating transfer of deposits to the banking sector thereby improving banks' liquidity. The results further showed

that mobile money mitigates credit risks by providing financial footprints which are used by lenders to accurately evaluate the riskiness of borrowers. It would therefore be appropriate for policy to focus on enhancing competition and collaboration between fintechs and banks as this would encourage innovation, improve efficiency, reduce cost of using digital financial services and encourage financial inclusion.

The real equilibrium exchange rate (REER) is a key variable in the conduct and implementation of monetary policy. To obtain insights on the implementation of monetary policy in the COMESA countries, the equilibrium level of REER was analyzed to determine the degree of misalignment in four COMESA countries, mainly based on behavioral equilibrium exchange rate (BEER) models. In Rwanda, the results showed that the REER is influenced by economic fundamentals and Rwanda's currency in real effective terms was undervalued by 2.3 percent in 2021 and overvalued by 3.4 percent in 2020. In Uganda, the study showed that, on average the shilling was slightly overvalued over the considered sample period and the correction of any misalignment takes about one and half years on average. In Zambia, the results from the fractional cointegration VAR suggest that the Zambian REER is fractionally cointegrated with the real copper price, fiscal deficit and productivity differential. The study also showed that a shock to the equilibrium exchange rate tends to have a slow speed of adjustment to its steady state. In DRC, the results of the Granger causality test indicated a bi-directional effect between the REER misalignment and the conduct of monetary policy. The results further showed that the misalignment of the exchange rate in DRC is corrected after one year.

The assessment of one country from the COMESA region of how well the interbank market functions as a conduit for the transmission of monetary policy was also conducted. The results of the case study of DRC showed a weak transmission of the policy interest rate to credit and bank lending rates, the key rate and the interbank rate. Additionally, the effectiveness of the central bank's interventions in the interbank and credit markets is hampered by the absence of an efficient money market and a high level of dollarization of the financial system.

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1. INTRODUCTION

1.1. Chapters in the Outline

1.1.1. Impact of Financial Systems Development on Macroeconomic Stability in Zimbabwe

The study assessed the relationship between financial development and macroeconomic stability. Macroeconomic stability was measured by the 5-year standard deviation of economic growth while financial system development was measured by a financial system development index and three traditional measures of financial development namely: private credit to GDP, total deposits to GDP and stock market capitalization to GDP. Using an Autoregressive Distributed Lag (ARDL) bound test technique and data covering the period 1980-2019, the results suggest that improvements in financial development as measured by the financial development index have significant impact on macroeconomic stability in both the long and short run. The improvement in financial development significantly reduces the standard deviation of economic growth, thus enhancing macroeconomic stability. The policy implication is that it is important to promote efficiency and intermediary role of the financial sector in order to support robust macroeconomic stability in Zimbabwe.

1.1.2. Impact of Financial Systems Development on Macroeconomic Stability in Sudan

The paper investigated the impact of the financial sector development on the macroeconomic stability in Sudan using Johansen approach to co-integration and vector error correction model based on data covering the period 1960-2020. The test for co-integration showed that there is a long run relationship between macroeconomic variables (Real GDP and Inflation) and financial indicators (Money Supply, Credit to Private Sector, and Bank Deposits as ratio of GDP). The empirical results are sensitive to the indicator used. The results show that money supply as a share of GDP has a significant positive impact on real GDP but insignificant negative impact on inflation while bank deposits have a significant negative impact on real GDP and inflation. The results further show that domestic credit to private sector has an insignificant effect on real GDP and inflation. This result would be reflective of the fact that most of the credit in the banking sector is channeled to the government and not the private sector.

1.1.3. Impact of Financial Systems Development on Macroeconomic Stability in Rwanda

Despite the dominant consensus of the positive influence of financial systems

development on macroeconomic stability, this link has come under increasing scrutiny in recent years, particularly following the 2007-09 global financial crisis. This study examined the financial system development-macroeconomic stability nexus in Rwanda using the local projections method and quarterly data, covering the period 2006 to 2018. While the evidence on the effect of financial systems development on macroeconomic stability is mixed in the literature, the results from this study, to a larger extent, support the view that financial systems development has contributed to macroeconomic stability in Rwanda, notably on real GDP growth via investment, while the effect on consumption is insignificant. Besides, evidence also points out to a stabilizing effect of financial system development on inflation and the exchange rate.

1.1.4. Impact of Financial System Development on Macroeconomic Stability in Kenya

The study sought to examine the impact of financial system development on macroeconomic stability in Kenya using quarterly data from 2005Q2- 2021Q2. A composite macroeconomic stability index (MSI) was developed using key macroeconomic variables to measure the evolution of macroeconomic stability conditions. Four measures of financial development, that is, financial depth, financial intermediation, market capitalization, and money multiplier were regressed on the MSI using ARDL models. Analysis of the trends of MSI indicate that Kenya's macroeconomic environment has been stable with short-lived intermittent periods of instability. The findings also show that both a short-run and a long-run relationship exists between selected financial sector development indicators and macroeconomic stability. Mobile money innovations positively influence macroeconomic environment in the long run, whereas bank lending weakens macroeconomic stability in the short-run. The study recommends that policy makers implement policies to support financial sector development such as mobile money innovations that increase productivity, and competitiveness in the productive sectors of the economy, while supporting longer-tenure credit provision to the productive sectors of the economy to support investment and thus drive economic growth and macroeconomic stability.

1.1.5. Impact of Financial Sector Development on Macroeconomic Stability in Mauritius

This paper empirically examined the impact of the financial system development on macroeconomic stability in Mauritius. The Mauritian financial sector operates in a liberalized system that is heavily dominated by banks. Global Business Companies play a crucial role in intermediating funds through banks from and to foreign countries. Thus, banks are characterized by a relatively high degree of financial dollarization. This study used a non-parametric composite-based approach to build an indicator of macroeconomic stability for Mauritius and Principal Component Analysis to construct a financial system development index. The study used autoregressive distributed lag (ARDL) approach and cointegrating relationship between the variables of interest was confirmed based on the Bounds tests. As a result, an Error Correction Model (ECM) was used and long and short-run

relationships assessed. The results showed a positive and statistically significant link between financial sector development and macroeconomic stability. The Granger-causality findings showed a bi-directional relationship between financial sector development and macroeconomic stability implying the need to quantitatively establish the determinants of financial development in Mauritius.

1.1.6. Impact of Financial Systems Development on Macroeconomic Stability in Eswatini

This paper examined the impact of financial systems development on macroeconomic stability in Eswatini based on cointegration and VAR approaches and quarterly data for the period 1990-2019. The study used financial depth (M2/GDP) and financial sector efficiency (Private Sector Credit-PSCR) as financial system development indicators and the standard deviation of economic growth, inflation, trade-openness and exchange rate to measure macroeconomic stability. The study found the existence of at least one cointegration equation between the financial sector development variables and macroeconomic stability and established a significant relationship between financial efficiency and macroeconomic stability in the long run. The VAR results indicated insignificant results between financial system indicators and macroeconomic stability except when financial depth and trade openness were respectively, used as indicators of financial system development and macroeconomic stability.

1.1.7. Marché interbancaire et efficacité de la politique monétaire en RDC

Cet article a analysé le marché interbancaire comme canal de transmission de la politique monétaire en RDC. Pour ce faire, l'étude a évalué comment les changements de politique monétaire se transmettent aux taux du marché interbancaire, aux taux débiteurs et comment ils affectent le volume du crédit. Les résultats montrent que le taux interbancaire s'aligne au comportement du taux directeur. Néanmoins, l'analyse révèle une faible transmission au crédit et aux taux de prêt des banques, du taux directeur et du taux interbancaire. Par conséquent, l'efficacité des interventions de la Banque centrale sur les marchés interbancaires et de crédit sont entravées par l'absence d'un marché monétaire efficient et d'un niveau élevé de dollarisation du système financier.

1.1.8. Implications of Fintech on Financial Stability: Evidence from Zambia

Fintech has been credited with accelerating positive change in the financial sector. While the advancement of financial technologies presents immense opportunities, it brings with it risks that could destabilize the financial system. Considering the lack of studies on the relationship between fintech and financial stability in Zambia, this study sought to assess whether fintech is a boon or bane to financial stability in Zambia. It employed an autoregressive distributed lag (ARDL) model which is appropriate for variables of mixed order of integration. The empirical results indicate that fintech promotes financial stability by facilitating transfer of deposits to the banking sector, improves banks' liquidity, while mobile

money mitigates credit risks by providing financial records which are used by lenders to accurately evaluate the riskiness of borrowers. Therefore, policy that enhances competition and collaboration between fintechs and banks would be appropriate as it would encourage innovation, improve efficiency, reduce cost of using digital financial services and encourage financial inclusion. The gains in financial inclusion accentuate transfer of diverse deposit from the informal sector to the banking sector, which are then used for lending. There is also a need to mitigate vulnerability of the financial sector to risks associated with new financial entrants, who are often risky.

1.1.9. Equilibrium Real Effective Exchange Rate and Monetary Policy Implementation in Zambia

This study examined the determinants of the REER and the effect of monetary policy on the REER. The study utilized fractional cointegration VAR (FCVAR) and Bayesian VAR models based on data covering the period 2006 to 2021. The results suggest that the Zambian REER is fractionally cointegrated with the real copper price, fiscal deficit and productivity differential. The study also shows that a shock to the equilibrium exchange rate tends to have a slow speed of adjustment to its steady state. The results from the Bayesian VAR show that a positive monetary impulse leads to the REER appreciating and gets to the equilibrium level after 15 quarters. The major policy implication is that there is some scope for policy intervention to hasten the return to equilibrium when the economy is buffeted by shocks that result in non-competitive prices. In addition, monetary policy tightening leads to a rise in the productivity differential against Zambia (as domestic productivity declines) implying that monetary authorities should make a trade-off between high inflation and loss of productivity for about a two year-period.

1.1.10. Real Effective Exchange Rate Misalignment and Monetary Policy in Developing Countries: The Case of Uganda

This paper estimated the equilibrium real exchange rate for the Uganda shilling, assessed the extent of its misalignment and the implication of monetary policy on exchange rate misalignment. Based on the ARDL cointegration approach and the Behavioral Equilibrium Exchange Rate (BEER) framework on data spanning 1990-2021, the study showed that, on average the shilling was slightly overvalued over the considered sample period. It is estimated that correction of any misalignment takes about one and half years. In addition, REER misalignment episodes appear to be linked with policy shifts and macroeconomic shocks and are characterized by both abrupt and at times extreme movements as well as long swings. The paper also provides evidence on the relationship between monetary policy and REER misalignment. Specifically, tight monetary policy appears to be linked to an increase in REER misalignment.

1.1.11. Equilibrium Real Effective Exchange Rate and Monetary Policy Implementation in Rwanda

In an open economy, the real exchange rate plays a crucial role in the transmission of

external shocks to the real economy and in the propagation of monetary policy actions. The main purpose of this paper was therefore to estimate the equilibrium real exchange rate, determine the level of real exchange rate misalignment and assess its implications on the monetary policy implementation in Rwanda. The study used quarterly data covering the period 2006Q1-2021Q4 and behavioral equilibrium exchange rate (BEER) models. The models were estimated using cointegration-basedestimators,particularly dynamic ordinary least squares (DOLS). The study revealed two important results. First, the results indicated that REER is influenced by economic fundamentals and alternating episodes of undervaluation and overvaluation were identified. Considering the most recent episode, the results showed that Rwanda's currency in real effective terms was undervalued by 2.3 percent in 2021 and an overvaluation of 3.4 percent in 2020, a level that is not too high to induce a negative effect on macroeconomic stability. Second, the study found that REER misalignment may not have important implications on monetary policy implementation. Nevertheless, the study recommends that the monetary authorities should continuously monitor the extent and evolution of exchange rate misalignment due to its potential impact on macroeconomic stability.

1.1.12. Taux de change effectif réel d'équilibre et mise en œuvre de la politique monétaire en RD Congo

L'objectif de cette étude est, d'une part, d'examiner la relation entre le taux de change effectif réel (TCER) du franc congolais et les fondamentaux économiques, et d'autre part, de calculer l'ampleur du désalignement de ce taux de change en relation avec la conduite de la politique monétaire en RDC. Les résultats du modèle VECM révèlent qu'un accroissement de 1% de la masse monétaire déprécie (sous-évalue) de 0,31% le taux de change effectif réel à long terme. De même, une mauvaise allocation des réserves de change et une accumulation du déficit du solde de la balance courante d'un point de pourcentage réduit la compétitivité de l'économie congolaise sur le taux de change effectif réel. Les résultats du test de causalité de Granger indiquent un effet bi-directionnel entre le désalignement du TCER et la conduite de la politique monétaire. Ce qui revient à dire que l'orientation de la politique monétaire au cours de la période sous étude, a été l'élément déclencheur du désalignement du TCER, et inversement.

Le désalignement en RDC est corrigé chaque année et que le TCER revient à son niveau d'équilibre au bout d'un an et 4 mois environ, toutes choses égales par ailleurs. L'étude révèle également que le recours à la politique de change comme outil de régulation monétaire, devrait être orienté par les fondamentaux influençant le taux de change effectif réel d'équilibre. L'un des résultats-clés de cette étude, est que la plupart d'épisodes de sous-évaluation du taux de change a été en réponse à des chocs idiosyncratiques découlant à la fois de défis économiques internes et des facteurs systémiques mondiaux.

PART 1:

IMPACT OF FINANCIAL SECTOR DEVELOPMENT ON MACROECONOMIC STABILITY

1. Impact of Financial Systems Development on Macroeconomic Stability in Zimbambwe

Dishoni Limbikani, Kennedy Munyaradzi Kupeta and Tawedzerwa Ngundu

I. Introduction

The relationship between financial development and macroeconomic stability has been topical since the work of Schumpeter in 1911. A well-functioning financial system supports sustainable economic growth which is critical for macroeconomic stability. The importance of an orderly financial system on macroeconomic stability gained renewed policy focus following the global financial crisis in 2008. As such since 2008, several papers have emerged challenging the earlier conventional wisdom indicating a positive link between financial development and macroeconomic stability.

A substantial body of empirical work has shown a strong relationship between financial development and macroeconomic stability (Schumpeter, 1911; Goldsmith, 1969; Levine, 1997; McKinnon, 1973). The studies have taken different dimensions including assessing the impact of the entire financial system on macroeconomic stability or only certain components of the financial systems such as banks and stock markets. Theoretically, a well-developed and efficient financial system can support economic stability by providing payment services and reducing transaction costs, pooling savings, thus helping overcome investment indivisibilities, economising on screening and monitoring costs, reducing liquidity risk and assisting in diversifying cross-sectional and inter-temporal risk.

Theory has, however, not been unambiguous regarding the impact of finance on macroeconomic stability. Bencivenga & Smith (1991) argues that in enhancing efficiency in deposit and lending services a robust financial system can depress aggregate savings, thereby negatively affecting investment and growth and hurting long term macroeconomic stability. Bolton, et al., (2016) also contend that a more developed financial system might draw young talent away from the real sector impacting negatively on macroeconomic stability. Importantly, recent studies have shown that there is a non-linearity in the relationship between financial sector development and macroeconomic stability (Cecchetti & Kharroubi, 2015).

Given the renewed and heightened interest on the financial sector development – macroeconomic stability nexus and the ambiguous theoretical and empirical relationship between the two, the objective of this study is to provide empirical evidence on the impact of financial sector development on macroeconomic stability in Zimbabwe. The evidence is critical for developing policies to support macroeconomic stability in the country and the COMESA region, in general. Importantly, the study is critical as the country and the region have witnessed new developments in the financial sector spurred by improvements in information communication and technology (ICT) including digital payment systems, mobile money and other new financial products.

The rest of the paper is organized as follows. Section II discusses evolution of the financial sector and implications for macroeconomic stability while section III provides the literature review. Sections IV focuses on methodology and section V provides the analysis of results. Section VI concludes the paper.

II. Stylised Facts of the Financial Sector Development and Macroeconomic Stability

Evolution of the Financial System in Zimbabwe

Zimbabwe's financial system was relatively well developed by 1960, composed of financial institutions, stock exchange, discount houses, accepting houses and a Postal Bank (Makina, 2009). The country has one of the oldest financial system which dates back to the 19th century (Ndlovu, 2013). Zimbabwe's first bank was established in 1872, under a free banking system, which was replaced by a currency board in 1940, and later replaced by the central banking system in 1956 (Ndlovu, 2013; RBZ, 2013). The stock exchange was established in 1894, and by 1963 it had 98 quoted shares and 13 brokers (ZSE, 2010). For the period 1980 to 1990, the Zimbabwean financial sector went through years of financial repression, characterized by extensive controls and regulations, controls on interest rates, foreign exchange allocations and highly oligopolistic banking sector, with multinational banks dominating the sector (Sibindi & Bimha, 2014). Controls manifested themselves through ceilings on lending and deposit rates, portfolio restrictions, government-directed lending programmes, selective credit policies and exchange controls (Makina, 2009; Ndlovu, 2013). This resulted in high interest rate spreads which may have led to limited intermediation role of the financial sector.

The adoption of Economic Structural Adjustment Programme (ESAP) of the 1990s ushered in reforms in the financial sector. These included the liberalization of interest rates, relaxation of entry regulations, removal of controls on bank lending and reforms to the exchange and payments systems. The deregulation of the financial sector resulted in new players entering the sector, new financial products and wide use of technologies. New entrants were into commercial, merchant and discount banking. Finance houses, unit trusts, leasing firms, exchange bureaux and micro-finance institutions were also established. The decontrolling of interest rates led to reduced interest rates spread thereby supporting productive lending and growth. As a result, private sector credit to GDP increased from 16.3% in 1980 to 27.6% in 2000. Real interest rates were negative between 1980 and 1990, the degree of financial deepening as measured by total deposits/GDP was averaging 25.9% rose to 40.7% between 1991 to 2000. The economic crisis which occurred between 2000 to 2008 somewhat reduced the gains made in the financial sector. The number of financial institutions which had increased to about 60 in 2003 declined to 28 by 2008. The decline in the number of financial institutions, in addition to the economic crisis, reflected poor corporate governance practices and inadequate capital (Mashamba & Magweva, 2015). The crisis also resulted in increased spread between deposit rates and lending rates. As a result of the crisis private sector credit to GDP declined from 26.2% in 2001 to 5.2% in 2008.

With a view to consolidate gains in the multicurrency system, some banks merged while others upgraded from merchant banks to commercial banks. Reflecting the impact of multicurrency system and the recent global trends of moving towards universal banking, most discount houses and merchant banks closed down during the period under review. As at end December 2019, there were 19 operating banking institutions (including POSB), comprising of 13 commercial banks, 5 building societies and 1 savings bank. There were also 225 credit-only microfinance institutions, 8 deposit taking microfinance institutions and 2 development financial institutions. Over the multicurrency era, from 2009 to 2017, financial depth improved from 14.3% in 2009 to 21.6% in 2018. Private sector credit to GDP steadily grew from 7.2% in 2009 to 19.2% in 2014. It however declined to 6.9% in 2019, reflecting macroeconomic challenges which emerged in since 2016 (Table 1).

Table 1: Summary Macroeconomic and Financial Development Indicators: 1980-2020

Variable	1980-1990 Financial Repression	1991-2000 Financial Liberalisation	2000-2008 Economic Crisis	2009-2019 Mult-currency system/dollarisation
GDP Growth (%)	4.3	0.7	-5.6	6.1
Inflation (%)	13.55	31.4	2,569,111	52.2
Fiscal Deficit/GDP (%)	-6.3	-11	-4.6	-2.4
Number of Banking Institutions	21	29	34	22
Private sector credit/GDP (%)	13.0	22.1	20.8	15.3
Total Deposits/GDP (%)	53.2	40.7	70.4	23.2
Market Capitalisation to GDP (%)	15.3	31.2	43.0	29.2

Source: ZIMSTAT, ZSE and RBZ, 2020

Structure of Banking System

The banking sector evolved significantly since 1980. At independence, the country had 4 commercial banks and 4 merchant banks all of which were foreign owned. Table 2 shows the evolving structure of banking system in Zimbabwe.

Table 2: Evolution of the Structure of Banking System in Zimbabwe

Period	Commercial bank	Merchant banks	Building Society	Discount House	Finance Houses	Savings Bank	Total
1990	6	4	3	2	5	1	21
1995	5	9	5	4	5	1	29
2000	12	6	5	7	6	1	37
2005	13	5	4	5	4	1	32
2010	15	5	4	0	0	1	25
2015	13	0	4	0	0	1	18
2019	13	0	5	0	0	1	19

Source: Reserve Bank of Zimbabwe

As shown financial liberalisation resulted in increased financial institutions from 4 in 1980 to 21 in 1990 and 37 in 2000. In addition, microfinance institutions (both credit-only and deposit taking) also increased from 10 in 1990 to 234 in 2019, mainly to cater for SMEs credit. These institutions are bridging the gap in provision of credit to the small-scale and informal sector who usually fail obtain credit from the banks (Sibindi & Bimha, 2014).

Bank concentration which is generally considered to reflect market power and, therefore, the degree of competition is important in assessing the importance of financial development on macroeconomic performance. Increased bank competition normally results in increased efficiency and hence improved financial sector intermediary role. Two approaches are used to measure bank concentration. The first approach is the k-bank concentration ratio which measures the share of output or assets controlled by a few dominant firms and the Hefindahrl–Hirschman index (HHI), which incorporates all banks in the measurement, while assigning greater weight to larger banks' assets as well the HHI. In general, three bank concentration Ratio (CR3) and four bank concentration rations (CR4) suggest that concentration is significant in the banking industry in Zimbabwe (Mlambo & Mupunga, 2018). Table 3 shows trend in the concentration ratios in deposits, loans and assets. Both CR3 and CR4 show that in 2009 concentration in the deposit market was much higher at 55.7% for CR3 and 64% for CR4. Table 3 also shows the HHI, which measures the market shares of all banks. Overall, the banking sector in Zimbabwe shows moderate to low levels of concentration which may be viewed as conducive to support macroeconomic stability.

Table 3: Trends in the Concentration Ratios in Deposits, Loans and Assets

	Three Bank Concentration Ratio (CR3)				Four Bank Concentration Ratio (CR4)			
	Deposits %	Loans %	Assets %		Deposits %	Loans %	Assets %	Herfindahl-Hirschman Index (HHI)
2009	55.67	52.33	46.98		64.64	59.14	55.54	1335.82
2010	42.57	41.08	41.34		52	47.29	48.12	1120.36
2011	42.19	45.58	36.61		50.46	51.45	44.24	954.88
2012	37.78	41.81	37.53		46.31	48.09	44.49	898.29
2013	42.26	44.72	42.14		50.7	51.34	49.73	925.11
2014	48.68	47.54	44.58		55.77	53.92	52.88	899.87
2015	53.07	48.71	47.62		59.47	55.75	54.93	1239.46
2016	50.73	50.5	46.11		58.22	57.31	52.56	1338.04
2017	50.83	48.92	46.10		57.82	55.66	53.46	1159.12
2018	51.54	49.38	46.61		58.50	56.24	53.65	1245.54
2019	51.03	49.60	46.27		58.18	56.40	53.22	1247.57

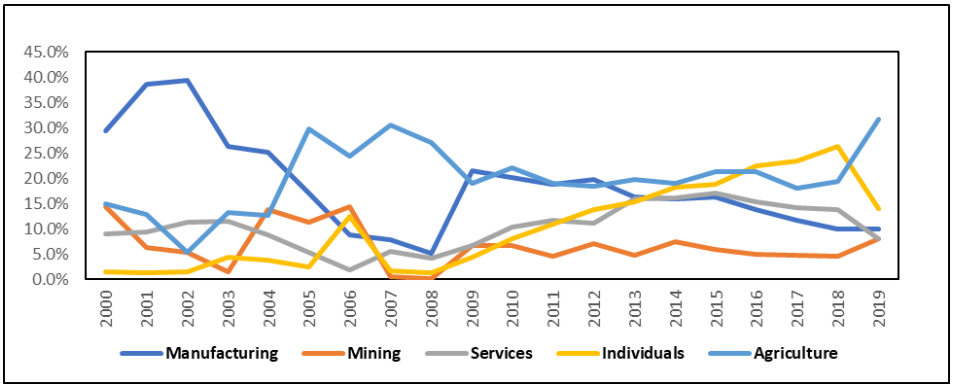
Source: Adopted from (Mlambo & Mupunga, 2018) and Authors own calculations, 2020

Structure of Loans and Advances by Sector

The allocation of lending to different sectors of the economy is also important, with increased lending to productive sectors likely supporting economic stability and growth. Levine (2005) argues that 'too much household credit' can actually harm macroeconomic stability. Prior to the crisis, most of the loans and advances were distributed to the agriculture sector but the loan to the sector plummeted from 30 percent in 2007 to 3 percent in 2008 on the background of a hyperinflationary period which made agriculture an unattractive enterprise. The reduced productivity in the agriculture sector may have reduced the effect of increased credit on agriculture on economic stability and growth. Other critical sectors that received considerable allocations of loans include manufacturing and mining, as shown in Figure 1.

The loans and advances to the manufacturing sector peaked at 38.5% of total proportion of credit in 2001 but declined from 21.5% in 2009 to 10% in 2019, due to increased de-industrialization. The short-term nature of credit also discouraged lending to fairly long-term manufacturing activities. The short-dated loans also mean reduced lending to mining projects, which normally have long term gestation period. As such, loans and advances to the mining sector have been low averaging 10% for the period under study. Figure 1 also shows that the proportion of individuals (households) to total borrowing averaged 3% from 2000 to 2009. Credit to households increased from 8% in 2010 to 26.3% in 2018 before declining to 13.9% in 2019.

Figure 1: Borrowing from Commercial Banks as a Proportion of Total Borrowing



Source: Reserve Bank of Zimbabwe

Zimbabwe Stock Exchange (ZSE)

By 1987, Zimbabwe had a well-diversified capital market which played a key role in supporting economic development. The ZSE saw increased activity as a result of financial liberalization in the early 1990s with the listed counters increasing from 60 in 1990 to 71 in 2000 and 78 in 2012, before receding to 63 in 2019 as the country faced some heightened macroeconomic challenges. As a result, stock market capitalization to GDP rose steadily from 11.2% in 1987 to a peak of 73.8% in 2002 before declining 18.0% in 2019, as shown in Table 4.

Table 4: Indicators of Stock Market Performance

Year	Market Capitalisation/GDP	Volume of shares traded/GDP	Listed Counters
1990	19.5	0.9	60
1995	31.6	1.9	65
2000	38.2	2.9	71
2005	26.6	2.6	79
2010	32.0	3.3	78
2015	15.0	1.1	60
2019	18.0	1.3	63

Source: Zimbabwe Stock Exchange

III. Literature Review

Theoretical Literature

Financial sector development is defined as the improvement in efficiency, quality and quantity of financial intermediary services (Choong & Chan, 2011). Levine (2005) highlights that financial development occurs when financial intermediaries, markets and instruments work to reduce the effects of information asymmetry, transaction costs, enforcement and as a result, improve the provision of the financial functions. In this regard, financial development encompasses the improvement in (i) pooling and mobilisation of savings (ii) facilitation of trading, hedging and diversifying and pooling of risk (iii) allocation of resources to productive sectors; and (iv) facilitate the trade of commodities. These functions influence savings and investment decisions as well as the efficient allocation of the resources in the economy.

Over the past decades, in the economic discourse, the concept of macroeconomic stability has undergone considerable changes. In the post Second World War era, the subject of macroeconomic stability was dominated by Keynesian thinking which basically meant a mix of internal and external balance, which in turn implied, in the first case, full employment and stable economic growth, accompanied by low inflation. In recent times, the issues of fiscal balance and price stability have come to the fore, supplanting the Keynesian emphasis on real economic activity (Ocampo, 2005). Theoretical literature proposes different ways in which financial system development impact macroeconomic stability.

An important theoretical strand on the nature of the relationship between financial system development and macroeconomic stability postulates that there is negative relative between financial sector development and output volatility. Thus, an economy's ability to deal with shocks is dependent on the level of development of its financial system. Using macroeconomic model with micro-underpinnings that made use of unequal access to investment opportunities and imperfections in the financial system, Aghion, et al., (1999) showed that economies that experienced slower growth and tended to be more

volatile than those with less developed financial systems.

This view is consistent with the work of Acemoglu & Zilibotti (1997), who postulated that well developed financial systems provide better risk management and diversification platforms that dampen macroeconomic fluctuations. In essence, they argued for a negative relationship between development of the financial system and output volatility. The view is also consistent with Caballero & Krishnamurthy (2001), who argued that economies facing offshore financial constraints can rely on the deeper financial system to alleviate firms' cash constraints and reduce volatility.

Linked to the above, is the essential theoretical work by Levine (1997) and Gertler (1988) who pointed out that by lowering transaction costs as well as the cost of information acquisition, financial institutions help reduce information asymmetries and improve resource allocation in the economy. Consequently, faster economic growth derives from higher levels of financial system development (Goldsmith, 1969; Greenwood & Jovanovic, 1990; King & Levine, 1993a; King & Levine, 1993b; Boyd & Prescott, 1986; Fischer, 1993).

On the other hand, it is debated that there is a positive relationship between financial system development and output volatility. Kaminsky & Schmukler, (2003), argued that firms in a developed financial system can be vulnerable to higher volatility due to increased leverage. In support of this view, Shleifer & Vishny (2010), argue that as a result of increased financial development, banks can over-leverage while entrepreneurs can assume more risk, which could potentially lead to more volatility in the economy. Wagner (2010) also pointed out the undesirable effects of diversification, a key component of developed financial system, and observed that it could result in higher systemic crises and reduced welfare.

Another important strand of theoretical literature focussed on the impact of imperfections in financial markets and existing information asymmetries on fluctuations in output and not on the level of financial developments. Seminal work by Bernanke & Gertler (1989) as well as Bernanke & Gertler, (1990), pointed out that with underlying imperfections to the credit markets, macroeconomic fluctuations are amplified as a result of shocks to the net worth of non-financial borrowers. The view is supported by Greenwald & Stiglitz (1991) and Kiyotaki & Moore (1997), who employed dynamic general equilibrium models to show that imperfections in financial markets and asymmetric information heighten volatility in the real sector.

Empirical Review

Empirical evidence on the relationship between financial system on macroeconomic stability in both cross country and in-country studies show an unambiguous impact. Braun & Larrain, (2005) and Raddatz (2006) showed that volatility of output was lowered by financial development, especially in industries that were financially vulnerable. The studies carried across a large cross section of countries employed sectoral valued added data and revealed that financially vulnerable manufacturing industries were more affected in economic downturns if located in countries with less developed financial system. The results showed that at a macroeconomic level, changes in the financial system can come up with critical differences in overall volatility of the

economy and that the development of the financial intermediaries was essential than that of equity markets for the lowering of volatility (Raddatz, 2006).

Easterly et al. (2000), investigated the impact of the financial system as the key driver in output volatility and found out there is a U–shaped relationship between the two variables. The findings showed that higher financial depth was generally associated with lower output volatility, but as leverage and the financial system continued to grow, macroeconomic vulnerability also increased. Denizer et al. (2002) employed the fixed-effects estimation with panel data covering the period 1956-98 from 70 countries to investigate the relationship between finance and macroeconomic volatility. According to the authors, consumption and investment volatility could be explained by the importance of banks in the financial system. The size of private credit as a proportion of GDP best explains consumption and output volatility. The findings of the authors suggested the manner in which the financial systems develop matters and that economies with advanced financial systems experienced less output, consumption and investment volatility.

Dabla-Norris & Srivisal, (2013) noted that the changes in the financial system dampened output volatility up to a certain point. Beyond this point, the advanced financial system amplifies volatility of consumption and investment, and this was the case for most advanced economies. The authors carried out an empirical study covering 110 countries (34 high-income countries and 76 middle and low-income countries) over the period 1974-2008 using the dynamic panel analysis methodology. The paper, which examined the effects of financial system development on macroeconomic volatility, also found out that well developed financial systems served as shock absorbers from the impact of negative external shocks on output volatility.

Contrary to the findings of Denizer et al. (2002), Firdmuc & Scharler (2013), found out that banking sector development was not significantly related to the size of fluctuations in the macroeconomy and that countries with well advanced equity markets experienced less pronounced fluctuations. Their paper looked at financial development and magnitude of business cycles, covering the period between 1995 and 2005 for a sample of OECD countries.

Reflecting the differences in empirical work, Acemoglu, et al. (2003) found out that the financial system was neutral in relation to macroeconomic volatility. The authors' findings suggest that the source of differences of the large cross-country macroeconomic volatility was institutional and noted that no standard macroeconomic variables appeared to be the primary channels through which institutional quality led to economic volatility. According to these authors, poor macroeconomic performance reflected symptoms of deep institutional issues. Beck, et al. (2006) corroborated the above view in a study of 63 countries over the period 1960-97, whose findings suggested an unambiguous relationship between the financial system and consumption growth volatility.

Financial indicators that have been selected to proxy financial sector development are dependent on the specific characteristics of a financial system. Deriving from the McKinnon-Shaw framework, which postulated that a monetized economy is evidence of a highly developed capital

market, most empirical studies have relied on monetary aggregates to nominal GDP as indicators or proxies of financial development (Choong & Chan, 2011). These variables are generally available and used in most empirical literature.

However, there have been criticisms on the use of monetary aggregates that they do not fully represent the effectiveness of the financial system in easing transactions costs, reducing information asymmetries. Thus, other indicators have been put forward. King & Levine, (1993a) provided alternative indicators to the monetary aggregates of which the first covered the relative significance of particular financial institutions, the ratio of deposit money banks assets to total banking assets. The other indicators developed measure the distribution of domestic assets under which the ratio of proportion of domestic credit channelled to the private sector to GDP and the ratio of claims of non-financial private sector to GDP are covered. King & Levine, (1993a) found a positive and significant relationship between several financial development indicators and growth.

Svirydzenka (2016) contends that financial sector development is multi-dimensional and requires use of multiple indicators. The evolution of financial markets, institutions and the introduction of different products and services has necessitated the need to broaden the measurement of financial development. Multiple indicators are necessary to measure financial development given the diversity of financial systems across countries. Furthermore, in order to circumvent some shortcomings that come with single financial indicators as proxies for financial development, a financial market development index is designed from various financial markets indicators. A typical financial markets development index summarises the developments of both financial markets and institutions in terms of access, depth and efficiency. The IMF has adopted a multi-dimensional approach to measure financial development based on the work of Čihák, et al., (2012).

Financial markets development index captures broader aspects of the financial system than a single financial indicator but does not include underlying drivers or outcomes. Svirydzenka (2016) contends that there are challenges in constructing the index and that some of the variables the index may adopt may overstate the true level of financial development. [1]

IV. Methodology

Consistent with previous studies, the study used traditional financial development indicators and a financial systems development index. It used monetary aggregates to proxy financial systems development, which are private sector credit to GDP, total bank deposits to GDP and stock market capitalisation to GDP, (Svirydzenka, 2016; Choong & Chan (2011). The measures show the degree of financial intermediation with total bank deposits of GDP reflecting mobilisation of resources from surplus units while private sector credit shows allocation of the resources to deficits units. The stock market capitalisation to GDP captures the impact of the capital market.

In line with Čihák et al. (2012), the study developed a financial systems development

[1] See details of the index by Čihák, et al., (2012) in Annex 1.

index from three indicators of financial development to have a broad measure of financial sector development. The index was constructed using respective weights of the banking and capital markets activities in the GDP. As such the private sector credit to GDP and total deposits to GDP used weights of 40% each while stock market capitalisation used a weight of 20%. The increase in the financial development index shows improvement in financial development and vice versa. An increase in financial development index denotes increased financial development and vice-versa.

As highlighted by Cariolle, (2012) there is little discussion about the choice of indicator for macroeconomic volatility, because the variables used are closely correlated. As in Dabla-Norris & Srivisal, (2013), macroeconomic stability is measured as a 5-year standard deviation of economic growth from 1980 to 2019. A decline in the standard deviation shows increased macroeconomic stability and while an increase in the standard deviation shows increased macroeconomic instability.

In terms of econometric approach, most of the previous studies utilised the Autoregressive Distributed Lag (ARDL) and variants of vector autoregressive models. In this regard, the study used the ARDL approach (i.e., the bounds testing approach to cointegration) based on data covering the period 1980 to 2019, (Pesaran & Pesaran, 1997; Pesaran and Shin, 1999; Pesaran et al. 2001). The model that used stock market capitalisation to GDP as an indicator of financial development, however, is run from 1987 to 2019 because continuous data on the stock exchange starts in 1987.

The ARDL has a number of favourable properties that tend to support its use. The most important is that the model can be used whether the variables are I(1) or I(0) and this entails that the pre-test unit root tests are not compulsory. Though in most cases it's still important to undertake unit root tests to ensure that there are no I(2) variables which make the ARDL not applicable. In addition, the ARDL is also even efficient in small and finite sample. The long-run parameters of independent and valid t-values can be accurately estimated even if the variables are endogenous. Lastly, the endogeneity bias tends to be reduced with the application of optimally and sufficiently large lags. As proposed by Pesaran and Shin (1999), the study first test the existence of cointegration based on the bounds test utilising the following equation:

$$\Delta Y_t = \alpha_0 + \delta_0 Y_{t-1} + \sum_{j=1}^{k} \delta_j Z_{J,t-1} + \sum_{i=1}^{p} \lambda_{0,i} \Delta Y_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q} \lambda_{j,i} \Delta Z_{J,t-i} + \varepsilon_t \qquad \text{……..(1)}$$

Where Y_t is the dependent variable, α_0 a is a constant term; and ∂_i and λ_i are coefficients; Z is a vector of k determinants of Y_t; p, q are optimal lag orders; Δ denotes difference operator, and ε_t is the white noise error term

In this paper, the dependent variable is the standard deviation of economic growth while independent variables will include the financial systems development index and three indicators of financial development which are considered separately. Other control variables considered in the model include trade openness and investment. Trade openness has been included in most studies on macroeconomic volatility as most developing countries are exposed to external shocks (Karras, 2006). Trade openness can promote macro stability by guaranteeing stable and sustainable GDP growth. On

the other hand, trade openness can result in increased macroeconomic instability as the economy becomes prone to increased external shocks. Fluctuation in investments tend to be associated with macroeconomic variability, (Denizer et al., 2002).

The F test to the bounds test in equation 1 is used to test whether there is cointegration or not and if the calculated F- statistic is lower than the lower critical bound, it suggests that there is no cointegration and if the values are greater than the upper bound critical values, it suggests that there is cointegration. If the F-statistic lies in between the lower and upper bound the results are inconclusive. If cointegration is affirmed, the study can proceed to estimate the long run equilibrium relationship among the variables and the error correction model for the variables as shown in equation 2 and 3.

$$Y_t = b_0 + \sum_{i=1}^{p} \delta_i Y_{t,i} + \sum_{j=1}^{k} \sum_{i=0}^{q} \beta_{ji} Z_{j,ti} + \mu_t \ldots\ldots (2)$$

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \lambda_{0,i} \Delta Y_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q} \psi_{j,i} \Delta Z_{J,t-i} + \lambda ECM_{t-1} + \varepsilon_t \ldots\ldots (3)$$

Equation 3 shows that a negative and significant coefficient λ of the error correction term means that any short-term changes from the equilibrium would be corrected and the system would converge back to the long run steady path.

Data Sources and Description

Data used in this study was obtained from various agencies. Real GDP, population, real investment and trade openness were obtained from Zimbabwe National Statistics Agency (ZIMSTAT) for the period 1980 to 2019. Real investment is real gross fixed capital formation. Trade openness is defined as the ratio exports and imports over GDP. Private sector credit to GDP and Total deposits to GDP for the period 1980 to 2019 was obtained from the Reserve Bank of Zimbabwe (RBZ). Lastly, stock market capitalisation to GDP for the period 1987 to 2019 was obtained from the Zimbabwe stock exchange (ZSE). Table 5 shows the variables and variable notation used in the financial development – macroeconomic stability regressions.

Table 5: Variables, Variable Notation and Description

Variable	Notation in Model	Description
Macroeconomic stability -Standard deviation of Real GDP growth rate	LRGDP	5-year Standard deviation of real GDP growth rate
Logged Real Investment	LINV	Constant Gross fixed capital formation
Openness	LOPEN	Nominal exports plus nominal imports divided by nominal GDP
Financial development index	FININDEX	Financial systems development index
Total Deposits to GDP	FINDEP	The ratio of gross deposits to GDP, obtained by dividing nominal total deposits by nominal GDP.
Private sector credit to GDP	PVTGDP	The ratio of private sector credit to GDP, obtained by dividing nominal private sector credit by nominal GDP.
Stock market capitalisation to GDP	MRKTCAP	The ratio of private sector credit to GDP, obtained by dividing nominal private sector credit by nominal GDP.

V. Empirical Results

This section discusses the findings of the study including cointegration test results as well as the model results.[2] Table 6 shows the results of the ARDL Bounds tests for the financial development index and the three financial development variables.

Table 6: ARDL Bounds Test for Co-Integration Analysis

Equation	Lag Length	F-statistics
LRGDP/LOPEN, lINV, PVTGDP	3	3.571696**
LRGDP/LOPEN, lINV, DEP/GDP	3	9.201657***
LRGDP/LOPEN, lINV, MRKTCAP	3	6.469455***
LRGDP/LOPEN, lINV, FININDEX	3	3.982803**

*** significant at 1% level of significant; **significant at 5% level of significant

Table 6 shows that ARDL bounds tests confirm the existence of cointegration for the four models used to analyse the financial development - macroeconomic stability nexus in Zimbabwe. The calculated F-statistics for all the three regression results are above the upper bound critical values of Pesaran (2001), which means that the null hypothesis of no cointegration cannot be accepted. Given that the study has established that there is co-integration between financial development and macroeconomic stability, the study proceeds to estimate Error correction regression for the four models. First the study estimates the long-run regressions as shown in Table 7.

Table 7: Long-run Models for Financial Development and Macroeconomic stability

Dependent Variable: Real GDP Standard Deviation

Variable	Model 1 Private Credit/ GDP	Model 2 Total Deposits to GDP	Model 3 Market Capitalisation/ GDP	Model 4 Financial Index/ GDP
C	6.107	9.676	12.847	-31.086*
	(0.422)	(0.561)	(0.156)	(0.017)
LOPEN	2.462**	0.334	2.389	6.886***
	(0.042)	(0.911)	(0.577)	(0.015)
LINV	-0.0715	-0.795	2.319	0.799
	(0.901)	(0.309)	(0.229)	(0.362)
FINDEP	-0.014			
	(0.4711)			
PVTGDP		-0.199		
		(0.311)		
MRKTCAP			1.078	
			(0.402)	
FININDEX				-0.295***
				(0.008)

Source: Authors computations

*** significant at 1% level of significant; **significant at 5% level of significant

[2] The unit root test results are reported in Annex 2. The results show that some variable are I(1) and others are 1(0), validating the appropriateness of ARDL approach.

In Table 7 and Table 8, private sector credit to GDP, total deposits/GDP, market capitalisation to GDP and the financial development index are considered as independent variables and estimated separately in models 1, model 2, model 3 and model 4, respectively. In Table 7, the results show that financial systems development as measured by the financial development index has a significant negative coefficient, which shows that improvement in financial development reduces the variability of economic growth and therefore enhances macroeconomic stability. The results depict that enhancing financial system efficiency and development is critical for long run macroeconomic stability.

The long-run regressions for the separate financial indicators, however, show a negative but insignificant effect on macroeconomic stability. This may reflect the fact that these indicators fail to fully capture financial development aspects in the long run. As such, the results show that the nexus between financial development and macroeconomic stability is also affected by measurement of financial development, with less broad measures resulting in likely insignificant relationship in the long run. The results of the ARDL error correction model, however, show that financial development have a negative and significant effect on macroeconomic instability in the short run for the financial development index and the separate financial development indicators as shown in Table 8.

The results of the error correction for all the four models suggest that financial development reduces the variability of growth in the short run. In the short run, a 1 percent increase in financial sector development as measured by the financial development index reduces the standard deviation of economic growth by 0.29 percent. In addition, the coefficients for private sector credit to GDP, total deposits to GDP and market capitalisation are also all statistically significant. This may mean that the finance –macroeconomic stability nexus is stronger in the short-run and possibilities of thresholds beyond which particular components of financial development cease to have a significant effect. The equilibrium cointegration coefficients are also negative and significant confirming that the system reverts to back long-run equilibrium in the event of a shock for all the models. The results are in tandem with empirical work of Nyasha & Odhiambo (2015), who found that an efficient, liberalised and developed financial system was essential for economic stability especially in the early stages of the growth process, which is also consistent with Patrick (1966), hypothesis of stage development.

Table 8: ARDL Error Correction Regressions Results:

Dependent Variable: Change in Standard Deviation of GDP growth

Variable	Model 1 Private Credit/ GDP	Model 2 Total deposits to GDP	Model 3 Market Capitalisation/ GDP	Model 4: Financial Index/GDP
C		-6.107***	-4.278***	-31.084***
		(0.000)	(0.001)	(0.000)
DLOPEN		-0.639	2.772	0.352
		(0.674)	(0.212)	(0.703)
LOPEN(-1)			-8.975***	-3.429*
			(0.006)	(0.090)
DLINV			4.109***	
			(0.008)	
DLNV(-1)			10.694***	
(0.001)				
DLINV(-2)			8.720	
			(0.000)***	
DLINV(-3)			4.293***	
			(0.011)	
DPVTGDP	-0.072*			
	(0.065)			
DPVTGDP(-1)	-0.120***			
	(0.005)			
DPVTGDP(-2)	-0.184***			
	(0.000)			
DPVTGDP (-3)	-0.145****			
(0.003)				
DFINDEP(-1)		-0.033*		
		(0.078)		
DFINDEP(-2)		-0.008***		
		(0.000)		
DFINDEP(-3)		-0.061***		
		(0.000)		
DMRKTCAP			0.0.148	
			(0.729)	
DMRKTCAP(-1)			-0.031	
			(0.934)	
DMRKTCAP(-2)			1.154***	
			(0.000)	
FININDEX				-0.295***
				0.008
CointEq(-1)*	-0.459***	-0.748***	-0.7814***	-0.679***
	(0.000)	(0.000)	(0.000)	(0.000)
Adjusted R-squared	0.536	0.710	0.733	0.713

Source: Authors own computations

*** significant at 1% level of significant; **significant at 5% level of significant

VI. Conclusion

The study investigated the relationship between financial development and macroeconomic stability in Zimbabwe during the 1980-2019 period using the ARDL Bound test technique. The study used a financial development index to measure financial system development and a 5-year standard deviation of economic growth to measure macroeconomic stability. The study also used private sector credit to GDP, total deposits to GDP and stock market capitalisation to GDP as other alternative separate indicators of financial development. The results show that financial development significantly lead to macroeconomic stability. The separate indicators of financial development because of their narrow nature tend to show insignificant relationship in the long run.

In the short run, however, all the indicators of financial development are negative and significant showing that improvement in financial sector lead to reduced macroeconomic variability. This would be implying possibilities of thresholds in the financial development-macros stability nexus in the long run. Nevertheless, the results suggest a need to enhance the optimal functioning of the financial system so as to boost the role of finance in the short term. The study recommends that future research focuses on, among other areas, the channels through which financial sector impact on macroeconomic stability as well as the importance of the structure of credit in terms of long term and short term and its importance on macroeconomic stability.

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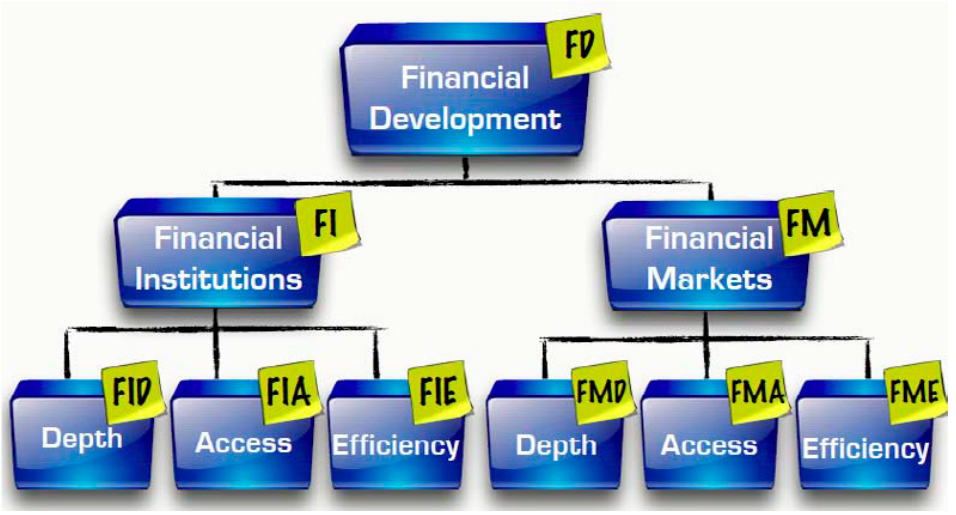
Annex 1: Financial Development Index Pyramid



Source: IMF staff, based on Čihák et al. (2012)

Annex 2: Unit Roots Tests Results

Variable	In levels	1st difference	Order of Integration
Standard deviation of Real GDP Growth rate	-2.836211 (0.2791)	-6.315894*** (0.0000)	I (1)
Private sector Credit to GDP	-2,5721 (0.2361)	-7,0949*** (0.0001)	1(1)
Trade Openness	-1,9810 (0.1543)	-6,1565*** (0.0004)	1(1)
Log Real Investment	-4,1426** (0.0253)		1(0)
Financial development index	-1,2843 (0.3974)	-3,4258*** (0.0007)	1(1)
Total deposits/GDP	-3, 0468 (0.1332)	-7,7769*** (0.0000)	1(1)
Stock Market Capitalisation/ GDP	-3,0806 (0.1096)	-4,2427** (0.0185)	1(1)

*** significant at 1% level of significant; **significant at 5% level of significant

2. Impact of Financial Systems Development on Macroeconomic Stability in Sudan

Aida Awad Mohamed, Gibreel Mohamed Siddig and Njem Eldin Mohamed Babiker

I. Introduction

Several factors determine and contribute to macroeconomic stability. One of these factors is the development of the financial system. The institutional framework, efficiency and performance of the financial system are important determinants of economic growth as well as the macroeconomic stability. Therefore, vast number of studies have been conducted to examine the relationship between the development of the financial system and the macroeconomic stability, especially following the numerous currency crises that occurred in the 1990s and the financial crisis in 2008.

The turbulences that hit the international economy after the financial crisis caused much damage to the world financial system, and the Sudanese financial system is not an exception. Moreover, the financial system in Sudan has its own challenges and obstacles attributable to other several reasons, such as the economic sanctions imposed by the US in the last two decades, which isolate the Sudan's financial system from the world financial system. In addition, it has been affected by the separation of South Sudan in 2011 in which case, Sudan lost 75% of its oil revenues, and the financial sector lost the main source of resources with negative implications on Sudan's financial system development. Furthermore, the performance of the financial system in Sudan has been affected by the adoption of different institutional frameworks at different time horizons. Sudan had fully fledged Islamic banking system before 2005, which changed to dual banking system after the comprehensive peace agreement in 2005. Sudan reverted back to the Islamic system after the separation with South Sudan in 2011. Since 2019, Sudan has been operating under a dual banking system.

Against this background, this study sought to empirically examine the impact of the financial sector development on the macroeconomic stability in Sudan based on data covering the period 1960-2020. The study utilized co-integration and Vector Error Correction Model (VECM) approaches to address its objectives. It is expected that the outcomes of this study will provide insights that can guide policy makers in strengthening the impact of financial sector on macroeconomic stability.

The rest of the study is structured as follows. Section 2 provides the background on the financial sector in Sudan while section 3 presents the literature review. Section 4 provides the methodology and section 5 reports the empirical results. Section 6 concludes the study and suggests some policy recommendations.

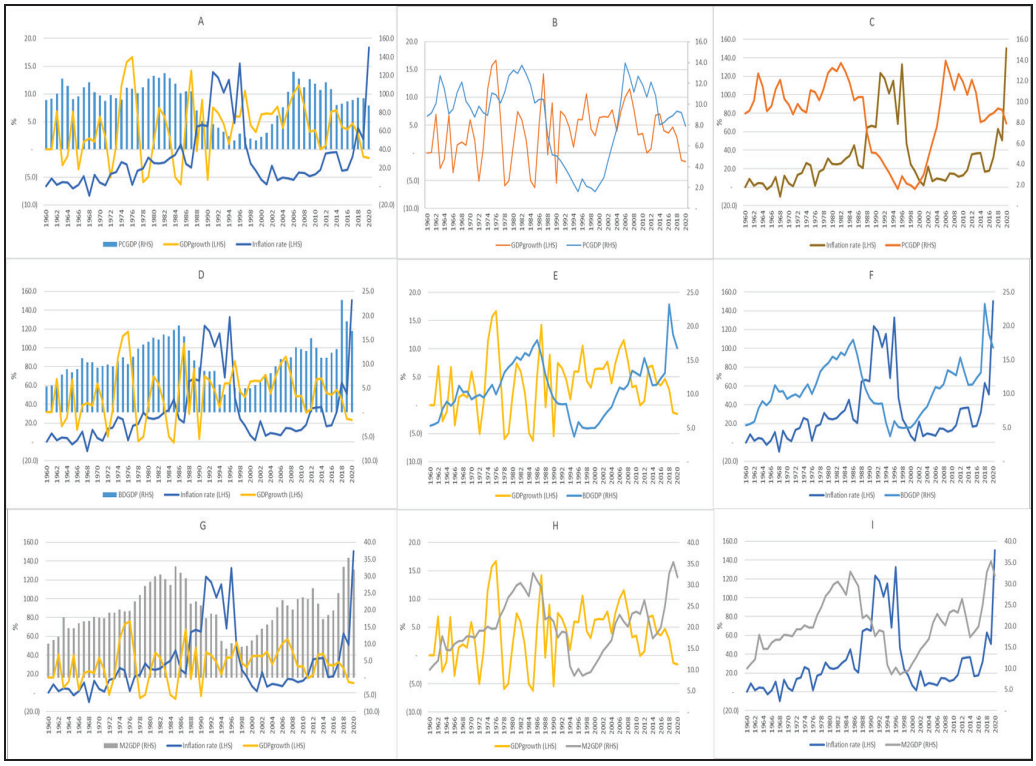
II. Background about Financial Sector in Sudan

The financial sector in Sudan dominated by the banking sector. It comprising of 37 commercial banks distributed into three groups according to capital ownership specifically state-owned, joint venture, and foreign banks, regulated and supervised by the central bank of Sudan. The non-bank financial institutions in Sudan's financial system includes 19 currency exchange bureaus, 19 transfer companies, 44 microfinance institutions and 15 insurance companies. All banking operations are supervised by a centralized High Shari'ah Supervisory Board established in 1992 to ensure full compliance with Shari'ah principles. However, banks are also required to establish in-house Shari'ah supervisory boards. In addition, the financial markets in Sudan were operating under the umbrella of Khartoum Stock Exchange (KSE) and recently under the umbrella of Capital Market Authority, which provides the operational platform for all financial markets' transactions. Beside the KSE, there is the Sudan Company Financial Services, established by the CBOS and Ministry of Finance and Economic Planning, and is responsible for issuance and management of government securities.

Sudan also operates credit guarantee institutions. These include the deposit guarantee fund and the microfinance guarantee agency. The deposit guarantee fund was established in 1991 to achieve specific goals and objectives represented in guaranteeing deposits in secured banks, protecting the rights of depositors, and redressing damages when they occur, with the cooperation and solidarity of the monetary authorities, banks and depositors themselves. Furthermore, the microfinance guarantee agency "Tayseer" was established in 2013. The agency does not provide financing directly, but rather facilitates microfinance institutions that have the ingredients for success but cannot provide the necessary guarantee to obtain financing from banks, and work to activate cooperation between banks and microfinance institutions in Sudan. The agency also provides guarantee documents to banks and microfinance institutions in accordance with the provisions of the agency law. The agency facilitates access to banking finance by providing the appropriate wholesale guarantee to small and medium-sized microfinance institutions in Sudan.

Figure (2) shows the performance of the indicators included in the study. The period covered in the study can be categorized into three phases. The first phase is before 1990, characterized by a stable performance of key economic indicators while some instability marked with the deterioration of most economic indicators was experience during the 1990s. For instance, the period post 1990 witnessed high inflation rate, decrease in the credit to the private sector, reduction in the banks' deposits and slowdown in the GDP. In contrast, the performance of the economy improved between (2000 – 2011) reflecting the oil period in Sudan. However, the economy deteriorated again after the separation of the South Sudan in 2011 and Sudan lost 75% of the oil revenues.

Figure 2: Performance of some Macroeconomic and Financial Indicators



Source: Bank of South Sudan, National Bureau of Statistics and author's calculations

III. Literature Review

The impact of the financial sector development on macroeconomic stability is intensively discussed in the literature, at different level in the advanced, emerging and developing counties and no consensus exists on the financial development and the macroeconomic stability relationship. Some studies indicated a positive relationship between financial development and macroeconomic stability. The studies used various indicators of financial development and data from advanced economies, Asia and Africa to show a positive relationship between financial development and economic growth (Prochniak & Wasiak, 2017; Noorhamizah, 2017; Creel et al., 2015; Manu et al., 2011; Estrada et al., 2010). Furthermore, Abdelbaki, (2013), investigated the relationship between macroeconomic variables and Bahraini stock market development based on the Autoregressive Distributed Lag model. The result showed that, the development of a financial market is closely related to the overall development in the national economy. However, some studies in Africa, Europe and emerging markets established a negative relationship between the financial system development and the macroeconomic stability, (Kapaya, 2020; Sajo & Li, 2017; Petkovski & Kjosevski, 2014; Naceur & Ghazouani, 2007; Ardic & Damar, 2006).

Other studies using data from African countries focused on the impact of financial development on aspects of growth such as investment and capital flows rather than the direct effect of financial development on growth. Notably, Coulibaly, (2015) investigated the causality between remittances and financial sector development in Sub-Saharan African (SSA) countries, using annual data over the 1980–2010 period for 19 SSA countries. The results show that, based on liabilities as a proxy for financial sector development, remittances positively influence financial development only in four countries (Niger, Senegal, Sierra Leone and Sudan) and financial development positively affects remittances only in Gambia. In the same study, the results show that remittances positively affect financial development only in Sudan and financial development does not influence remittances in any country when credit growth is used as a measure of financial depth. On financial development-investment nexus, Boateng et al., (2017) examined the interactive effect of financial development and foreign direct investment (FDI) inflows on domestic investment in sub-Sahara Africa (SSA). The results showed that financial development complements FDI inflows to augment domestic investment in SSA. Yinusa et al., (2020) however assessed the nexus between institutional quality, financial development and inclusive growth in Nigeria for the period 1984-2017. The study concluded that institutional quality and financial development are crucial variables that influence inclusive growth in Nigeria.

There is no consensus on the relationship between financial development and macroeconomic stability from a few studies that have focused on Sudan. For instance, Sirag et al., (2018) investigated the relationship between financial sector development, foreign direct investment (IFD) and economic growth in Sudan and found evidence supporting the existence of positive and significant effects of financial system development on economic growth. Similarly, Arabi, (2014) investigated the dynamic relationship between financial development and economic growth in Sudan during 1970–2012. The study used Johansen approach to Co-integration and Vector Error Correction Model (VECM) to find out the long and short run effects of the financial sector development on economic growth. The findings showed a marginal positive effect of financial sector development on economic growth in Sudan. Similarly, Hussein et al., (2020) investigated the influence of banking sector on economic growth in Sudan and found positive linkages. Contrastingly, other studies found a weak and limited role for the financial sector development in macroeconomic stability in Sudan. Using both banking sector and stock market indicators, the studies showed limited impact of financial development on economic growth, (Elhassan & Braima, 2020; Mohamed, 2008).

IV. Data and Econometric Methodology

The study used annual data covering the period 1960–2020. It utilized three measures of financial system development. The first measure is money supply-GDP ratio (M2GDP) which measures the degree of monetization in the economy as well as the depth of the financial sector. The second measure is the ratio of domestic credit to private sector to GDP (PCGDP) and the third is banks deposit liability to

GDP (BDGDP). The real GDP and inflation rate were used as macroeconomic stability indicators. The variables are defined in Table 9.

The paper used the cointegration procedure and vector error correction model (VECM) to test the long run equilibrium and short run relationship among the variables. According to Granger representation theorem, if the series are co integrated, the dynamic relationship involving the variables could be examined within VECM framework.

$$\Delta Z_t = \alpha\beta' Z_{t-1} + \sum_i^{p+1} \Gamma_i \Delta Z_{t-i} + \delta\emptyset + E_t$$

Where $\alpha\beta' Z_{t-1}$ represents the long-run information on the process of Z_{t-1}. Specifically, the rows of β' are explained as the distinct cointegrating vectors and the rows of α indicate the speed of adjustment of the dependent variables towards the long-run equilibrium state. The specific form of the VEC model is given as:

$$\Delta LGDP = \beta_{1j} + \sum_{p=1}^{m} \beta_{11ip} \Delta LGDP_{it-p} + \sum_{p=1}^{m} \beta_{12ip} \Delta inflation_{it-p} + \sum_{p=1}^{m} \beta_{13ip} \Delta M2GDP_{it-p} + \sum_{p=1}^{m} \beta_{14ip} \Delta PCGDP_{it-p} + \sum_{p=1}^{m} \beta_{15ip} \Delta BDGDP_{it-p} + \gamma_{1i} ECT_{1t-i} + e_{1it}$$

Where, Δ represents lag operator and p stands for lag length in the above VECM framework. The above framework allows for causality direction. ECT shows error correction term. The ECT coefficient i.e.γ_{1i}, quantity tendency of each variable to return towards equilibrium position.

Table 9: Definitions and Sources of Data used in the Analysis

Variable	Variable	Source
Real Gross domestic product	Log RGDP	Central Bureau of Statistics
Inflation rate	Inflation	Central Bureau of Statistics
Money supply-GDP	M2GDP	World bank database
Domestic credit to private sector to GDP	PCGDP	World bank database
Banks deposit liability to GDP	BDGDP	World bank database

V. Empirical Results

The study conducted unit root tests reported in Annex 2 and found that all the variable were non-stationary in levels but stationary in first difference. The Johansen Co-integration test as reported in Table 10 indicates that there is one co-integrating equations, implying a long run relationship between GDP and inflation rate as macroeconomic stability indicators and all the financial susyem development indicators. The Johansen Co-integration test is presented in Table (10) indicates that there is one co-integrating equations, implies a long run relationship between GDP and

inflation rate as macroeconomic stability indicators and money supply-GDP ratio, the ratio of domestic credit to private sector to GDP and banks deposit liability to GDP as the financial development proxies.

Table 10: Johansen Co-integration Test

Null Hypothesis	Alternative		95% Critical	Prob.
λrace tests		λrace value		
r = 0	r >0	103.8228***	88.80380	0.0027
r ≤ 1	r >1	59.74684	63.87610	0.1060
r ≤ 2	r >2	34.10155	42.91525	0.2839
r ≤ 3	r >3	17.17323	25.87211	0.4021
r ≤ 4	r >4	7.368103	12.51798	0.3077
λmax tests		λmax value		
r = 0	r =1	44.0759***	38.33101	0.0098
r = 1	r =2	25.64529	32.11832	0.2504
r = 2	r =3	16.92832	25.82321	0.4638
r = 3	r =4	9.805131	19.38704	0.6397
r = 4	r =5	7.368103	12.51798	0.3077

Notes: The symbols ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively. Trace test indicates 1 co-integrating eqn(s) at the 0.01 level and Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.01 level.

Since the variables were integrated of same orders, they could be co-integrated and thus we could proceed to construct a vector error correction model (VECM). An appropriate optimal lag length was found to be two based on Final prediction error (FPE), sequential modified LR and Akaike Information Criteria (AIC). The VECM results based on inflation as an indicator of macroeconomic stability are shown in annex 3.

The results of some selected variables from VECM estimates are presented in Table 11. The results show that financial deepening (M2GDP), deposit liability (BDGDP) were significant at 1 percent with expected sign implying a 1% rise in financial deepening (M2GDP) lead an increase in real GDP growth by 0.011, while deposit liability (BDGDP) lead decrease in real GDP growth by 0.016 during the study period. However, the impact of domestic credit to private sector is insignificant. This would be explained by the weak capital base of Sudanese banks, high public sector share in domestic credit and the absence of an appropriate investment climate required. Similarly, the results in annex 3 indicate that the financial deepening (M2GDP), deposit liability (BDGDP) and domestic credit to private sector (PCGDP) are insignificant impact on the inflation rate.

Table 11: Vector Error Correction Model

Vector Error Correction Estimates: Sample (adjusted): 1963 2020:
Included observations: 58 after adjustments
Dependent Variable: D(LGDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.399315	0.088075	-4.533808	0.0000
D(LGDP(-1))	0.545077	0.121933	4.470300	0.0001
D(LGDP(-2))	-0.001298	0.119190	-0.010887	0.9914
D(BDGDP(-1))	-0.016030	0.005113	-3.135231	0.0030
D(BDGDP(-2))	-0.015262	0.005380	-2.836766	0.0068
D(M2GDP(-1))	0.011311	0.004375	2.585365	0.0130
D(M2GDP(-2))	0.016256	0.004022	4.041393	0.0002
D(PCGDP(-1))	-0.001129	0.005462	-0.206697	0.8372
D(PCGDP(-2))	-0.004775	0.004945	-0.965562	0.3393
D(Inflation(-1))	0.000101	0.000274	0.366158	0.7159
D(Inflation(-2))	5.75E-05	0.000273	0.210299	0.8344
C	0.013285	0.008936	1.486648	0.1439

R-squared= 0.553, adjusted R-squared=0.446; Breusch-Godfrey Serial Correlation LM = 12.39298 (0.0884), Breusch-Pagan-Godfrey heteroscedasticity test =20.3637 (0.1584), Jarque-Bera=2.2567 (0.32356), F-Statistics=5.179 (0.000031) *Values in bracket are probability values.

The results further show that there is a causal relationship between financial development indicators and Macroeconomic indicators. The vector error-correction term ECM (-1) provides the evidence of a long-run linkage between real GDP growth and financial sector indicators. The results in Table 11 show that about 40% of disequilibrium is corrected annually. Diagnostic tests show that the VECM is stable, has no serial correlation, has no heteroscedasticity and the residuals are multivariate normal. The financial sector indicators (M2GDP; PCGDP; BDGDP) have expected signs and results in the study are in line with findings in some developing economies. For instance, Mohamed (2008) found evidence supporting the weak relationship between financial intermediaries and economic growth in Sudan. These results may be attributed to the inefficient allocation of the banks' resources.

Long-run exclusion tests

Each of the variables was tested for long-run exclusion test, i.e., testing whether (or not) a corresponding variable can be excluded from the estimated long-run relation. This was achieved by imposing zero restrictions on each of the β′s, in turn. If accepted, the variable is redundant to the long-run relations and so can at most have a short-run impact. Results from long-run exclusion tests showed that no variables can be excluded from the long-run while the BDGDP can be excluded in short run.

Table 12: VEC Granger Causality/Block Exogeneity test

Dependent variable: D(LGDP)			
Excluded	Chi-sq	df	Prob.
D(BDGDP)	9.782414	2	0.0075
D(M2GDP)	16.61877	2	0.0002
D(PCGDP)	1.843397	2	0.3978
D(INFLATION)	0.251134	2	0.8820
All	21.06413	8	0.0070
Dependent variable: D(INFLATION)			
Excluded	Chi-sq	df	Prob.
D(LGDP)	5.143976	2	0.0764
D(BDGDP)	7.389154	2	0.0249
D(M2GDP)	0.351395	2	0.8389
D(PCGDP)	2.189127	2	0.3347
All	21.31475	8	0.0064

Note: The null hypothesis of the test, in part, is that individually, variable i is excludable from any of the system equations, and that collectively, all system variables are excludable from each of the system equations.

We find unidirectional causation, with influences running from BDGDP to RGDP growth i.e., BDGDP → RGDP growth **(D(LGDP)** block); and from M2GDP to RGDP growth, i.e., M2GDP → RGDP growth **(D(LGDP)** block). We find unidirectional causation, with influences running from BDGDP to Inflation rate i.e., BDGDP → Inflation rate **(D(Inflation)** block. VEC Granger Causality in the VECM was also conducted as reported in Table 12. VEC Granger Causality results reveal unidirectional causation, with influences from bank deposit liability to real GDP growth and from money supply as a share of GPD to real GDP growth. Similarly, the results showed a unidirectional causation from bank deposit liability to inflation.

VI. Conclusion

The paper investigated the impact of the financial sector development on the macroeconomic stability in Sudan based on data covering the period 1960-2020. The study used Johansen approach to co-integration and vector error correction model. The short-run results show that bank deposits have a significant negative impact on real GDP and inflation rate. Additionally, the results showed that financial deepening proxied for by money supply affects has a positive and significant impact on real GDP but negative and insignificant impact on the inflation rate. The results further show that domestic credit to private sector results indicate an insignificant effect to real GDP and inflation rate.

On the other hand, the long-run results indicate that, the bank deposits have a positive and significant impact on real GDP but a negative effect on inflation rate. In contrast, the financial deepening indicator has a significant negative impact on real GDP and positive impact on the inflation rate. The domestic credit to private sector has a positive impact on real GDP and a negative effect on inflation rate.

In terms of policy implications, there is need for Sudan to strengthen and enhance the impact of financial sector on macroeconomic stability by continuing the implementation of financial reforms including banks structural reforms, institutional reforms and Sudan's financial inclusion strategy. It is also recommended that the government develops policies that encourage bank credit to private sector, and limit the government crowding out of the private sector.

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Annexes

Annex 1: Unit root tests results

Variable	Level		First difference		Comment
	ADF	PP	ADF	PP	
Log RGDP	-2.505	-2.230	-5.635***	-5.026***	I(1)
Inflation	-2.064	-2.138	-9.356***	-9.343***	I(1)
M2GDP	-1.952	-1.808	-6.195***	-6.206***	I(1)
PCGDP	-2.339	-1.791	-3.456**	-5.895***	I(1)
BDGDP	-1.888	-1.890	-7.764***	-7.764***	I(1)

Notes: The lag lengths are selected according to Schwartz information criterion (SIC). The critical values for the ADF are based on Mackinnon (1996). ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Annex 2: Vector Error Correction Model_ D(Inflation)

Vector Error Correction Estimates: Sample (adjusted): 1963 2020:
Included observations: 58 after adjustments
Dependent Variable: D(Inflation)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	137.4310	46.47249	2.957255	0.0049
D(LGDP(-1))	-132.5831	64.33758	-2.060741	0.0450
D(LGDP(-2))	-14.94315	62.89038	-0.237606	0.8132
D(BDGDP(-1))	-4.567730	2.697837	-1.693108	0.0972
D(BDGDP(-2))	2.207615	2.838755	0.777670	0.4407
D(M2GDP(-1))	-0.748145	2.308484	-0.324085	0.7473
D(M2GDP(-2))	-0.842576	2.122367	-0.396998	0.6932
D(PCGDP(-1))	2.527854	2.882053	0.877102	0.3850
D(PCGDP(-2))	1.644377	2.609178	0.630228	0.5317
D(Inflation(-1))	-0.184299	0.144832	-1.272500	0.2096
D(Inflation(-2))	0.035239	0.144174	0.244419	0.8080
C	9.544290	4.715106	2.024194	0.0488

R-squared= 0.521, adjusted R-squared=0.407; Breusch-Godfrey Serial Correlation LM = 6.1254 (0.5252), Glejser heteroskedasticity Test =24.27679 (0.0605), Jarque-Bera= 10.4277 (0.00544), F-Statistics=4.549 (0.000120) *Values in bracket are probability values.

3. Impact of Financial Systems Development on Macroeconomic Stability in Rwanda

Christian Nyalihama and Callixte Kamanzi

I. Introduction

There is a robust theoretical presumption among policymakers and scholars that financial systems development, defined broadly in terms of expansion of financial institutions, markets, and infrastructures in the economy is a catalyst for macroeconomic stability and sustained economic development (Levine, 1997; Demirguc-Kunt, 2006; Demirgüç-Kunt & Levine, 2008; Beck, 2013; Zhang, et al., 2012). The standard explanation is that a well-developed financial system smoothens macroeconomic volatility by relaxing credit constraints on firms and households and providing them with various instruments to withstand adverse shocks (Caballero & Krishnamurty, 2001) and promoting diversification and management of risks (Acemoglu & Zilibotti, 1997).

Despite the consensus of the positive influence of financial systems development on macroeconomic stability, this link has attracted more attention from researchers in recent years, particularly following the 2007-09 global financial crisis. It is argued that the impact of financial systems development on macroeconomic stability is nonlinear, that is, as the financial sector deepens, its contribution in reducing volatility declines, hence increasing the propagation and amplification of shocks (Cecchetti & Kharroubi, 2012; Sahay et al., 2015). In the same scope, some studies suggest that the level of financial system development is positive only up to a certain point, after which it becomes a hindrance on macroeconomic stability (Aghion, et al., 2005; Arcand, et al., 2015; Dabla-Norris & Srivisal, 2013).

Against this background, it is therefore pertinent to understand the financial development-macroeconomic stability nexus for at least three reasons. First, the issue of macroeconomic stability is profoundly important for policy-makers mandated to mitigate the severity of macroeconomic instability in their respective economies, (Ramey & Ramey, 1995). Second, the global financial crisis has re-ignited the policy debate on the role of finance in propagating and dampening macroeconomic fluctuations. Third, the theory of a possible linkage between financial systems development and macroeconomic stability is still controversial (Aghion, et al., 1999).

Since the 1990s, many developing countries, including sub-Saharan African countries, have undertaken significant reforms geared towards financial systems development, typically occurring through financial institutions and financial markets. However, the region still lags behind the stages observed in developed and emerging economies. Given that most sub-Saharan African countries are still below the financial systems development index benchmark level (Mlachila, et al., 2016), its effect on dampening the growth volatility tends to be stronger through reducing

borrowing constraints, participation costs, and increased intermediation efficiency.

Similarly, Rwanda recorded noticeable development in the financial system in the last two decades in many aspects, including depth, institutions, markets, and access. Successively, the financial sector in Rwanda has been expanding, consisting of a broad and growing array of institutions and products, and established capital markets. Rwanda's economic performance has also been outstanding, with annual growth of around 8% on average since 2010, while inflation has generally been contained at moderate levels.

Nevertheless, episodes of macroeconomic instability in terms of economic growth and inflation have been recurrent. This is a big concern for policymaking as it can derail the long-term development path. Notwithstanding the noticeable progress in Rwanda's financial system, some challenges remain, including relatively low financial depth in the region, financial access for some sectors, and limited alternatives beyond the banking sector. In such a context, one would wonder whether the level of development in the financial system has helped to improve macroeconomic stability in Rwanda. In addition to this, the divergent views on the effect of financial development on macroeconomic stability provide justification to investigate this matter for each economy like Rwanda that enjoys significant positive changes in both aspects.

Previous studies assessed the relationship between financial development and economic performance in Rwanda, (Kigabo, et al., 2015; Karangwa & Gichondo, 2016; Nyalihama & Kamanzi, 2019). Their findings suggest a positive effect of credit to the private sector on economic growth and suggest bi-directional causality between financial development and economic growth in the long run, thereby confirming that financial development is important for economic growth in Rwanda and vice versa. All these studies looked at economic growth and not macroeconomic stability, and so far, empirical evidence on the latter are still lacking in Rwanda. Thus, this study addresses gaps in previous work in at least two respects. First this study determines the relationship between financial system development and macroeconomic stability in Rwanda by considering various measures of macroeconomic (in)stability beyond economic growth volatility. The study considers other macroeconomic variables such as inflation and exchange rate that are important indicators of macroeconomic stability in the Rwanda context, as they can be subject to acute shocks with implications to the real sector. Second, this study enriches existing work by using a new index of financial development developed by the International Monetary Fund (IMF) that captures this aspect in various dimensions, which are depth, access, and efficiency of the financial system (i.e. both financial institutions and financial markets).

This study is important as it sheds light on the impact of financial systems development on macroeconomic stability in Rwanda and aims at contributing to policy making going forward in devising appropriate policies to sustain strong macroeconomic stability and promoting financial systems development. This study uses local projections consistent with previous studies (la Jorda, 2005). This approach is popular in assessing the effect of macroeconomic policies notably monetary and fiscal, as well as on the role of of credit cycles or financial conditions on business

cyles especially during the 2008 GFC and afterwards. This method is suitable as it addresses issues of asymmetry and non-linearities which usually characterize the relationship between financial variables and real variables, (Jorda et al., 2013; and Kalemli-Ozcan et al., 2022).

Empirical results are largely in line with literature. Evidence from the local projection method suggest that financial system development in Rwanda has generally contributed to macroeconomic stability in Rwanda. The stabilizing effect is relatively more evident in GDP growth and per capita GDP. The effect on GDP growth is mostly via stabilizing effect on investment. In addition, there is some evidence that development in financial system has had stabilizing effect on inflation and exchange rate.

The paper is structured as follows: the next section reviews the main developments observed in the Rwandan financial sector while section 3 reviews the literature. Section 4 provides the methodology used and section 5 reports the empirical results. Section 6 concludes the study.

II. Financial System Development in Rwanda

Overview of the Financial System

The Rwandan financial system has tremendously grown over the past two decades due to various factors including political stability, conducive macroeconomic environment, and entry of new market players. More notably, the National Bank of Rwanda (henceforth, NBR) has put in place important reforms to ensure that the financial system remains sound. These reforms include the establishment of appropriate market infrastructure, especially the efficient legal and regulatory framework, supervisory tools, modern payment systems, and the private credit reference bureau.

The Rwandan financial sector comprises a range of institutions, markets, and financial infrastructure. As of June 2020, the NBR regulated 603 institutions, including 16 banks; 14 insurance companies; 459 microfinance institutions; 13 pension schemes; 97 foreign currency dealers and remittance companies, and 4 registered lending-only institutions, (Table 13). Total assets of these institutions amounted to FRW 5,747 billion at the end of June 2020 (equivalent to 63 percent of GDP). Total assets of mainstream financial institutions (Banks; MFIs; Insurance; and Pension) stood at FRW 5,718 billion (62 percent of GDP). The capital market, regulated by the Capital Market Authority (CMA), is also an integral component of the Rwandan financial system.

The financial sector remains dominated by the banking sector, accounting for 67.0 percent of the total financial sector assets as of the end of June 2020. The banking sector is not only the largest but also a systemically important sector based on its interconnectedness with the rest of the sub-sectors; combined deposits of microfinance, insurance, and pension funds accounted for 23 percent of banking sector deposits at the end of June 2020. The pension sector comes in second place with a 17.2 percent share of the financial sector assets. The pension sector is dominated by the mandatory public-defined benefit pension scheme (RSSB) with 95 percent of the pension sector assets while the 12 private pension schemes account for 5 percent of pension sector assets. The insurance and microfinance sectors account for 9.5 percent and 5.7 percent, respectively, of the financial sector assets,

while the rest (foreign currency dealers, remittance companies, and lending-only institutions) account for the remaining 0.5 percent (Table 13).

The level of financial sector development and deepening has been increasing though it remains low, just like in other developing countries. Credit to the private sector as a percentage of GDP has almost doubled, increasing from 10.3% in 2000 to 20.1% in 2019. The monetization of the economy accelerated as the ratio of M3 to GDP increased from 16.5% to 26.3%, and the deposit to GDP ratio increased from 13.4% to 23.9%.

The financial sector has also become more inclusive, as revealed by the recent FinScope survey (2020). This survey done every 4 years indicates that the percentage of the adult population in Rwanda served by the formal financial sector (i.e., regulated sector) increased from 69 percent in 2016 to 77 percent (5.5 million adults) in 2020. These are adults that have or use formal financial products and services, including the banking sector and other formal (non-bank) financial products/services from insurance firms and Mobile Network Operators (MNOs). The Government of Rwanda targets to increase the proportion of formally served adults to 100 percent by 2024, as elaborated in the National Strategy for Transformation (NST 1). The formal inclusion gains in the last four years (2016-2020) was driven by the increase of bank account holders (from 1.1 million in 2016 to 2.6 million in 2020), increased uptake of mobile money (4.4 million in 2020, against 2.3 million in 2016), U-SACCOs (2.4 million account holders in 2020, against 2 million in 2016), more insured adults (1.2 million in 2020, from 0.5 million in 2016), and increased account holders in other MFIs (0.7 million in 2020, from 0.3 million in 2016).

Table 13: The Structure of the Financial System

Regulated Financial Institutions	**June 2020**		
(Assets in FRW Billion)	**Number**	**Assets**	**% of Total Assets**
Banks	16	3,854	67.0
Commercial Banks	11	3,142	54.7
Microfinance Banks	3	66	1.15
Development Banks	1	265	4.6
Cooperative Banks	1	381	6.6
Pension Schemes	13	990	17.2
Public	1	941	16.4
Private	12	49	0.8
Insurers	14	544	9.5
Life	3	52	0.9
Non-Life	11	492	8.6
Microfinances	459	330	5.7
U-SACCOs	416	139	2.4
Other SACCOs	24	97	1.7
Limited Companies	19	94	1.6
Foreign Currency Dealers & Remittances	97	9	0.2
Forex Bureau	83	9	0.2
Remittance Companies	8	-	0.0
Money Transfer Agencies	6	-	0.0
Lending only Institutions	4	20	0.3
Grand Total	**603**	**5,747**	**100**

Source: National Bank of Rwanda, 2020

The financial sector has played an essential role in financing the economy, witnessed by the increased share of new authorized loans (NALs) to various sectors, despite the minimal share of loans to risky sectors such as agriculture, Table 14).

Table 14: Distribution of NAL by Economic Sector in % Share

Economic Sector	2015	2016	2017	2018	2019
Commerce	33.8	34.1	35.2	32.9	27.2
Public works and building	32.0	24.7	28.0	26.2	25.6
Personal loans	9.0	9.9	11.0	11.0	12.7
Manufacturing activities	6.9	8.1	7.3	7.3	12.4
Transport & warehousing & communication	7.3	4.8	8.9	14.6	7.7
Water & energy activities	0.2	3.1	2.4	1.6	5.2
Services provided to the community	3.0	2.8	2.4	3.1	4.5
Restaurants and hotels	3.9	10.1	2.5	1.6	2.2
Agricultural, fisheries& livestock	1.9	1.5	1.1	1.2	1.5
OFI & Insurances and other non-financial services	2.0	0.7	1.1	0.5	1.1
Mining activities	0.0	0.2	0.1	0.0	0.0
TOTAL	100	100	100	100	100

Source: National Bank of Rwanda, 2019

Banking Sector Development in Rwanda

The size of the banking industry has consistently been expanding since 1995 on the back of the financial sector development programs adopted by the Government of Rwanda, strong legal and regulatory environment enforced by the NBR to comply with international standards and best practices, financial liberalization, and entry of new banks in the market.

The number of banks in Rwanda increased to 16 in June 2020 from 1 in 1964. This consisted of 11 commercial banks, 3 microfinance banks, 1 development bank and 1 cooperative bank. The number of bank branches increased from 99 in 2010, and now the sector serves its clients through a network of 200 branches: 150 sub-branches and outlets and 4,706 agents and digital platforms like internet banking and mobile banking. The banking sector is predominantly private and subsidiaries of foreign banks. Currently, 14 out of 16 banks are private banks based on majority shareholdings, while 11 out of 16 banks are subsidiaries of foreign banks and holding companies. Deposits increased from FRW 90.3 billion in 2000 to FRW 2,184 billion in 2019, while credit to the private sector increased from FRW 70.9 billion to FRW 2,084 billion, and total assets increased from FRW 879 billion to FRW 3,476 billion over the same period, (Table 15).

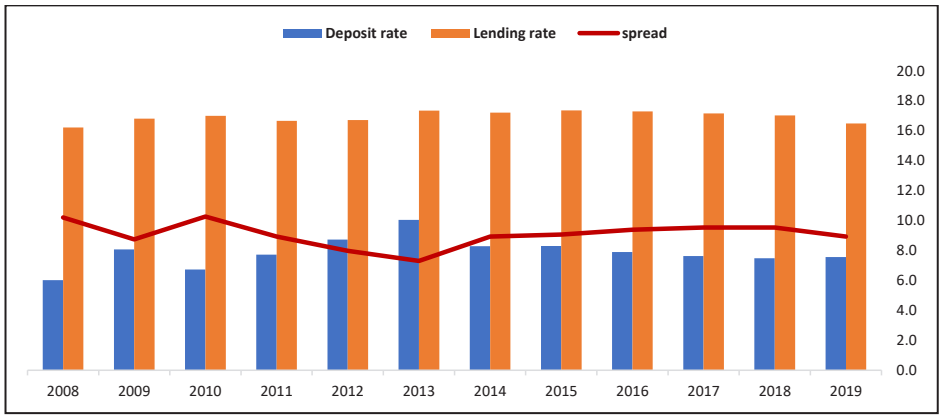
Table 15: Evolution of Total Assets, Loans and Deposits of Banks (in FRW billion)

	2015	2016	2017	2018	2019
Total Assets	2,133	2,380	2,685	3,091	3,476
Total Loans	1,269	1,457	1,646	1,871	2,084
Total Deposits	1,418	1,530	1,723	1,965	2,184

Source: National Bank of Rwanda, 2019

Financial intermediation remains the core business of banks, with 56.7 percent of their assets loaned at the end of June 2020. The other two key earning assets for banks are Government securities- treasury bills and bonds (18 percent of total assets) and placements in foreign financial institutions (4.7 percent). Other assets include cash and reserves at the central bank (7.1 percent of total assets), dues from other financial institutions in Rwanda (6.7 percent); fixed assets (4.2 percent); and other assets (2.4 percent). Bank lending is primarily to the private sector with around 95 percent of the stock of loans to private entities- Public Enterprises account for 5 percent of the total stock of banking loans. Banks maintain a stable funding profile, with 76.8 percent of their liabilities being deposits. Interbank and foreign borrowings, the two secondary sources of funds for banks, account for 18.1 percent and 0.7 percent, respectively. Other liabilities account for the remaining 4.3 percent of total liabilities.

Figure 3: Annual Average Interest Rate Spread in Rwanda (2008-2019)



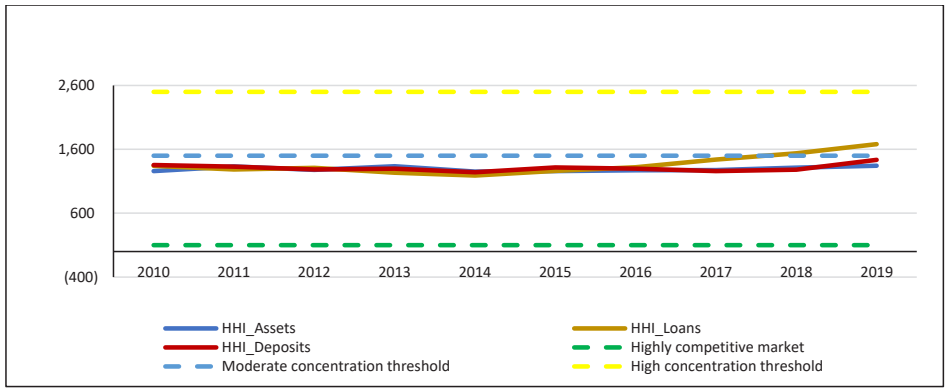
Source: National Bank of Rwanda, 2019

The wedge between the average lending and deposit rate, which generally indicates the efficiency of banks, has remained relatively sticky over time, suggesting that there is still room for improvement with regards to banks' efficiency. The stickiness is mainly attributed to downward rigidity in lending rates in the past compared to the fluctuating and less elevated deposit rates. However, the most recent developments indicate improved efficiency in the banking sector, whereby the spread between the lending rate and deposit rate dropped by 63 basis points to reach 8.85 percent on average in 2019.

Another important aspect is the concentration of the banking sector in Rwanda. Figure 4 shows the computed Herfindahl-Hirschman Index (HHI) on banks' assets, loans, and

deposits indicates that the banking sector in Rwanda has been unconcentrated. However, since 2016, the sector has become less competitive, and the loans market has become concentrated since 2018, indicating the increase in the loans market power of some banks.

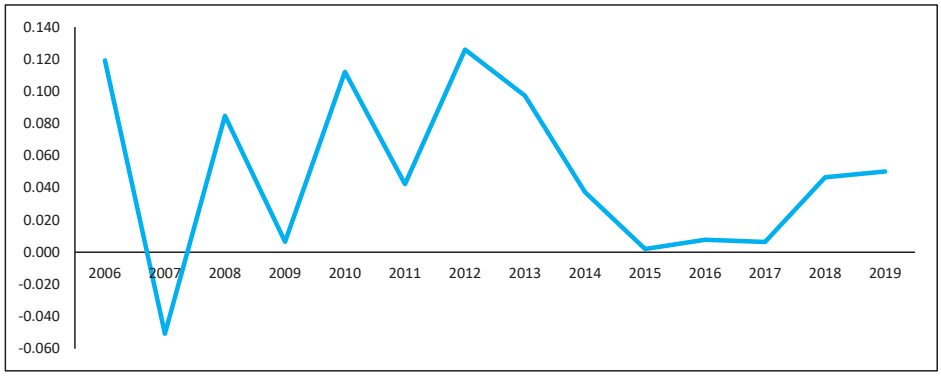
Figure 4: Evolution of HHI on Banks Assets, Loans and Deposits



Source: 'Authors' computation using data from NBR

The most used indicator of competition is the Lerner index (or price-cost margin). Figure 5 displays the evolution of the average Lerner index in the banking sector in Rwanda. A lower Lerner index implies less market power to price above the marginal cost, hence more competition. The index shows that the competition in the banking sector in Rwanda has been increasing since 2012, although in the last two years (2018 and 2019), that trend has reversed, and the market has become relatively less competitive.

Figure 5: Evolution of the Lerner Index



Source: 'Authors' computation using data from NBR

Microfinance Institutions Highlights

Microfinance initiatives burgeoned from 2002, primarily as a response to the weak involvement of the traditional banks in small and micro enterprises and rural areas. The microfinance sub-sector, which constitutes microfinance institutions with limited liability status as well as saving and credit cooperatives (SACCOs), remains an important

component of the financial sector, especially through its role in driving financial inclusion. The presence of microfinance institutions in all administrative sectors (Imirenge) of the country reduces the distance to a formal financial institution, thereby eliminating the access barrier to financial inclusion. According to the financial inclusion survey (AFR, 2020), there is a slight increase in the uptake of Umurenge SACCOs, whereby 2.4 million adults have Umurenge SACCO accounts for saving or borrowing from 2.0 million in 2016. Because the microfinance sector largely serves the rural population of which more than 70 percent is involved in agriculture, the growth of deposits and loans reflects the 'farmers' access to financial services. This has partially solved the structural problem of insufficient financial capital for farmers, as they can now trade their produce, save generated revenues, and borrow from the nearest microfinance institution.

The size of microfinance institutions (MFIs) extended significantly between 2015 and 2019. Total assets of the sector increased by 53.5%, from FRW 208.9 billion to 320.7 billion, (Table 16). Deposits in MFIs from their clients also increased by 45.1% in the period under review to FRW 170.2 million from FRW 117.3 million. MFIs investment in government securities tremendously increased by 1081.4% to FRW 5.5 billion in 2019 from FRW 461.91million in 2015. Deposits of MFIs in commercial banks also increased by 36.5%, amounting to FRW 101. 5 billion from FRW 744 billion.

Table 16: MFIs Performance Indicators

Indicators	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19
Assets (FRW billion)	209	223	244	280	321
Loans (FRW billion)	117	134	138	164	184
Deposits (FRW billion)	117	115	124	144	170
Equity (FRW billion)	65	79	87	98	114
Net profit/Loss (FRW billion)	7	10	2	7	12
Capital Adequacy Ratio (%)	31.1	35.2	35.8	35.1	35.7
NPLs Ratio (%)	7.9	9.0	8.2	6.5	5.7
ROA (%)	3.4	4.4	1.0	2.6	3.8
ROE (%)	11.4	13.7	2.9	7.7	10.7
Liquidity Ratio (%)	89.6	88.8	102.0	100.3	100.4

Source: National Bank of Rwanda, 2019

Capital Market Developments

With an ambition to develop a more resilient, reliable, and diversified financial sector, the Government of Rwanda considers the capital market as an alternative source of finance for big investments that will drive the economy on its path to growth and development and a channel for long-term savings and investment. ' 'Rwanda's capital market was established in 2011 under the Capital Market Act of 2011 to lead the development of

capital markets.

In 2007, the Rwanda capital market advisory council had been established, before the establishment of the Capital Market Authority (henceforth, CMA). The council mission was to develop the capital market in Rwanda, facilitate the trading of debt and equity securities and enable securities transactions, as well as perform regulatory functions over the Rwanda Stock Exchange (henceforth, RSE). Since then, a solid foundation has been put in place through a robust legal and regulatory framework and important milestones. As of October 2010, ten (10) companies were listed on RSE, and by December 2019, the market capitalization stood at US$ 3.31 billion, representing 41% of the Rwanda Gross Domestic Product. Despite the good performance, RSE is still nascent with limited transactions, dominated by the banking sector as the primary source of funds for the corporate sector.

The Treasury bond is one instrument widely used to develop the capital market due to the high level of trust in the Government, hence lower risks of investing in T-bonds. In Rwanda, bonds are issued on a quarterly basis for the maturity period 2, 3, 5, 7, 10, 15, and 20 years. In a bid to develop the Rwandan bond market, the Government of Rwanda, in collaboration with NBR, published its quarterly bond issuance program in February 2014. Subsequently, the total outstanding bond significantly increased, with a better diversification of investors. All T-bonds issuances have been oversubscribed, showing the appetite of economic agents to invest in Government securities and that the bourse presents an immense opportunity to mobilize funds. The capital market in Rwanda is providing saving opportunities to more economic agents. The investor base broadened since 2014 due to the collective effort of public awareness campaigns across the country and within the region.

The increased participation of institutional investors and retailers also contributed to the development of the secondary market of government securities in recent years. The number of deals on the secondary market increased from 99 to 274 and the value of issued bills on that market increased from FRW 1,634 million to FRW 19,874 million between 2016 and 2019, (Table 17).

Table 17: Development in the Secondary Market of T-bonds

	2016	2017	2018	2019
Number of deals	99	179	187	274
Value of the bonds on primary market (in FRW million)	1,634	5,121	9,740	19,874
Value of the bonds on secondary market (in FRW million)	1,680	5,195	10,034	20,713
Turnovers (in FRW billion)	1.7	5.3	10.0	20.7

Source: National Bank of Rwanda, 2019

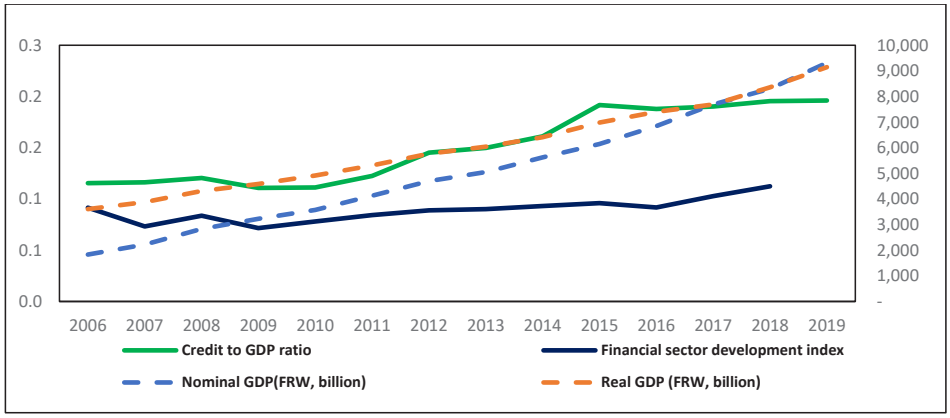
Financial System Development and Macroeconomic Evolution in Rwanda

The previous sections discussed key highlights in different sectors of Rwanda financial system, showcasing past and recent developments. However, it is also important to put in context of evolution in other key macroeconomic indicators, considering that in recent

decades, the Rwandan economy has recorded progress in almost all social economic indicators.

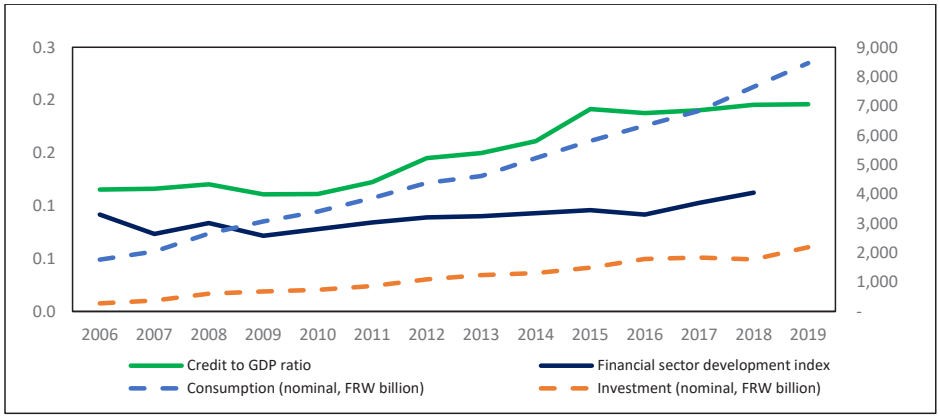
Figure 6 provides key insights by contrasting financial development indicators with key macroeconomic variables. The figure shows that the improvement in financial development has been concomitant with expansion in economic activities in Rwanda as shown by the upward trend in GDP, consumption and investment. Depsite the fact that the credit to GDP ratio had plateaued since 2016, the index of financial development continued its upward trend due to improvements in financial institutions and is positively correlated with GDP, consumption and investment with a correlation coefficient of 0.81, 0.81 and 0.76, respectively.

Figure 6: Indicators of Financial System Development and GDP



Source: National Bank of Rwanda, and IMF, 2019

Figure 7: Indicators of Financial System Development and Consumption and Investment

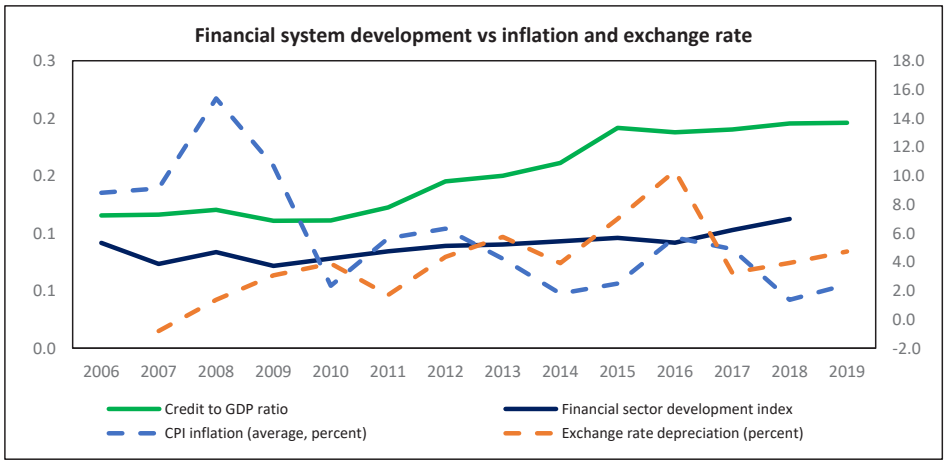


Source: National Bank of Rwanda, and IMF, 2019

Regarding financial development and inflation, the progress in the former has been consistent with more stability in CPI inflation while the exchange rate against USD remained volatile. This can be associated with the fact that the external balance remains an issue especially due to higher imports needed in the current phase of Rwanda's

economic development. In summary, we can observe that financial development improved overtime, along with improvement in macroeconomic stability, notably, the internal balance.

Figure 8: indicators of the Financial System Development and Inflation and Exchange Rate



Source: National Bank of Rwanda, and IMF, 2019

III. Literature Review

Theoretical and empirical studies on the relationship between financial systems development and macroeconomic stability have been relatively scanty. Theoretical literature outlines various ways in which financial development affects macroeconomic stability. On one hand, there is a solid theoretical presumption that financial deepening promotes stability by mitigating economic growth volatility. A well-functioning financial sector provides a closer match between savers and investors and helps absorb exogenous shocks in the real sector. It can also promote diversification, which in turn reduces risk and dampens cyclical fluctuations (Acemoglu & Zilibotti, 1997). In addition, efficient financial markets mitigate information asymmetries and enable economic agents to process information more effectively, resulting in lower growth volatility (Greenwald & Stiglitz, 1991).

On the other hand, it is debated that the recent financial crisis and the following recession were caused by financial innovation and the preceding liberalization of financial sectors. The financial depth and the complexity of the financial system may increase the probability of a financial crisis and thereby increase the risk of sharp fluctuations in macroeconomic activity (Bernanke et al., 1999). Furthermore, larger financial systems may also indicate higher leverage on the part of economic agents, which implies more risk and lower stability. Certainly, there is a strong evidence that the excessive size of financial systems in some advanced economies was a causal factor behind the global crisis (Smaghi, 2010).

Moreover, financial frictions and the underlying agency and informational asymmetries can play an important role in transmitting real sector shocks via the credit channel. In particular, shocks to the net worth of non-financial borrowers in the presence of credit market imperfections limit the country's ability to reallocate resources, amplifying macroeconomic fluctuations and contributing to their persistence (Bernanke & Gertler, 1990; Kiyotaki & Moore, 1997; Greenwald & Stiglitz, 1991).

Various empirical studies have attempted to examine whether financial depth reduces macroeconomic volatility using a variety of approaches. The results, however, appear to be sensitive to the measures of financial development considered, the sets of controls, aggregation periods, country samples, and the estimation techniques employed. Important to note here that across the literature, the role of financial development in macroeconomic stability is often assessed via its impact on reducing instability or volatility in key macroeconomic variables, notably economic growth or per capita growth.

In most cases, empirical evidence shows that financial development leads to macroeconomic stability. Using a panel data for 110 advanced and developing countries, Dabla-Norris & Srivisal (2013) assessed the effect of financial depth on macroeconomic volatility. They found that financial depth plays an important role in dampening the volatility of output, consumption, and investment growth, but only up to a certain point. They further found a robust evidence that deeper financial systems serve as shock absorbers, moderating the negative effects of real external shocks on macroeconomic volatility. However, financial depth amplifies consumption and investment volatility at very high levels, such as those observed in many advanced economies. Fidrmuc & Scharler (2013) investigated how the development of financial systems influences the magnitude of output growth fluctuations in a sample of OECD countries between 1995 and 2005. Their findings indicate that while the development of banking sectors is not significantly related to the magnitude of macroeconomic fluctuations, countries characterized by developed stock markets experience less pronounced fluctuations.

Using a panel data of 22 OECD countries for the period of 1970 to 2000, Hahn (2003) found a robust relationship between stock market development and the severity of the macroeconomic cycle and evidence that well-developed financial systems magnify monetary shocks and dampen real ones. Their results also indicate that the stock market size matters when interaction with stock market volatility is controlled for. Using panel data for 60 developed and developing countries, Easterly et al. (2000) find that deeper financial systems development are associated with lower volatility. Besides, they suggest that this relationship is nonlinear. Their point estimates indicate that output volatility starts raising when credit to the private sector reaches 100 percent of GDP. With a similar methodology but different controls and aggregation periods, Denizer et al. (2002) supported a negative correlation between financial depth and growth, consumption, and investment volatility. Nevertheless, they did not find private sector credit as a fraction of GDP to be a significant determinant of macroeconomic volatility.

A study by Ibrahim & Alagidede (2018) on 29 sub-Saharan African countries based on

the system generalized method of moments (GMM) reveals that rapid and unbridled credit growth comes at a huge cost to economic growth with consequences stemming from the financing of risky and unsustainable investments coupled with excessive consumption fueling inflation. However, the pass-through of finance-economic growth effect through the investment channel is more substantial. A Similar study on sub-Saharan African countries by Mlachila et al. (2016) suggests that financial development has supported growth and reduced its volatility by facilitating other economic policies in enhancing growth and stabilizing the economy. They pointed out that further financial development could yield additional gains for the region and confirm the salutary impact of financial development on reducing the volatility of growth and other macroeconomic variables. Nevertheless, they suggested that countries need to be vigilant about the emerging macro-financial risks in order to effectively manage the risks in financial development.

More recent studies used local projections method to show the existence of real effect of debt cycles and financial cycles, (Jorda et al., 2013; Kalemli-Ozcan et al., 2022). These studies highlighted the fact that this method addresses asymmetry and non linearities which usually characterize the relationship between financial variables and real variables.

In summary, looking at results from empirical studies, the consensus on financial development and macroeconomic stability is yet to be reached. The fact that studies used different methods and different measures of financial development and different sample period can be one of the reasons behind the divergent conclusions (Dabla-Norris & Srivisal, 2013; Ibrahim & Alagidede, 2017; Easterly et al., 2000; Denizer et al., 2002; Fidrmuc & Scharler, 2013).

IV. Methodology

Empirical analysis with macroeconomic variables always face challenges related to the problem of endogeneity and reverse causality. For this study, in particular, there is a possibility that in Rwanda as a developing market with rapid economic growth and structural reforms, macroeconomic stability may bolster financial system development, and other unobserved common factors may influence both. The literature suggests different approaches to overcome this issue with the frequently used being the structural VAR (SVAR) framework. While the SVAR has proven to be a valuable tool especially in analysis of dynamics of macroeconomic variables after a shock, some concerns have been raised with regards to reliability of impulse response functions at distant time horizons when the estimated VAR does not necessary represent the true data generating process (Ramey, 2016), and when the sample period is relatively short. Considering that quarterly national account data from Rwanda starts in 2006, this sample period is relatively short for a VAR framework as more lags and variables reduce degrees of freedom.

The local projection method is one of the alternative methods used on credit cycles, especially in recent studies (Jordà, 2005). The advantage of local projections methods are that they are robust to model misspecifications especially when their alternative, VAR, may not capture the data generating process well. For the Rwanda case, this study adopts the local projection method for three reasons. First, it addresses

the recurrent issue of short sample period, which may limit degrees of freedom especially in a multivariate model. Second, the empirical strategy offers flexibility to identify shocks within the VAR framework if the VAR does not fully capture the data generating process. Third, due to its flexibility, the local projections permits the possibility of comparison between its impulse response functions and VAR impulse response functions. This is consistent with the views in Plagborg-Møller & Wolf (2021), where it is argued that at finite lag lengths, the two approaches could yield different dynamics in impulse response at long horizons. A number of studies on macro-financial linkages, especially on credit cycles, housing cycles, and their macroeconomic implications, have also used the local projection methods, with some additional features (Jorda, et al., 2013).

According to Ramey (2016), the impulse response from ' 'Jorda's local projection methods can be estimated from the following regression:

$$Y_{i,t+h} = \theta_{i,h}\varepsilon_{1t} + X + \epsilon_{t+h} \qquad (1)$$

Where $\theta_{i,h}$ is the estimate of the impulse response of Y_t at horizon h to a shockε_{1t}. X is the vector of control variables, which include lags of and lags of other variables. As in this method, a separate regression for each horizon is estimated; the control variables do not necessarily need to be the same for each regression.

Data Justification and Description

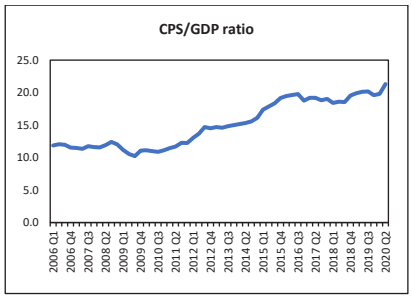
This section describes variables used for the Rwanda case. This study used quarterly data, starting from 2006 to 2018 as early data on some key variables used namely GDP, consumption and investment for Rwanda are only available on quarterly basis since 2006. The main variables of interest are indicators of financial system development and macroeconomic stability. Starting with financial system development, this a broad concept involving many aspects, including how the financial system channels funds to the economy, mobilizes resources, manages risks, and conducts efficient and inclusive financial intermediation, among others. Many previous studies have opted for traditional measures of financial system development, such as the ratio of credit to the private sector to GDP or its alternative such as the ratio of broad money to GDP, banking sector assets to GDP, stock market to GDP ratio (Dabla-Norris & Srivisal, 2013; Levine et al., 2000). Despite its shortcomings in measuring some of the aspects of financial system development, we opt for the ratio of credit to the private sector from the banking system to GDP, as it is the best proxy available in quarterly observations.

Alternatively, the study used the financial development index recently developed by the IMF. This index considers various aspects of financial development, including financial institutions access, depth and efficiency, and financial market access, depth, and efficiency. The country index is derived using the principal component analysis. This indicator provides more insights on Rwanda's's financial development journey as it considers more aspects of financial system development. It is only available on an annual basis, and the quarterly values are derived using linear interpolation.

Figures 9 and 10 depict the two main indicators of financial development, . In Figure 9, the chart shows improvements made since 2006 in both institutions and markets.

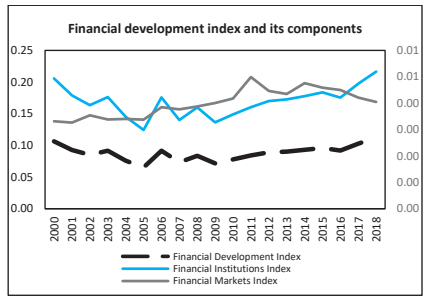
The ratio of credit to the private sector to GDP also indicates improvement in financial deepening over time.

Figure 9: Evolution of credit to GDP ratio



Source: National Bank of Rwanda, 2019

Figure 10: Financial development index



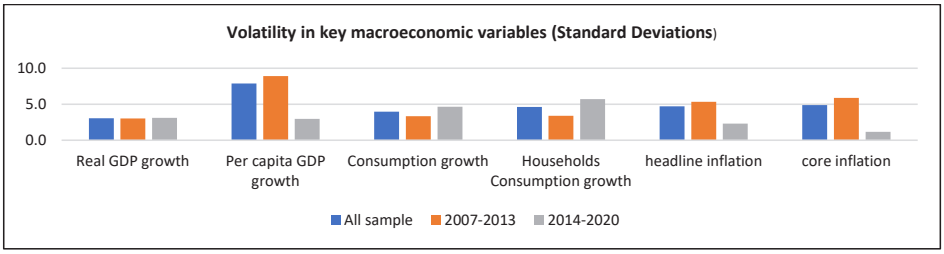
Source: Authors, using IMF data

Regarding indicators of macroeconomic stability. This study considers the standard deviation in real GDP growth, real GDP per capita growth, and inflation rate, which capture the internal balance and exchange rate, which indicate the external balance. A number of studies reviewed, considered only GDP or GDP per capita (Dabra-Norris and Srivisal, 2013). Nevertheless, in the Rwanda context, inflation and exchange rate are important indicators of macroeconomic stability, especially as they can be subject to acute shocks with implications to the real sector.

An important point to highlight here is the measurement of stability. Most of the studies reviewed have used standard deviations or gaps, which usually measure instability. For instance, Dabra-Norris and Srivisal, (2013) derived the deviation from the trend, on real GDP growth and inflation, while other studies (e.g. Denizer, et al., 2002, Islam, 2016) considered the standard deviation in the rate of GDP growth, per capita GDP growth and inflation. Nevertheless, for the case of Rwanda, we opted for standard deviation in variables highlighted in the previous section as a proxy for macroeconomic stability.

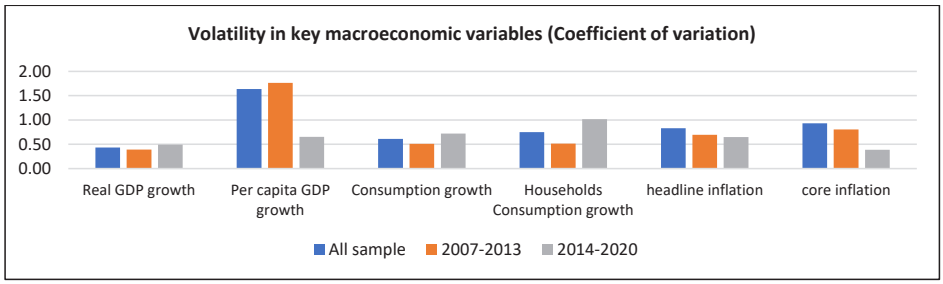
As illustrated in figure 11 and 12, volatility in real GDP has not changed much over time, despite sustaining good economic performance. We compare two equal subsamples namely from 2007 to 2013 and from 2014 to 2020. This is primarily due to recurrent episodes of adverse shocks in the agriculture sector, notably from weather conditions. On inflation, noticeable improvements are evident in line with the modernization of monetary policy, which contributed to inflation stabilization over time.

Figure 11: Evolution of volatility (standard deviation) in key macroeconomic variables



Source: National Bank of Rwanda, 2019

Figure 12: Evolution of volatility (coefficient of variation) in key macroeconomic variables



Source: National Bank of Rwanda, 2019

Control variables include investment (in levels), inflation rate (in percentage), the real monetary conditions index, and global oil prices. Investment is included in all models estimated as a proxy of capital, which is one of the main factors of production and is in logarithm. Inflation is the annual percentage change in the monthly consumer price index, averaged per quarter. It is included as another indicator of business cycles, used to identify the shock to our variable of interest, namely indicator of financial system development. Real monetary conditions index is included as an indicator of monetary policy stance, which is expected to affect macroeconomic stability. It is the weighted average of the real effective exchange rate and real interest rate.

Identification Strategy

Local projections are performed within the VAR framework, and we opted for the recursive method to identify the shock on financial system development. The financial development indicator was ordered last in various models estimated, in order to fully exogeneize the shock from other variables included. For the remaining variables, we followed the usual ordering in VAR for monetary policy where output and inflation are ordered ahead of monetary policy indicator.

V. Empirical Results

As previously explained, we use standard deviation to measure macroeconomic instability; hence the increase would imply more macroeconomic instability while their decline would imply increasing stability. Secondly, we alternatively use two proxies of financial system development, namely financial development index developed by IMF

(for left-hand side charts) and the ratio of credit to the private sector to GDP (for right-hand side charts). The responses from local projection are in blue with their confidence band in red. The ones of VAR are in green.

Effect on Output Stability

The study used standard deviation in selected macroeconomic variables as proxy of macroeconomic stability and consistent with other studies, a decline in standard deviation indicate an improvement in stability. The results indicate that financial development has contributed to dampening output volatility in Rwanda when the financial development index is used as an indicator. Impulse responses in Figure 13 are on the negative side, indicating that financial development leads to lower output growth volatility for at least one quarter while beyond that it is not statistically significant. However, when credit to the private sector to GDP ratio is used as an indicator of financial system development, the results show that dampening effects on output volatility is last longer with two quarters. Considering per capita GDP as an alternative indicator of macro stability, the results are almost similar, as shown in Figure 14, as financial development is associated with lower volatility in per capita GDP.

Figure 13: Effect on growth volatility (measured by standard deviation)

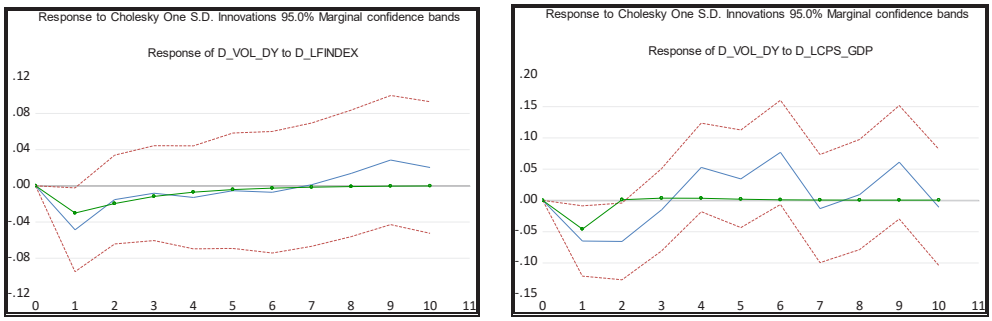
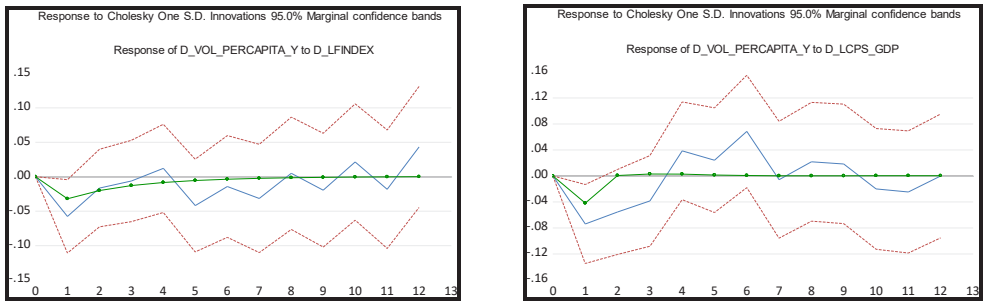


Figure 14: Effect on per capita GDP volatility (measured by standard deviation)

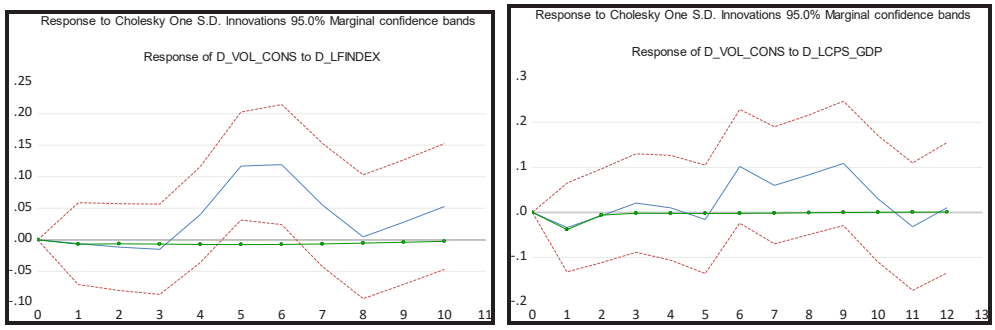


Source: 'Authors' estimation

Effect on Consumption Stability

To understand the channels via which financial development influences output stability, we analyze the relationship of the former with consumption and investment as the main component of aggregate demand. Regarding consumption, evidence suggests that the influence of financial development on consumption stability is rather absent, contrary to the view that financial development would usually help to smooth out consumption. Important to note that this may be due to some imperfections in how consumption is measured in Rwanda's national account compilation. Consumption is measured as residual after subtracting Government expenditures and net exports from total GDP compiled from the production side.

Figure 15: Effect on consumption growth volatility (measured by standard deviation)

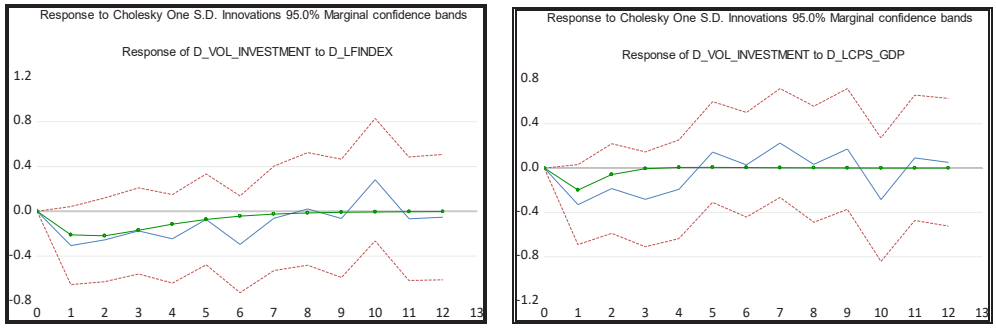


Source: 'Authors' estimation

Effect on Investment Growth Stability

Consistent with the literature, the impulse responses in Figure 16 suggest that financial development has contributed to stability in investment though the effect is short lived. The effect is more significant when financial development is proxied by the credit to GDP ratio. Thus, investment seems to be the main channel via which financial development has contributed to output stability in Rwanda.

Figure 16: Effect on investment growth volatility (measured by standard deviation)

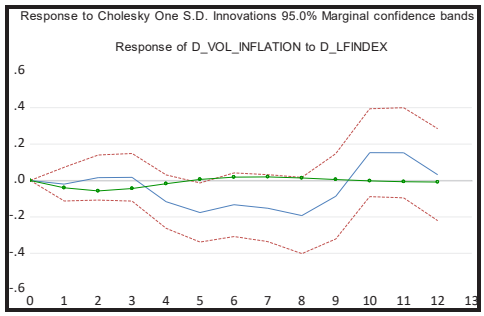


Source: 'Authors' estimation

Effect on Inflation Stability

Evidence is mixed on the relationship between financial system development and inflation. On the one hand, the effect of financial system development on inflation is not significant when the financial development index is used as an indicator of financial system development. Nevertheless, when credit to GDP ratio is used as an indicator financial system development, the impulse responses indicate that financial system development has a stabilizing effect on inflation and this last 3 quarters.

Figure 17: Effect on inflation volatility (measured by standard deviation)

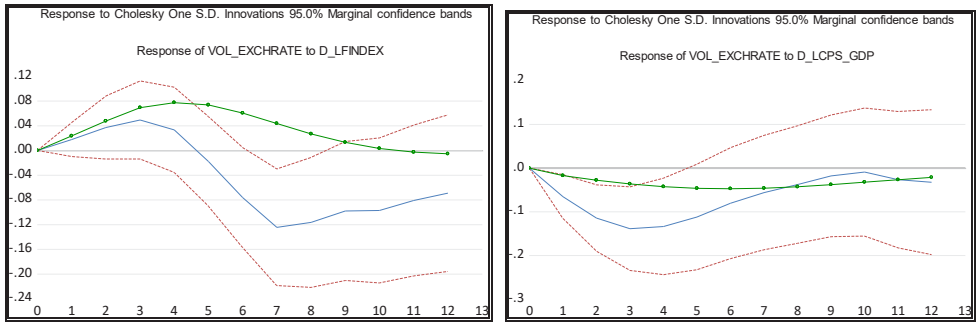


Source: 'Authors' estimation

Effect on Exchange Rate Stability

We use the standard deviation in year-on-year percentage change in FRW exchange rate against the US dollar. As in the case of GDP growth and inflation, evidence suggests that financial system development has a stabilizing effect on exchange rate, particularly, when financial development is proxied by the credit to GDP ratio. Nevertheless, when financial development is measured by the index, impulse responses rather depict some stabilizing effect appearing only after 5 quarters as shown in Figure 18.

Figure 18: Effect on volatility of exchange rate depreciation (measured by standard deviation)



Source: 'Authors' estimation

In summary, although the results indicate sensitivity to different measures used to proxy for financial development and macroeconomic stability, it can be concluded that there is a positive effect of financial development on macroeconomic stability via its dampening effect on volatility in economic growth especially through the investment channel. This is noteworthy evidence considering the importance of investment in promoting sustainable economic growth.

The positive effect is also partially evident for other remaining macroeconomic variables such as inflation and exchange rate especially when credit to GDP ratio is used as an indicator of financial system developemnt. However, the effect is insignificant when the index is used as a proxy for financial development. This may be due to many factors. For instance, both inflation and exchange rate are prone to exogenous shocks such as food supply and foreign inflows shocks which significantly affect their volatility. Lastly, this result on consumption may be explained by some imperfections on its measurement as a residual in national account compilation in Rwanda.

VI. Conclusion

The purpose of this study was to assess the impact of financial system development on macroeconomic stability in Rwanda and identify potential channels through which the effect is propagated. This was motivated by the recent concerns raised by the literature, demonstrating that the expansion in financial services such as rapid credit growth may introduce potential macroeconomic volatility, an issue of profound importance for policy makers mandated to mitigate the severity of macroeconomic instability. The divergent views on the effect of financial development on macroeconomic stability justify country specific investigation of this relationship.

Our analysis used the local projection method with quarterly data. The study used the ratio of credit to the private sector to GDP and the financial development index developed by the IMF as proxies for financial development. The study further used real GDP growth, real GDP per capita growth, inflation rate and the exchange rate as indicators for macroeconomic stability. The stability of macroeconomic variables was proxied by the standard deviation in those variables listed above.

Generally, the results are sensitive to the indicator used for financial development and macroeconomic stability. The results generally indicate that financial development contribute to stabilizing output in Rwanda using the ratio of private sector credit to GDP as a proxy, but the stabilizing effect is short-lived, and mild when the financial development is captured by the financial development index. The same analysis reveals no evidence that financial development has a stabilizing effect on consumption. The evidence also indicates a stabilizing effect of financial development on investment in line with the literature. The effect is more significant when financial development is proxied by the private sector credit to GDP ratio. Regarding inflation and exchange rate depreciation, evidence points out to a stabilizing effect from financial system development, notably when the private sector credit to GDP ratio is used as the indicator of financial development. These results are critical considering the importance of investment in promoting sustainable economic growth and the fact that stability in macroeconomic

indicators is crucial to investment climate and sustainable economic growth.

In terms of policy implications, the results imply that it is important to sustain ongoing initiatives to develop the financial system in Rwanda. This includes initiatives to promote financial inclusion and access to credit as well as on financial infrastructures and regulations. The ratio of credit to GDP is still relatively low, implying that there is room for development. In addition, it is also important that the central bank continue to ensure the stability and soundness of the financial system as well as macroeconomic stability in order to foster a favorable environment for financial systems development.

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Annexes

Annex 1: Evolution of Key Variables

Source: National Bank of Rwanda, 2019, authors calculation[3]

Annex 2: Unit Root Test Results

	ADF test level	ADF test 1st differences	Results
CPI inflation	0.00		I(0)
Log of financial development index	0.35	0.27	I(2)
Log of credit ratio to GDP	0.38	0.00	I(1)
Log of investment	0.00		I(0)
Log of oil prices	0.25	0.00	I(1)
Real monetary condition index	0.01		I(0)
Consumption (std deviation)	0.62	0.00	I(1)
Real GDP growth (std deviation)	0.91	0.00	I(1)
Exchange rate (std deviation)	0.03		I(0)
Inflation (std deviation)	0.87	0.00	I(1)
Investment (std deviation)	0.91	0.00	I(1)
Per capita GDP (std deviation)	0.92		I(1)
GDP gap	0.07		I(0)

Source: Authors' estimation

[3] From the left to the right, starting with the upper row, the graphs show the evolution of (1) CPI inflation, (2) Financial development index in log, (3) the ratio of credit to private sector to GDP ratio in log, (4) Investment in log, (5) Global oil prices in log, (6) the Real monetary conditions index, (7) the output gap , (8) the volatility of GDP growth measured by its standard deviation, (9) the volatility of Per capita GDP measured by its standard deviation, (10) the volatility of consumption measured by its standard deviation, (11) the volatility of investment measured by its standard deviation, (12) the volatility of inflation measured by its standard deviation, and (13) the volatility of exchange rate measured by its standard deviation.

4. Impact of Financial System Development on Macroeconomic Stability in Kenya

Irene Rugiri, Camilla Chebet Talam and Samuel Kiemo

I. Introduction

Financial systems play an important role in promoting economic development through transforming savings into long-term investments via financial intermediation. Financial systems comprise of institutions, various market players and sets of rules and practices that facilitate intermediation of funds between entities and investment by economic agents. Efficient financial systems comprise of different players including deposit- taking institutions namely commercial banks, mortgage finance companies, microfinance banks and deposit-taking saving and credit co- operatives (Saccos); non-deposit-taking institutions namely insurance, pensions, capital markets, development finance institutions and financial markets infrastructure providers. Intermediation efficiency ensures that financial sector participants are able to access resources and other financial services affordably through maturity transformation of financial assets, facilitating investments and hedging risks (Štreimikienė, 2012).

A sound and efficient financial system is a significant driver of economic development and macroeconomic stability through allocation of resources to enhance productivity. This may be achieved by matching long-term savings to support long-term investment products; facilitating market confidence through efficient legal and institutional frameworks; expanding financial services and products; and having efficient payments systems to facilitate financial transactions. The financial sector mobilizes savings, allocates capital, offers risk management tools and general oversight of investments.

Theoretically, financial system development underpins macroeconomic stability and sustainable economic development. [4] A well-functioning financial sector provides liquidity, to firms and households, smoothening their expenditure and savings and ultimately suppressing adverse macroeconomic volatility during shock periods (Levine, 1997; Beck & Demirguc-Kunt, 2006). A well-developed financial system has also been found to be resilient to economic shocks, hence reducing economic volatility, leading to stable economic development. On the other hand, a less developed financial system has been found to be susceptible to economic shocks and macroeconomic instability leading to slower economic development (Aghion and Howitt, 1997).

No consensus exists in the literature regarding the impact of financial development on macroeconomic stability. On the one hand, empirical evidence reveals a positive link between financial sector development and macroeconomic stability. However, the 2007-09 global financial crisis led to intense debates on this positive linkage. On the other hand,

[4] Indicators of macroeconomic stability include GDP, stable inflation, sustainable fiscal deficit and stable exchange rate

some studies indicate negative linkages between the two variables in which case, rapid financial sector development is found to trigger macroeconomic instability. Further, some studies show that as the financial sector deepens, its contribution to reducing volatility declines thus increasing the propagation and amplification of shocks (Cecchetti & Kharroubi, 2012; Sahay et al., 2015). Other studies suggest that the level of financial system development is positive only up to a certain point, after which it becomes a hindrance to macroeconomic stability, (Aghion et al., 2005; Arcand et al., 2012; Dabla-Norris & Srivisal, 2013). These studies therefore show that the link between the financial system development on macroeconomic stability is still inconclusive.

Additionally, the direction of causality between financial sector development and macroeconomic growth remains inconclusive. There is general consensus that the level of financial sector development drives economic growth, where an efficient financial sector optimally allocates resources to the various economic agents hence increasing productivity, and ultimately leading to higher economic growth. There is evidence that the financial sector positively influences growth (King & Levine, 1993). However, there are counter arguments that sustainable economic development drives financial sector development, where economic development supports firm's employment and boosts households' incomes. The rise in income levels smoothens consumption and saving patterns for both firms and households ultimately promoting financial sector development. This argument contradicts the premise that financial sector development promotes macroeconomic development but supports the view that the finance-growth nexus causality runs from economic development to finance sector development. Therefore, financial sectors players have called for close monitoring on the expansion of financial services, tracking of vulnerabilities emanating from financial sector development and closely examining the link between the financial sector and the real economy.

There is a dearth of literature on the financial sector development and macroeconomic nexus based on Kenyan data despite the relatively advanced financial sector. In the last three decades, Kenya has undergone a unique financial sector development experience in which significant reforms to improve efficiency and deepen the financial sector have been undertaken. These reforms were mainly institutional, legal and market-based and they have supported both financial sector development and macroeconomic stability, through promoting competition, increasing access to financial services and fostering financial sector stability. Despite these positive outcomes, significant vulnerabilities still exist as evidenced by low economic growth, a segmented banking sector, exchange rate volatility, an elevated fiscal deficit leading to a rise in public debt and depressed private sector credit growth. These vulnerabilities raise policy questions on the financial sector development and macroeconomic stability nexus. The main objective of this study, therefore, is to address these policy gaps by re-examining the link between financial sector development and macroeconomic stability in Kenya.

The rest of the paper is organized as follows; section 2 describes the financial sector development and macroeconomic development in Kenya. Section 3 highlights theoretical and empirical literature. underpinning the study. Section

4 presents data and the research methodology. Section 5 discusses the empirical findings, and finally section 6 concludes with policy recommendations.

II. Financial Sector and Macroeconomic Development in Kenya

Kenya has a well-developed financial system comprising of a wide variety of institutions, markets, products, services and financial infrastructure. The sector plays an important catalytic role of facilitating the growth of all other sectors of the economy. Though the degree of financial intermediation is relatively high with domestic bank credit as a percent of GDP at about 32 percent in Kenya compared to the continental average of 20 percent in 2021, pockets of weaknesses still exist such as; financial services access gaps along gender, wealth, rural-urban dimensions; and wide fiscal deficits as well as rising public debt.

The Kenyan financial system is complex, highly interconnected and diversified with increased cross border operations. The adoption of FinTech has transformed the sector in terms of products and services through innovations. The complexity of the financial sector led to the establishment of non-operating holding companies to manage operations across these complex financial institution entities. Although the financial sector transformation and growth has improved efficiency and synergies in resource use and profit maximization, it has also become a growing source of potential risks, including incidents of fraud and cyber security attacks (CBK, 2019). Private sector credit to GDP is a standard indicator of financial depth in empirical literature. Kenya's private sector credit to GDP is higher than its East Africa peers only surpassed by South Africa, Cape Verde and Mauritius (Table 18). This indicates that Kenya's financial sector is bank-led rather than market led, though not the extent of South Africa, Cape Verde and Mauritius whose banking sector assets are larger than the size of their respective economies. Despite large banking sectors in South Africa, Cape Verde and Mauritius, their mobile financial services penetration is not as prominent or as developed as Kenya's (Kiemo & Kamau, 2021).

Table 18: Banking Assets and Private Sector Credit as % of GDP, 2020

	Banking sector assets to GDP (percent)	Domestic private sector credit to GDP (percent)
Kenya	65.7	32.0
Nigeria	29.9	11.2
Tanzania	25.8	13.1
Uganda	31.2	13.0
Egypt	65.8	27.1
South Africa	136.5	62.4
Cape Verde	171.5	72.6
Mauritius	408.1	95.9

Source: Kiemo & Kamau, (2021)

Kenya's financial system comprises of the banking, insurance, capital markets, pensions, and Sacco societies sub-sectors and digital financial services providers. The developments and risks across these sub-sectors, are monitored, regulated, and supervised by independent government agencies namely, Central Bank of Kenya (CBK), the banking industry regulator; Capital Market Authority (CMA), the capital markets regulator; Insurance Regulatory Authority (IRA), the insurance industry regulator; Retirement Benefit Authority (RBA), the pension industry regulator and Sacco Societies Regulatory Authority (SASRA), the Sacco societies regulator. Additionally, the Kenyan financial system is supported by a robust financial markets infrastructure that facilitates payments, settlement, and custodial services. The development in these sub-sectors can be classified into three broad categories namely, depository corporations, non-depository corporations and, market infrastructure featuring mobile money and payment platforms as discussed below.

The key depository corporations in Kenya include commercial banks, microfinance banks, and Savings and Credit Cooperative Organizations (SACCO). Kenya's financial sector is bank-led rather than market based as the banking sub-sector is the dominant depository corporation. Banking industry assets accounted for 49.51 percent of nominal GDP while SACCOs accounted for less than 10 percent in 2018. In 2021, the CBK Annual Bank Supervision Report showed that total banking sector assets recorded significant growth of approximately 359 percent in the period 2008-2020, to close at KSh. 6.1 trillion in 2020. The growth in assets have largely been driven by a three-fold rise (365 percent growth) in loans and advances over the same period, reaching KSh. 3.0 trillion in 2020. Mobile money has also significantly driven banking sector assets since banks act as custodians for mobile money trust account balances. The value of mobile money transactions has grown from KSh. 166.6 billion from 2008 to KSh. 5.2 trillion in 2020 (Annex 1).

Market share of microfinance banks has remained low relative to other depository corporations, with microfinance banks' total assets reaching KSh. 75.4 billion in 2020, translating to an 83 percent growth since 2013. The growth is largely driven by total loans that rose from KSh 28.1 billion in 2013 to KSh 49.5 billion in 2020.

Kenya's Sacco industry is among the largest in Africa with a total asset to GDP ratio of 5.7 percent, followed by Rwanda and Ethiopia, with 3.0 percent and 0.7 percent, respectively. Growth of the Sacco industry has leveraged on rapid adoption of technology and innovations in the provision of financial services and products, coupled with the opening of the common membership bond. In addition, the enhanced legal and regulatory environment has helped the Sacco industry to grow and increased access of the adult population by 28.4 percent as at December 2019, the highest in Africa (CBK, 2020).

Non-depository corporations in Kenya comprise of pension, insurance and capital market players. Kenya's insurance penetration rate, measured by the ratio of insurance premium to GDP, has remained low at 2.3 percent between 2019 and 2020, below the 7.4 percent global average. Consequently, IRA and stakeholders have taken strategic policy measures to increase the insurance penetration rate. Similarly, pension coverage, is also low at 22 percent of the total labour force in 2019, with

majority of those covered being in the formal sector. The low level of pension penetration across the informal sector has necessitated a shift in industry focus to boost pension savings among informal sector workers (CBK, 2019). The industry has been relatively stable with the overall risk score at 3.09 in 2019, above the desired overall risk score of 2.88 (Annex 1).

Kenya has emerged as East and Central Africa's financial service hub, with the Nairobi Stock Exchange (NSE) ranked 4th in Africa in terms of market capitalization. The robustness in Kenya's capital market is evidenced by the 174 percent growth in market capitalization from 2008 to close at KSh. 2336.7 billion in 2020. Additionally, as M-Akiba bonds offer tax-free fixed coupon of 10 percent per annum, an upsurge has been recorded in the secondary market by retail investors, reflecting flight to quality and safety following improved disposable incomes by low-income earners (Annex 1).

Robust market infrastructure has underpinned Kenya's financial sector development. The M-PESA mobile phone account was licensed in April 2007, which marked the advent of mobile money in Kenya and made domestic and international money transfer and payments easier. Kenya continues to register growth in the adoption of Mobile Financial Services (MFS), which is largely propelled by the ease of access and existence of convenient delivery channels. More people are embracing technology and the use of mobile phones for day-to-day activities, driving the growing demand for convenient financial services as evident from the increasing number of active mobile subscriptions to approximately 61.4 million in 2020. The growth in mobile money usage was accelerated by a growth of over 4000 percent in the number of active mobile money agents to 282,929 in 2020 as the government introduced a number of measures during the Covid-19 pandemic. Some of the measures included, a waiver on mobile money charges, and encouragement of the public to use mobile money instead of cash, habits that were entrenched even in subsequent periods. (Annex 1).

A well-functioning financial market infrastructure (FMI) plays a critical role in ensuring effective, efficient, safe and reliable financial transactions and transfer of value by households, firms, public entities and the Government within and across borders. These transactions include transfers of value/ payments, trading, settlements and custody through retail, wholesale, trading and custodial payments systems. FMI is the nerve center of the financial system, which connects financial markets and financial institutions to the economy. The close interconnectedness and partnership arrangements between financial institutions and markets means that FMIs can easily propagate shocks and risks quickly across the financial system, that ultimately trickle down to the rest of the economy. Therefore, financial market infrastructure players and regulatory authorities should institute measures to mitigate disruptions and manage risks, for efficiency, effectiveness, safety, reliability and availability. Kenya's sound and efficient payments ecosystem comprises of both retail and wholesale platforms that serve individuals, firms and Government. Retail payments and settlement systems include; mobile money service platforms, automated cheque clearing houses, Automated Teller Machines (ATMs) and point of sale (POS) devices. Other systems include wholesale and trading platforms such as the Real Time Gross Settlement

(RTGS) system, also known as the Kenya Electronic Payment and Settlement System (KEPSS) and the Nairobi Securities Exchange Trading System (CBK, 2020).

Kenya's economic growth has been resilient with the real GDP growth rate averaging about 5 percent annually in the last two decades. This has largely been driven by appropriate government and monetary policy measures to promote stability. However, Kenya's growth lags behind its East Africa peers such as, Uganda, Rwanda and Ethiopia. Rising government expenditure coupled with constant government revenues have led to an average fiscal deficit to GDP of 3 percent between 2005-2020. Similarly, higher net imports drove Kenya's relatively wide current account deficit to GDP that averaged 6 percent in the period 2005-2020. Domestic prices have been low and stable as indicated by the single digit annual inflation rate that averaged 5 percent over the period 2005-2020, which is within the Government target band (Annex 2).

III. Literature

Theoretical literature has focused on how financial intermediation and development through financial markets and intermediaries promote growth. Growth is driven by the financial accelerator via financing household consumption and business investment, particularly in advanced countries where growth is driven by private consumption and investment (Levine et al., 2000; Levine, 1997). Due to the significance of the financial accelerator particularly, the relationship between economic growth and financial development remains an important issue of debate among academics and policy makers (De Gregorio & Guidotti, 1995). Three prominent economic growth theories have emerged to attempt to explain the finance-growth nexus namely; the neoclassical growth theory, the endogenous growth theory and the intermediation theory. The neoclassical theory developed by Solow and Swan in 1956, attempts to explain long-run economic growth by looking at capital accumulation, labor and population growth, and increases in productivity, commonly referred to as technological progress. The model focuses on four variables: output/GDP, capital, labor, and knowledge/technological progress. The model estimates the separate effects of technological change, capital and labor on economic growth.

On other hand the endogenous growth theory argues that financial or economic growth is generated from internal (rather than external) procedures and inputs. The endogenous theory is built on the concept that improvements in innovation, knowledge, and human capital leads to increased productivity, which positively affect economic growth. This theory notes that productivity can be improved using technology to improve the efficiency of skilled labor force. Additionally, the endogenous theory states that in the long run, economic growth will depend on the policy measures taken by different governments, implying that policies that embrace openness, competition and innovation will promote growth (Aghion and Howitt, 1997). Lastly, intermediation theory proponents (Goldsmith, 1969; Shaw, 1973; Mckinnon, 1973), argue that financial markets (both money and capital markets) play a pivotal role in economic development, attributing the differences in economic growth across countries to the quantity and quality of services provided by financial institutions. In this regard, credit is an important aspect of financial

intermediation as it funds economic entities that can allocate credit to the most productive uses, (Gwilym, 2011).

Largely based on the direction of causality, two major strands of empirical literature have emerged in regard to the link between the financial sector and macroeconomic stability. The first strand of literature supports the argument that financial sector drives macroeconomic outcomes. This argument supports the widespread belief that financial development enhances productivity which promotes growth. However, despite the general agreement on the direction of causality, conflicting evidence has been found on the nature of causality. For example, Kar & Pentecost (2000) and Boulika & Trabelisi (2002) found that financial development has a positive effect on economic growth, while others arrive at an opposite conclusion (Lucas, 1988; Stern, 1989). On the other hand, Joseph et al (1998) showed granger causality from financial development to economic growth in five SSA countries (Benin, Cameroon, Cote d' Ivorie, Mali and Senegal), and reverse causality in two SSA countries (Burkina Faso, and Togo).

In a study examining the role of financial globalization, institutions, and economic growth on financial sector development in the European Union between 1989 – 2016, Nasreen, et al. (2020) found a positive association between economic growth and financial sector development. Zarrouk, et al. (2020) using the ARDL technique (1960-2014) found that credit to the private sector, an indicator financial development has a positive effect on growth in Kenya in both short and long-run periods. In a bibliometric analysis of the financial and real economy, Zabavnik & Verbic (2021) highlighted how the interlinkages between the financial development and the economy strengthen as the financial sector develops. Their analysis reveals that as the financial sector develops and becomes more complex, transmission channels between the macroeconomic environment deepen the impact of macroeconomic stability on the financial sector and the stronger the interdependencies between the two. Puatwoe & Piabuo (2017) study on Cameroon found a short-run positive relationship between the monetary base (M2), government expenditure and economic growth, as well as a short run negative relationship between bank deposits, private investment, and economic growth. However, in the long run, all indicators of financial development suggested a positive and significant impact on economic growth. Ndikumana (2000) found similar results in the case of the Southern African Development Community (SADC). The findings suggest a positive and statistically significant link between real per capita GDP growth and indices of financial development. Phillips (1977) study found that high and sustained economic growth leads to business cycles and financial sector development that contribute to greater optimism and higher risk tolerance by financial sector intermediaries whose actions lead to financial instability.

The negative effects of financial sector on economic growth have been attributed to the financial crisis including, the low financial sector operations below the threshold point and a lack of efficient resource allocation by banks together with absence of a conducive environment to support investment. For example, Koivu (2002) found declining private credit in 25 transition economies (1993-2000). Similarly, Gillman, et al. (2004) study on 13 transition countries found a negative and significant relationship between Money

supply (M2) and growth. Other studies found no relationship between financial sector development and macroeconomic stability. Demetriades & James (2011) study on a sample of 18 SSA

countries for a period 1975-2006 using multiple variables as instruments of financial development including bank deposit, liquid liability, and credit by bank (share to GDP), found no link between financial development and growth in SSA countries. SSA banking systems appear to be unable to extend growth enhancing credit to the private sector despite the banking sector growing in tandem with economic growth in SSA, thus the conclusion that finance does not promote economic growth in the long run in SSA. Fisher (1933) and Bernanke & Gertler (1989) find a positive association between financial sector imbalances and worsening economic contractions, due to high household leverage, high debt in banks and lower consumption and investment.

The other strand of literature postulates that macroeconomic variables drive financial sector development. This strand of literature show that macroeconomic indicators such as public debt, fiscal balance, current account balance, inflation, and economic growth influence the stability and development of the financial sector. However, empirical finding on this link is inconclusive as some studies find a positive relationship while others find a negative relationship. Fiscal balances and rising public debt have been linked to financial sector development mainly though the crowding out effect and the sovereign bank nexus.

Literature on external sector pressures including high current account balances, high external debt and unstable exchange rates have been linked to the financial sector stress through twin banking and current account crises (Kaminsky & Reinhart, 2000). Other studies linking economic growth and financial sector development revealed negative effects of rapid economic growth on financial sector stability. Afanasyeva et al., (2020) study which examined financial imbalances and economic growth in the US in 1960s using a national financial conditions index and a structural Vector Autoregression (VAR), found that rapid economic growth raised private debt and led to a build-up of financial imbalances. Gorton & Ordonez (2020) illustrated how a rise in productivity that increases economic growth could trigger a credit boom that exacerbates the asymmetric information and moral hazard problem between lenders and borrowers and result in a crisis triggered by a rise in NPLs if asset quality remains unchecked. Bordalo, et al. (2018) study focused on how optimism during good economic times may lead to financial intermediaries overweighting good information and thus mispricing risk leading to financial instability.

Other empirical literature illustrates various macroeconomic interlinkages with respect to financial sector development. In a study examining the finance-inflation nexus in Low Income countries (LICS) Khan et al., (2006) found that rising inflation slows growth and impedes financial deepening. Barajas, et al. (2011) and Klein (2010) highlight other macroeconomic interlinkages such as the Dutch Disease phenomenon that affect financial depth, where negative externalities from oil-export dependence increase external and internal imbalances (lack of fiscal discipline and real exchange appreciation). Nili & Rashad (2007) find that low growth was driven by lower financial development

for oil-importing countries, implying a financial channel of the finance-growth nexus in explaining external sector weaknesses.

IV. Methodology

The paper used quarterly time series data for the period 2005Q2 to 2021Q2. The 66 quarters selected provide a pool of data covering different period of major reforms and economic shocks in Kenya's economy. The variables were extracted from Central Bank of Kenya, Kenya National Bureau of Standards and The National Treasury publications. A range of indicators were used to measure financial sector development, which are the independent variables namely, broad money (M3) as percent of nominal GDP as measure of financial depth and domestic private sector credit (PSC) as percent of nominal GDP to measure level of credit intermediation to the private sector. Total banking assets (TA) as percent of nominal GDP to measure size of the banking sector; Market capitalization (MktCap) as percent of nominal GDP to measure the depth of capital markets; and the Money Multiplier (MM) to capture the rate of money circulation/creation to capture the role of mobile money.

Macroeconomic Stability Index

In this study, a macroeconomic stability index (MSI) based on four key macroeconomic variables was constructed to capture the multi-dimensional nature of various macroeconomic indicators. [5] The composite indicator-MSI, comprises of inflation rate (Inf) to capture the stability in the general prices; real GDP growth rate (GDP) to capture expansion rate of the real sector; public debt (PB) to capture the level of sovereign debt, which is an element of an internal imbalance; and current account balance (CA) to capture effect of the external imbalances on Kenya's economy. The main benefit of using a composite index is to capture the dynamic and multi-dimensional aspect of macroeconomic stability as an outcome of various macroeconomic indicators as no one indicator adequately captures macroeconomic stability.

Real GDP growth is included in the index based on theoretical and empirical literature (McKinnon, 1973; Levine 1997) on the finance-growth nexus. Inflation rate is included in the index as guided by Otieno et al., (2017) study which reveals that Kenya's stock market has been sensitive to changes in inflation rate particularly during periods of financial stress. The current account balance as a proportion of GDP in the index proxies for external imbalances and external sector vulnerability. This is evidenced empirically by Kaminsky & Reinhart, (1999) study which revealed the link between currency and banking crises and the interlinkages between growth, capital flows and currency overvaluation that coincide with financial crises. The constructed MSI is thus used as the dependent variable to assess the link between financial sector development and macroeconomic stability.

The index is constructed based on two key stages. The first stage involves standardization for comparability and the second stage involves weighting the score into one composite index. Applying the z-score standardization method, all variables are transformed into a z-score by differencing each observation from its mean value and the result is divided

[5] The analysis of the trends of the macroeconomic stability index (MSI) is reported in Annex 5

by the standard deviation as shown in equation 1.

$$Z\_(i,t) = ((X\_(i,t) - u\_(i,t))/ \sigma\_(t) \; \forall i=1,2, ..., i \; and \; t=1,2, ..., n \qquad [1]$$

The standardized variables are then scored between 1 and 10 and the MSI is generated as an equally weighted average of all four variables. The index ranges from 1 and 10, increasing values (towards 10) denote strengthening stability and lower values (toward 1) denote weakening stability. This methodology is preferred to isolate the variables that have the biggest effect on macroeconomic stability, as larger values have a greater effect on the composite index. It also enables us to objectively determine the dynamic effect of different variables on macroeconomic stability over time. To achieve the overall MSI index, summation of z-score is done as shown in equation 2.

$$MSIi,t = \sum_{i=1}^{n} zi,t \qquad [2]$$

Where: X = Value of indicator X, μ= Mean Value; σ = Standard Deviation; Z = Normalized Value for indicator X of indicator, while t and i represent time and cross-sections respectively. Table 19 describes all the variables used in both in index construction and the estimation

Table 19: Description of variables for Estimating of Macroeconomic Stability Index (MSI)

Symbol	Variable Name	Description
GDP	Real Gross Domestic Product	Constant real GDP at the aggregate level (%)
M3	Financial depth	The broad money (M3), measuring money supply in an economy expressed as percentage of nominal GDP (%)
PSC	Private sector credit	The private sector credit provided by domestic financial intermediaries expressed as percentage of nominal GDP (%)
MrkCap	Market capitalization	Total market shares of all companies listed at NSE expressed as percentage of nominal GDP (%)
MM	Money Multiplier	Capture the rate of money circulation/creation to capture the role of mobile money.
TA	Total banking sector assets	Total banking assets (TA) as percent of nominal GDP to measure size of banking sector development
INF	Annual Inflation Rate	Annualized changes in consumer price index (%)
FB	Public Debt	The Public Debt stock as a proportion of GDP (%
CA	Current account balance	The difference between international financial inflows and outflows as proportion of GDP (%) Independent Variables

Descriptive Statistics

Based on descriptive analysis in Table 20, the descriptive statistics reveal that financial

variables meet the normality criteria such as the skewness is between -2 and +2, while the kurtosis is between - 7 and +7.

Table 20: Descriptive Statistics

	MSI	M3	MKT_CAP	MM	PSC	TA
Mean	-0.017872	0.339149	0.025957	6.914255	0.254255	0.497660
Median	-0.030000	0.360000	0.030000	6.780000	0.290000	0.520000
Maximum	0.090000	0.460000	0.040000	9.200000	0.330000	0.710000
Minimum	-0.090000	0.200000	0.010000	5.510000	0.140000	0.280000
Std. Dev.	0.036945	0.072647	0.006136	0.956956	0.055315	0.119986
Skewness	0.566820	-0.149715	-0.655443	0.810927	-0.561447	-0.033490
Kurtosis	3.493709	1.990659	3.074287	2.882620	1.968944	1.947270
Jarque-Bera	2.994072	2.170669	3.376053	5.178204	4.551104	2.179089
Probability	0.223793	0.337789	0.184884	0.075087	0.102740	0.336370
Sum	-0.840000	15.94000	1.220000	324.9700	11.95000	23.39000
Sum Sq. Dev.	0.062787	0.242766	0.001732	42.12515	0.140749	0.662243
Observations	47	47	47	47	47	47

Estimation Method

Consistent with previous studies, this paper utilized the Autoregressive Distributed Lag (ARDL) model, (Pesaran & Pesaran, 1997; Pesaran et al., 2001). The ARDL model is preferred due to its usefulness in capturing the dynamic short-run and long-run effects of regressors on the dependent variable simultaneously and performs well with small samples. The ARDL is the appropriate model due to the nature of data available in terms of size of sample, the relationships to be investigated in the model and literature that has applied similar methodology to investigate the same phenomenon (Kar & Pentecost, 2000; Zarrouk, et al., 2017; Puatwoe & Piabuo, 2017).

The ARDL model to be estimated is characterized in equation 3, assuming errors are normally distributed as $et \sim IID\ (0, \sigma 2)$, where the dependent variable is MSI, while the regressors include market capitalization as a proportion of GDP, the money multiplier, and private sector credit as proportion of GDP. Broad money, a potential regressor is excluded from the estimation as it has a high correlation with private sector credit based on correlation matrices and given that private sector credit forms a significant proportion of broad money. The relationship between broad money and private sector credit could create an issue of multicollinearity in the model which would bias the coefficients making them sensitive to small changes and the coefficients would also be less reliable in predictive power.

$$\emptyset\ (L)y=\delta+\beta(L)xt+\mu t \qquad \text{.....[3]}$$

The autoregressive component of the model, that is isolated by using lagged values of

the regressors and independent variables to lags p, q is a desirable quality of the model as it reduces autocorrelation in the model thus yielding unbiased estimates of coefficients. Given the normality conditions of the data as determined above, the ARDL model can therefore be run in ordinary least squares as it meets the Gauss-Markov 'blue' assumption of consistency. The unit root tests reveal that all the variables are either stationary or integrated of order 1(0). MM and PSC/GDP are all integrated of order 1(0) as they all become stationary after first differencing, while MSI and Market cap/GDP are stationary as per the results of the unit root tests (Annex 3).

An ARDL of the order ARDL (2, 0, 3, 4) is selected as the most suitable model based on the Akaike information criteria (Annex 4). Diagnostic tests such as the collerogram of the squared residuals, the Durbin Watson test of autocorrelation in the first lag and the Breush-Godfrey serial correlation test suggest that the model estimations are serially uncorrelated and thus the estimates are reliable. The CUSUM test confirms that the model is dynamically stable as the cusum line lies within the 5% upper and lower significance levels.

The bound tests confirm a long run relationship between the regressors and the independent variable as the F-test statistic is above the upper bounds of the I(I) critical values indicating cointegration between the regressors and the independent variable. An Error Correlation Model (ECM) is then estimated characterized as equation 2 to obtain the long-run estimates of the model.

V. Empirical Findings and Discussion

The ARDL model results reveal three findings. Firstly, there is a long-run relationship between the financial sector development and macroeconomic stability. The long-run equation suggests that macroeconomic stability is explained by its own lag and the money multiplier and private sector credit which have positive and significant effects on macroeconomic stability. Specifically, increases of 1 percentage point in the second lag of money multiplier and the fourth lag private sector credit as a proportion of GDP strengthen macroeconomic stability by 0.3 and 1.01 percentage points respectively in the long run.

Secondly, in the short-run the first and second lags of money multiplier both have a positive and significant effects on macroeconomic stability, such that when the money multiplier increases by 1 percentage point, macroeconomic stability strengthens by 0.01 percentage points in the next quarter and 0.3 percentage points two quarters after.

The third finding is that in the short-run private sector credit weakens macroeconomic stability as indicated by the negative and statistically significant effect of private sector credit to GDP on macroeconomic stability. When private sector credit to GDP increases by 1 percent, macroeconomic stability weakens to a large proportion by 1.02 percent. This finding reveals that private sector credit though the banking sector has stronger short-run effects on macroeconomic stability than mobile money innovations, despite their negative effect on macroeconomic stability that may be due to other reasons such as the tenure of private sector loans, high non-performing loans associated with rapid credit growth, etc. (Table 21).

Table 21: ARDL Estimation Results

Dependent Variable	Independent Variable	Coefficient	Standard Error
MSI	MSI(-1)	0.718*** (5.430)	0.132
	MSI(-2)	-0.43*(-3.586)	0.119
	BM	-0.006 (-0.031)	0.208
	MKT_CAP	1.03 (1.260)	0.813
	MM	-0.009 (-0.854)	0.01
	MM(-1)	0.029*** (2.838)	0.01
	MM(-2)	0.008 (0.643)	0.012
	MM(-3)	-0.027 (-2.190)	0.012
	PSC	0.191 (0.455)	0.419
	PSC(-1)	-0.577 (-0.778)	0.741
	PSC(-2)	-0.367 (-0.473)	0.774
	PSC(-3)	-0.361 (-0.497)	0.727
	PSC(-4)	1.017** (2.187)	0.465
	C	-0.017 (-0.384)	0.043

Number of observations 50; R-Squared 76.7%; Adj.R-Squared 68.3%; Durbin Watson 1.09; AIC -4.571

VI. Conclusion

This study sought to examine the links between financial sector development and macroeconomic stability based on an ARDL model and quarterly data covering the period 2005Q2 to 2021Q2. The study constructed a macroeconomic stability index-MSI, which revealed that Kenya's macroeconomic environment has been largely stable safe for short-lived intermittent periods of instability. The MSI also captures economic, political, and financial shocks that have affected macroeconomic stability in Kenya. The analysis also shows that Kenya's macroeconomic environment responds to both positive and negative shocks in the financial sector landscape. Nonetheless, the Kenyan macroeconomic environment appears to be dynamic.

Findings from the econometric model show that financial sector development through both mobile money innovations and bank lending strengthen macroeconomic stability in the long run. In the short-run, empirical findings reveal that mobile money innovations strengthen macroeconomic stability while bank lending weakens macroeconomic stability, and the effects of bank lending are stronger and greater than proportionate indicating the importance of banking sector development on macroeconomic stability. The negative impact of bank lending on macroeconomic stability in the short-run may be due to high non-performing loans and the tenure of bank lending that may be medium to short term thus may limit long run macroeconomic stability. Moreover, a large proportion of bank lending funds household consumption though some is channeled to Small and Medium Enterprises (SMEs), thus funding consumption rather than investment which may adversely impact macroeconomic stability possibly through increasing inflationary

pressure. Furthermore, bank lending only comprises a third of GDP thus the limited scope of bank lending may not support growth adequately thus weakening macroeconomic stability in the short run.

With regards to mobile money, findings suggest that growth of mobile money innovations support macroeconomic stability, and this may support the theory of leapfrogging proposed in the literature where mobile money enables developing countries such as Kenya to leapfrog via mobile money technologies that pave the way for digitalization to increase the economies productivity, efficiency and competitiveness. These innovations therefore enhance total factor productivity as suggested by the Solow model thus strengthening GDP and increasing the economy's dynamism. Given these considerations, this study concludes that financial sector development promotes macroeconomic stability through the banking sector and mobile money innovations. Consolidating the positive effects of mobile money innovations in the long-run and bank lending in the short-run, this study recommends that policymakers implement policies to support mobile money innovations that increase productivity and competitiveness in the productive sectors of the economy while supporting longer-tenure credit provision to the productive sectors of the economy to support investment and thus drive growth and macroeconomic stability.

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Annexes

Annex 1: Select Performance Indicators

	Mkt Cap Kshs (B)	NASI All Share Index	Total Deposit (KSh.B)	Total Assets (KSh.)	Loans Advanced (KSh.B	Number of Agents	Customers In (Millions)	Number of Transactions (Millions)	Transactions In Value (KSh.B)	Insurance Penetration Ratio (%)
2008	853.9	73.4	909.7	1,330.2	661.7	6,104	3.1	62.7	166.6	
2009	825.8	97.0	1,040.6	1,509.5	737.5	23,012	8.9	193.5	473.4	
2010	1133.2	97.0	1,252.8	1,745.9	901.3	39,449	16.4	311.0	732.2	
2011	868.2	68.0	1,524.8	2,114.1	1,174.5	50,471	19.2	433.0	1,169.2	
2012	1272.0	94.9	1,738.7	2,433.8	1,324.2	76,912	21.1	575.0	1,537.5	
2013	1920.7	136.7	1,958.9	2,832.5	1,561.8	113,130	25.3	733.0	1,901.6	2.7
2014	2300.1	162.9	2,310.4	3,375.6	1,916.6	123,703	25.2	911.0	2,371.8	2.9
2015	2049.5	145.7	2,672.3	3,923.1	2,298.4	143,946	31.6	1,114.0	2,816.1	2.7
2016	1931.6	133.3	2,767.8	4,177.8	2,439.6	165,908	34.9	1,331.0	3,355.1	2.8
2017	2521.8	171.2	3,061.9	4,509.8	2,552.7	182,472	37.4	1,543.0	3,638.5	2.6
2018	2102.0	140.4	3,395.7	4,931.2	2,643.6	223,931	47.7	1,740.0	3,984.4	2.4
2019	2540.0	166.4	3,613.0	5,389.7	2,856.4	224,108	58.0	1,839.0	4,346.0	2.3
2020	2336.7	152.1	4,075.1	6,111.8	3,079.3	282,929	65.7	1,863.3	5,213.5	2.3

Source: Compiled from CBK Annual Banking Sector Supervision Reports (2008-2020).

Annex 2: Kenya Key Macroeconomic and Financial Sector Development Indicators

Year	GDP Growth Rate Q/Q (%)	Inflation Rate (%)	Fiscal Balance (%)	Current Account Balance (%)	Mrk Cap/ GDP (%)	Banking Assets/ GDP (%)	PSC/ GDP (%)	M3/GDP (%)	Money Multiplier (%)	GDP (Kshs Billion)
2005	6.0	4.7	-4.1	-1.4	1.5	48.0	30.5	47.5	5.2	1,175.2
2006	6.0	8.0	-4.3	-2.1	1.5	48.0	24.3	37.8	5.1	1,970.4
2007	4.4	5.7	-3.5	-2.5	3.1	48.0	18.1	28.1	5.0	2,765.6
2008	1.2	17.8	-3.5	-5.2	3.1	48.0	23.3	32.5	5.5	2,772.0
2009	1.2	5.3	-1.4	-4.0	3.1	28.2	13.7	19.5	5.7	5,361.5
2010	8.7	4.5	-2.3	-5.4	3.1	30.1	15.3	21.9	5.7	5,793.5
2011	3.9	18.9	-2.6	-8.4	1.4	34.7	19.0	24.9	5.9	6,091.2
2012	4.5	3.2	-2.7	-7.8	2.0	38.2	20.1	27.1	5.9	6,368.4
2013	3.2	7.1	-2.1	-8.8	2.9	42.9	23.3	30.4	6.2	6,595.7
2014	4.3	6.0	-1.6	-9.4	3.0	48.6	27.1	33.7	6.2	6,942.2
2015	5.3	8.0	-2.8	-6.1	2.8	53.8	30.3	37.1	6.9	7,287.0
2016	7.5	6.3	-3.1	-5.4	2.5	54.7	30.1	36.4	6.8	7,644.4
2017	0.8	4.5	-2.2	-6.9	3.2	57.2	29.9	38.4	6.9	7,883.8
2018	6.0	5.7	-3.1	-5.5	2.5	59.2	29.0	40.1	6.8	8,327.6
2019	4.4	5.8	-2.7	-5.5	2.9	61.7	29.6	40.3	7.6	8,742.4
2020	1.2	5.7	-3.2	-4.6	2.7	70.1	32.2	45.8	8.5	8,714.8

Source: Central Bank of Kenya

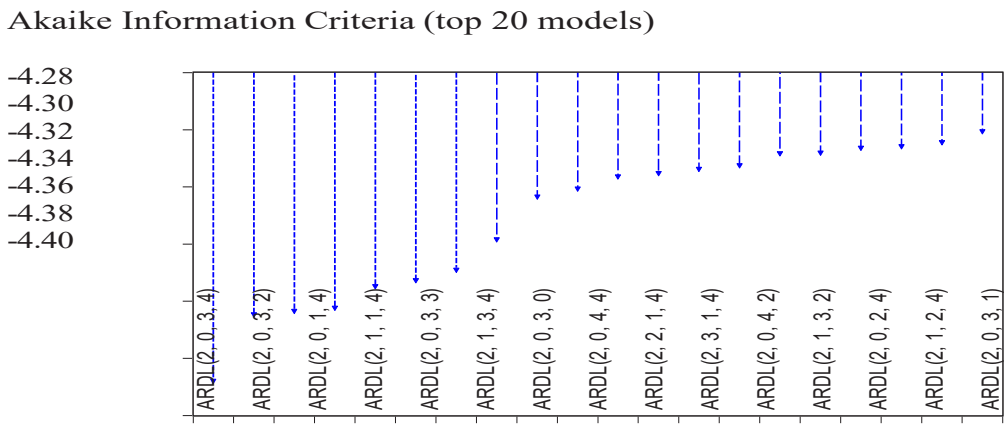
Annex 3: Augmented – Dickey Fuller (ADF) Unit Root Tests

Variable	T-statistic	Probability
MSI	-3.9	0.0038***
MKT_CAP	-2.7	0.0800*
MM	2.2	0.99
PSC/GDP	-1.16	0.69

***Reject the null hypothesis that the variable has a unit root at the 1% significance level

*Reject the null hypothesis that the variable has a unit root at the 10% significance level

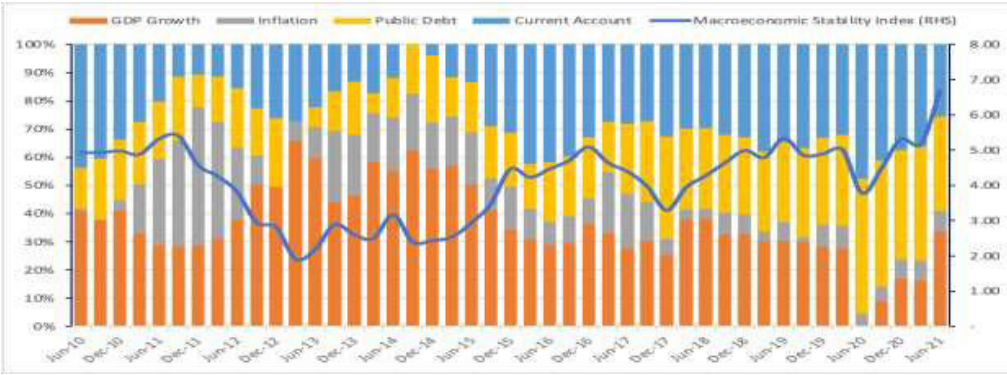
Annex 4: Model Selection Summary by Akaike Information Criteria



Annex 5: Macroeconomic Stability Conditions

The MSI index reveals that the macroeconomic environment in Kenya has been stable and stability conditions have been strengthening in the past year as indicated in the chart below. The macroeconomic environment was at its peak stability level between 2010 and early 2011, a period where several financial sector reforms were implemented. The 2010-2011 peak may also be attributed to a rapid narrowing of the current account deficit, high Real GDP growth and moderate debt levels. Since the decline in macroeconomic conditions in March 2020, macroeconomic stability has been strengthening mainly attributed to a recovery in Real GDP growth, a narrowing current account deficit and low and stable inflation (Annex 1). Various events and shocks have affected the macroeconomic environment including, the exchange rate depreciation and high credit growth period in 2011, the interest rate capping introduced in 2016 – 2018, and the Covid-19 pandemic that emerged in Kenya in March 2020. From 2012, Kenya's economy is characterized by a higher average level of stability and rebounding of macroeconomic stability shortly after each stress period, indicating the dynamism and resilience of Kenya's economy to external and internal shocks.

Macroeconomic Stability Index and Key Macroeconomic Variables



Source: Authors

5. Impact of Financial Sector Development on Macroeconomic Stability in Mauritius

Ashwin Moheeput

I. Introduction

Financial sector development and macroeconomic stability are multidimensional concepts that are subject to numerous debates. On the one hand, financial system development embraces the role and importance of financial intermediaries and of financial markets in economic activity, as well as improved access by the population to financial products and services. Evidence suggests that financial institutions (e.g., banks, insurance companies and pension funds) and financial markets (e.g., stock market, bond and derivatives market) play an important role in promoting economic development, as well as fostering inclusion. On the other hand, macroeconomic stability tends to be more subjective and subject to 'social norms' benchmarks about what is socially and politically accepted as stability.

The many aspects of both concepts create a number of challenges to the modeller. Prominent among these is the need to construct a reliable measure of, both, financial sector development and of macroeconomic stability. Regarding the former, the literature does not throw light on the best way to construct this measure since much depends upon the macro-financial idiosyncrasies of a country's financial sector. For instance, in market-oriented financial systems which comprise more diversified financial players and a broader range of financial products, indicators ranging from bank assets to stock market capitalization weights may be useful in constructing the index. In more bank-dominated systems where banks follow the traditional intermediary roles, indicators such as deepening and financial access may be given relatively more prominence. Regarding the latter, in some countries, fiscal risks may be perceived as an important factor affecting macroeconomic stability. In others, external sector risks may be the most important factor. In countries with well-designed fiscal and external sector buffers, inflation and growth performance may constitute the fulcrum of macroeconomic stability.

A more recent study by the IMF (2019) underscores the relative importance played by the financial sector in the Mauritian economy. The authors built a Financial Conditions Index (FCI), as a leading indicator of economic activity based on a set of domestic and external factors using two approaches, namely Vector Autoregression Analysis (VAR) and Principal Component Analysis (PCA). The FCI provides a good mechanism explaining changes in economic activity in Mauritius and offers a robust out-of-sample prediction of four-quarters ahead real GDP growth rate. This study by the IMF confirms our hypothesis that, due to a depth of the financial system and the good level of financial access, developments taking place in the Mauritian financial system directly affect economic prospects.

However, the quantitative impact of financial sector development on macroeconomic stability in Mauritius is still not clear. This study attempts to address this gap by quantitatively analysing the relationship between financial sector development and macroeconomic stability based on an Autoregressive Distributed Lag Model (ARDL) approach and composite indices of macroeconomic stability and financial sector development.

The rest of the paper is organized as follows. Section 2 presents an overview of macroeconomic and financial sector developments in Mauritius while section 3 provides the literature review. Section 4 provides the methodology while section 5 discusses the empirical findings. Section 6 provides the conclusions of the study.

II. Macroeconomic and Financial Sector Developments in Mauritius

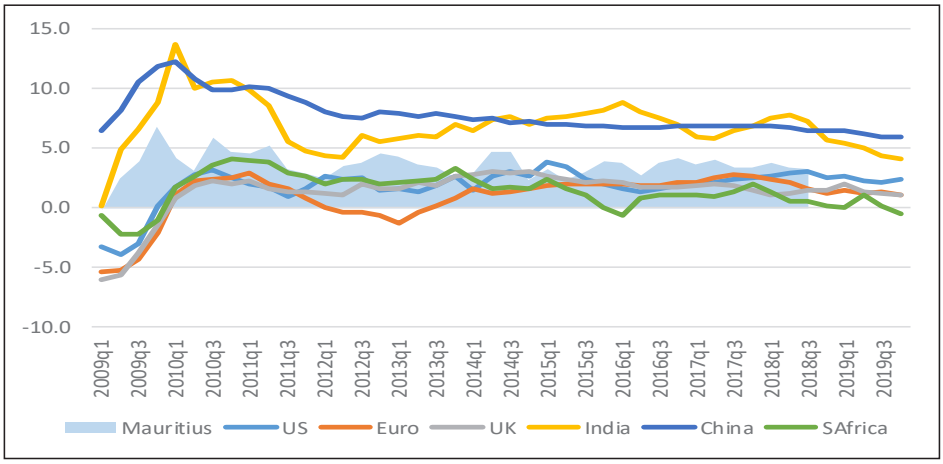
Since independence, Mauritius has successfully undergone important structural transformation of its economy from a low-income monocrop economy to a modern diversified high-income economy that is propelled by the financial services, tourism and manufacturing sectors. As at end-2018, the services sector accounted for nearly 79 percent of GDP, followed by industry (16 percent) and agriculture (4 percent). Since the 2000s, growth averaged 5-6 per cent annually until the 2008 Global Financial Crisis (GFC), after which, annual economic growth averaged 3-4 per cent. Macroeconomic stability has been the key feature of the Mauritian economy, underpinned by political stability and good governance frameworks for institutions.

Headline Inflation has been low in recent years and hovered at an annual average of 0.5 per cent in 2019, on account of favourable food price developments. The Bank of Mauritius (Bank) has been pursuing an accommodative monetary policy in recent years given the low inflation. The Budget deficit has averaged 5.0 per cent of GDP over the past few years and has worsened. The outlook regarding the budget deficit is challenging in view of the country's limited revenue mobilization capabilities and growing need to engage in current spending (principally wage hikes and demographic challenges tied to pensions), as well as capital spending (principally public transport infrastructural projects). The public debt averaged 65.4 percent of GDP in 2019 and has been kept at a sustainable level with the low prevailing interest rates. However, the economy remains vulnerable to negative shocks both externally and domestically. At 9.5 per cent of GDP, the savings level is low when compared to emerging economies and is lower than investment level which stood at 19.8 per cent.

The savings-investment deficiency translated into a current account deficit which averaged 5.7 per cent of GDP in 2019. Due to lack of natural resources, the economy is highly dependent on external trade, namely food items and energy needs, as well as industrial materials for input into construction sector. Its export structure has undergone significant transformation since independence moving from sugar sector to embrace manufacturing, tourism, financial services and transportation. The economy is relatively dependent on Europe making it highly vulnerable to any adverse developments in Europe. The current account deficit is mainly financed by inflows of foreign capital, namely Foreign Direct Investment (FDI) which is essentially geared towards luxurious real

estate projects. [6] The Global Business Sector (GBC) also plays a fundamental role in funding current account imbalances, and in 2019, the net inflow of GBC averaged 10 per cent of GDP. Europe, South Africa and India are the principal sources of funds into Mauritius and destinations of funds out of Mauritius.

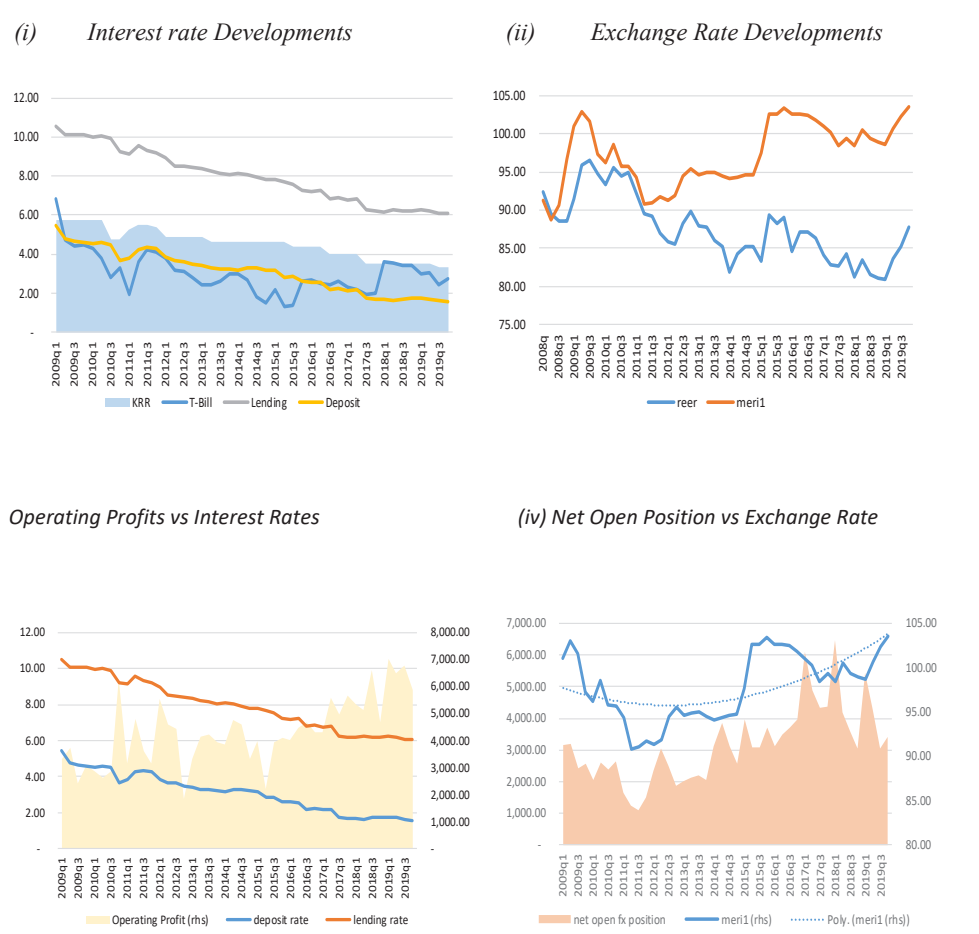
Figure 19: Growth Rate of Mauritius vis-a-vis its Main Trading Partners



Monetary policy has been largely accommodative in recent years in Mauritius. This is because the low inflation environment has created space for the Bank of Mauritius to lower its policy rate, the Key Repo Rate (KRR) on several occasions during the last decade, mainly to support growth in the midst of numerous external shocks that had plagued the major economies in Europe. Figure 20 depicts the evolution of key selected financial market indicators showing the performance, operations and resilience of banks. Figure 20 (i) shows the downward trend in the KRR, and the ensuring downward trends in the Prime Lending Rate (PLR) and average deposit rate. The yield on Treasury bills, a more market-based interest rate, fluctuated depending on the degree of excess liquidity in the market, but for large periods of time, followed a general downward trend.

[6] This has been made possible due to various schemes designed to attract high net-worth individuals in Mauritius in recent years. These include Integrated Resort Scheme, Real Estate Scheme, Invest Hotel Scheme, Property Development Scheme and the Smart City Scheme.

Figure 20: Selected Macro-Financial Indicators in Mauritius



Source: Bank of Mauritius Monthly Statistics

In Mauritius, exchange controls were abolished in 1994 and the financial system was liberalized shortly afterwards. There are no capital account restrictions that are applicable in Mauritius, an appealing feature for foreign investors and GBC holders [7]. Figure 20 (ii) depicts the behavior of the local currency, the Mauritian rupee, vis-à-vis major trading partners' currencies weighted appropriately (MERI1), and adjusted for inflation differences (REER). The general tendency over the last decade has been a depreciation of the rupee as evidenced by the upward trend in the MERI1. Figure 20 (iii) shows that banks have largely benefited from the low-interest rate environment. Finally, Figure 20

[7]The notable restrictions here include: (1) full restrictions on activities that are prohibited by the UN under its embargo, sanctions and prohibition policy; (2) restrictions to hold cash above a value of MUR 500,000; (3) the need for prior approval for foreigners investing in real estate; (4) specific limits imposed on foreign investors investing in shareholdings of local banks and in shares of private companies; Enhanced Due Diligence (EDD) on activities originating from countries black-listed by the Financial Action Task Force (FATF

(iv) shows that the depreciation of the rupee has also been a factor that has contributed to the sound performance of banks. In fact, since the banking system has a positive net open position in foreign currency, it largely benefits from lower exchange value of the rupee when performance is converted to rupee equivalent basis.

Mauritius has a large bank-dominated financial sector. As at December 2018, the ratio of banking system assets to GDP averaged over 300 percent, compared to Non-Bank Deposit Taking institutions (19 percent of GDP), insurance (19 percent of GDP) and pension (20-30 percent of GDP). Banks and Non-Bank Deposit Taking Institutions (NBDTIs) are regulated by the Bank. The regulatory regime has been upgraded to embrace Basel III framework since 2014 and banks are required to maintain additional buffers (e.g. Capital Conservation Buffers, as well as Domestic-Systemically Important Bank (D-SIB) surcharges). Non-bank financial institutions such as insurance and pensions as well as the capital market are regulated and supervised by the Financial Services Commission (FSC). Of the 18 banks, five are domestically owned, including the largest two banks; twelve are subsidiaries of foreign banks; three are branches of foreign banks; and one is a domestic/foreign joint venture. The GBC plays an important role in funding the domestic banking system and owe their presence in the Mauritian jurisdiction to the network of Double Taxation Avoidance Agreements (DTAAs) that the country has signed bilaterally with other countries [8]. Foreign currency deposits of GBC companies account for nearly a third of total banking sector deposits. Many banks in Mauritius are part of financial or mixed conglomerates that include other financial services firms.

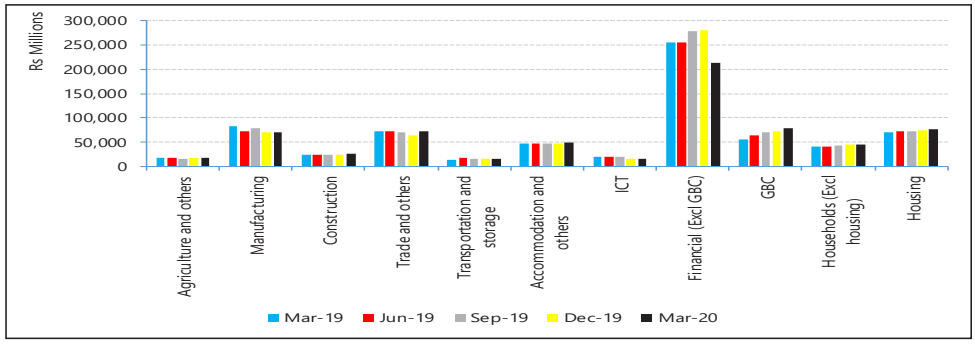
The financial sector indeed plays a macro-critical role in the Mauritian economy. In addition to the weight of banking system assets, the contribution of the financial services averages 12-15 percent of GBC. In the financial sector alone (including the GBC sector), about 15,000 people are employed. Furthermore, the lending portfolio of banks is geared towards sectors which play an important role in the macro-economic landscape. As Table 22 shows, sectors such as the financial services, tourism, real estate / construction as well as manufacturing are important contributors to growth. These sectors are also important recipients of banking credit facilities. For instance, the share of total credit allocated to financial services (including GBCs) averages over 30 percent. Credit allocated to the tourism, real estate / construction and manufacturing sectors was around 5.6, 3.1 and 8.1 percent, respectively, at end-December 2019.

[8] Out of the 51 DTAAs, 22 were signed with African countries. Collectively, there are about 12,000 GBC structures in Mauritius with total balance sheet assets exceeding 50 times the GDP of Mauritius.

Table 22: Economic Sectors – Weight in GDP [9] and Weight in Loan Portfolio of Banks

	Employment (bracket: percent of total workforce)	Contribution to GDP (percent)	Weight in Bank Loan Portfolio (percent)
Financial Services (incl. GBCs)	15,000 (2.2 percent)	12-15 [10]	34
Travel and Tourism	40,000 (6 percent)	8.6	5.6
Real Estate and Construction	-	10	3.1
Manufacturing (incl. smart manufacturing)	125,000 (8 percent)	16	8.1

Figure 21: Evolution of Sectoral Credit Allocation



Financial deepening in Mauritius has improved over time, as evidenced by relatively high levels of deepening indicators namely Loans, Deposits and Broad Money as a percentage of GDP. The banking sector is characterized by a relatively high level of dollarization. Over the period June 2005-2019, loan dollarization was at around 63 percent as a proportion of total loans.[11] Deposit dollarization averaged 60 per cent over the same period. [12] A look at the balance sheet structure of banks reveals that Banks' foreign currency denominated assets and liabilities dominate those denominated in local currency. The relative degree of financial dollarization is relatively high in Mauritius, in part, due to a thriving GBC sector. GBC deposits account for nearly a third of total banking sector deposits and for a smaller share of total assets of the sector. Liabilities denominated in foreign currencies account for nearly 65 percent of total liabilities, while assets denominated in foreign currencies account for nearly 63 percent of total assets (Figure 22).

[9] Some figures have been obtained from the Economic Development Board (EDB) – manufacturing and financial services. The rest of the figures was obtained from the World Bank Atlas.

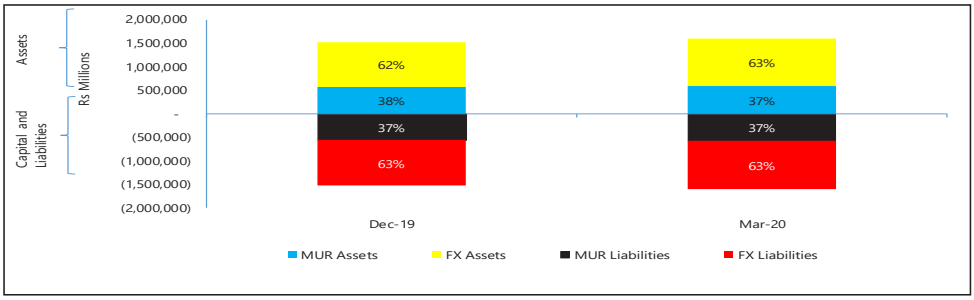
[10] According to the Economic Development Board (EDB), the GDP contribution of financial services sector is currently made up of 6.9 percent of financial intermediation, which is essentially banking activities and the capital markets, 3.2 percent of insurance activities and 0.7 percent of financial leasing and other credit granting activities.

[11] Including GBCs.

[12] Including GBCs.

There are three main prudential requirements in Mauritius with respect to foreign exchange holdings for banks. Firstly, there is a reserve requirement of 6 percent on foreign currency deposits over a fortnight (4.5 percent limit on a daily basis); secondly, banks are not allowed to keep net open foreign exchange positions of more than 15 percent of Tier 1 capital. Thus, whenever mismatches arise in the timing of receipts and payments, banks engage in the interbank market for foreign exchange and / or with the Central Bank in instances of foreign exchange intervention to inject or withdraw foreign currency liquidity in the system; and thirdly, there is a Liquidity Coverage Ratio (LCR) in, both, domestic currency and material foreign currency of at least 100 percent. Thus, banks are required to keep a sufficient level of high quality unencumbered liquid assets in material foreign currencies to withstand a 30-day liquidity shock. Many banks in Mauritius, especially subsidiaries of foreign banks, engage in making liquid placements abroad and these are readily available to top up their liquidity levels in times of need.

Figure 22: Degree of Financial Dollarization of the Mauritian Banking System [13]



III. Literature Review

The relationship between financial sector development and macroeconomic stability has long been established by empirical papers in the literature. This builds on the canonical theoretical models built in the 1970s which provided rationale for the existence of financial intermediaries as vehicles for addressing financial frictions [14] – thus, departing from the Walrasian principle enshrined in the Arrow-Debreu world. Some early papers similarly posited that financial restrictions hampered financial development and economic growth. (McKinnon-Shaw, 1973)

Later contributions pioneered by King and Levine (1993) and Levine (1997) built on the literature of endogeneous growth and showed that financial development positively contributes to growth. However, these papers differed in several grounds, namely: country and period of coverage; methodological choice behind computation of financial development; and empirical estimation methodology. In King and Levine (1993), several

[13] The figure incorporates all on-balance sheet figures only. For net open foreign exchange position limits, off-balance sheet items are considered as well. Banks in Mauritius have positive net foreign exchange positions that are way below the regulatory limit of 15 percent of Tier 1 capital.

[14] For example, some theoretical papers showed the Pareto-Superiority of financial intermediaries over financial markets in addressing informational asymmetries such as Moral Hazard or Adverse Selection, or in providing liquidity insurance to depositors / investors - which financial markets could not do. See the canonical contribution of Diamond and Dybvig (1983) for more details

measures of financial development were proposed, namely: liquid liabilities of banks and of non-banks as a share of GDP; the ratio of bank credit to the sum of bank and Central Bank credit; the ratio of private credit to total domestic credit; and lastly, private credit as a share of GDP. The study covered a panel of 80 countries spanning the period 1960-1989. Rajan and Zingales (1996) found evidence of threshold effects between financial development and industry-level growth performance.

Some more recent studies have analysed the relative merits of bank-based financial systems (e.g., China, Germany and Japan) vs market-based financial systems (e.g., UK and USA) in promoting growth. Proponents of the former argue that, in line with earlier literature on 'why are banks special?', banks can better address market imperfections and take a long-term view of developmental issues. Proponents of the latter argue that financial systems that are centred around banks do exploit maximum economic rent from borrowers. Thus, the borrowers are left with relatively little residual profits to undertake long-term investments. Supporters of market-based systems thus argue that bank-based systems result in lower relative growth. Evidence that emerged afterwards shows that there is ambiguity about which view holds more empirical traction. For instance, Levine (1999) argues that what matters is the legal and institutional system and not whether banks are pareto superior or inferior to markets. Indeed, in modern financial systems, banks and financial markets are complementary in promoting economic growth.

Some papers also posit that the relationship between financial development and growth may go either way. While financial development may promote growth, reverse causality may also be possible, thus creating a simultaneity bias issue. This issue influences the choice of econometric methodology used. In Table 23, a summary of the main findings of studies that utilised similar approach to the one used in this study is provided.

Table 23: Summary of Review of Key Empirical Papers in the Literature

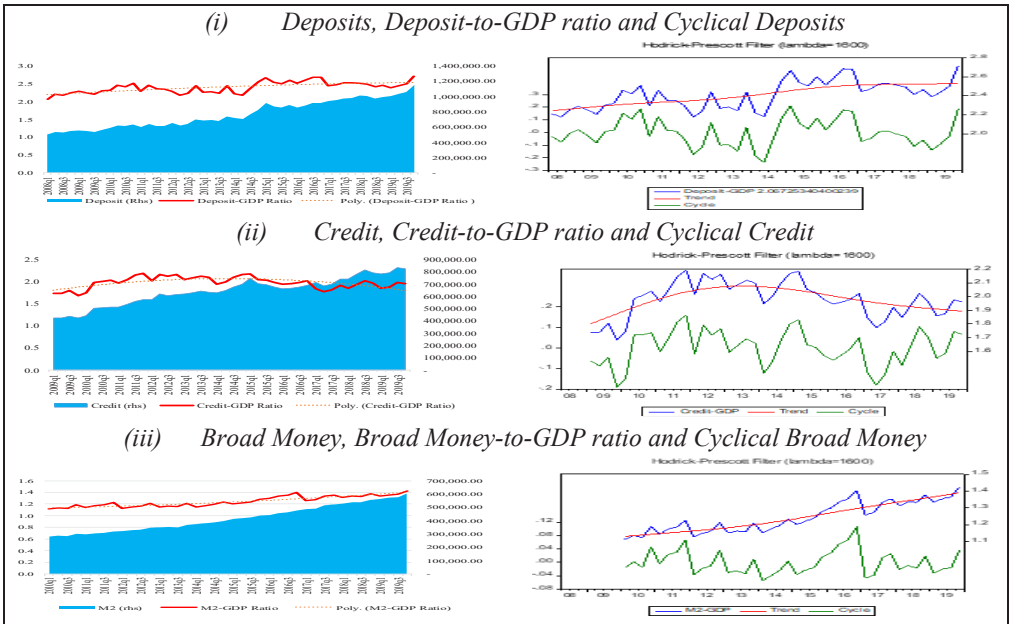
Author(s)	Country / Countries of Focus	Methodology	Findings
King and Levine (1993)	80 countries	Contemporaneous regressions and sensitivity analysis	Strong positive link between economic growth and development of financial sector
Beck et al. (2000)	74 developed and developing countries	GMM	Positive impact between financial development and growth
Beck and Levine (2004)	40 countries (1976-1998)	GMM	Stock market and banks positively influence growth
Christopoulos and Tsionas (2004)	10 countries	Multivariate Co-integration	Long-term causality between financial sector development and growth
Islam and Khan (2004)	Bangladesh	Granger Causality	Positive link between growth and development
Caporale et al. (2009)	10 new EU countries	GMM and Granger Causality	Development affects growth but not vice-versa due to lack of financial depth.

Estrada et al. (2010)	125 countries in Asia	Panel data regression	Bank credit and stock market capitalization have a positive and significant effect on growth.
Ujunwa and Salami (2010)	Nigeria	Co-integration and Error Correction	Negative impact between stock market development and growth in Nigeria.
Zermeno et al. (2011)	Selected countries in Latin America and in Southeast Asia (1980-2009)	Non-parametric panel regression	Stock market developments positively affect growth in Asia but not so in Latin America
Seetanah et al. (2010)	10 Least Developed Countries (1995-2009)	GMM	Banks contribute towards growth. Stock markets do not contribute to growth.
Hakeem and Oluitan (2013)	24 Countries in Sub-Saharan Africa	Panel Co-integration Test, Impulse Response and Sensitivity	Uni-directional causality from output to financial sector development.
Adu et al. (2013)	Ghana	Autoregressive Distributed Lag	Negative impact when broad money to GDP is used as proxy for development.

IV. Methodology

Financial depth captures the relative importance of the financial sector in the economy. It incorporates the relative size of banks, non-bank deposit-taking institutions, financial markets and non-bank financial entities such as insurance companies and pension funds. Four banking sector measures and one stock market measure popularly used to measure financial depth are highlighted in this section. The ratio of private credit to GDP is the most popular and it stood at 180 percent as at end-2019 in Mauritius. This ratio is lower than the historical average but slightly above its underlying trend reflecting a broad range of financial products, with the development of many substitute products to loans (e.g., equity and fixed income financing and private placements). Financial depth is also measured based on total banking assets to GDP, which encompasses private credit, credit to government and banking sector assets other than credit (Figure 23).

Figure 23: A Selection of Financial Deepening Indicators in Mauritius



Source: Author's Computation

The third useful measure is the deposit-to-GDP ratio. In Mauritius, the deposit-to-GDP ratio averaged 250-300 percent over recent years, and the trend has been upwards. Agreements (DTAAs) with other partner countries, and various Investment Protection and Promotion Agreements (IPPAs) have contribution in attracting of investment flows from Africa and Asia. [15] The fourth indicator of financial depth is the Broad Money supply-to-GDP ratio. In developing economies, this measure is a useful determinant of the degree of monetization and inflationary pressures in the economy. In the case of Mauritius, the ratio of broad money[16] to GDP has been rising steadily and has ranged between 120 percent and 140 percent over the past decade (see Figure 23). Stock market capitalization as a percentage of GDP, is highest in Mauritius at 67 percent (approx. USD 12 billion). This is, in part, due to initiatives taken in recent years by the Stock Exchange of Mauritius (SEM) to launch an international multi-asset class platform with upgraded structures ranging from multi-currency capital raising and listing platforms, as well as dual-currency trading platforms.

The financial landscape in many parts of the world has undergone significant changes over the last decade with the introduction of new financial products being offered to a previously unbanked segment of the population facilitated by technological innovation. The setting up of fintech firms and techfins has indeed helped boost this process of financial inclusion in many parts of the world. In some of the lesser developed countries,

[15] There are 44 IPPAs (23 signed with African countries).

[16] Broad Money in Mauritius is defined as notes and coins in circulation plus all deposits in the banking system (with the exception of GBC deposits which tend to have a more volatile nature.) This was with the concordance of the IMF.

efforts have been underway to promote financial inclusion through a number of supply-side responses (e.g., mobile banking, internet banking and establishment of more traditional facilities such as growing network of bank branches and Automated Teller Machines (ATMs) in poorer areas) and demand-side initiatives (e.g., financial literacy programs and education). The level of financial access in Mauritius has improved over time particularly in terms of registered mobile accounts and outstanding deposits with commercial banks as a share of GDP (Table 24).

Table 24: Summary Indicators on Financial Access, 2014-2018

	2014	2015	2016	2017	2018
Number of ATMs per 100,000 adults	45.0	45.6	44.5	43.5	43.2
Number of commercial bank branches per 100,000 adults	22.5	21.7	20.4	18.6	17.1
Number of depositors with commercial banks per 1,000 adults		1956.0	1836.5	1891.4	1876.2
Number of borrowers from commercial banks per 1,000 adults		286.0	284.3	279.0	260.1
Outstanding deposits with commercial banks (% of GDP)	159.2	169.3	164.6	167.1	122.7
Outstanding loans from commercial banks (% of GDP)	75.0	76.5	71.4	68.3	60.2
Outstanding small and medium enterprise (SME) loans from commercial banks (% of GDP)			3.4	3.4	3.1
Number of registered mobile money agent outlets per 1,000 km2			61.6	65.5	65.0
Number of registered mobile money accounts per 1,000 adults		5.0	128.1	114.1	199.9
Value of mobile money transactions (during the reference year) (% of GDP)			0.0	0.0	0.0

Source: Financial Access Survey

Source: Financial Access Survey

Data Sources and Description

Table 25 provides an overview of data used in this study. The data covers the period 2009Q1 to 2019Q4. The description of the data is provided, as well as the source of the data collection. The details of the derivation of the index of macroeconomic stability and the financial development index are provided in Annex 1.

Table 25: List of Variables, Abbreviation, and Description

List of Variables	Denomination	Description	Source
Macroeconomic Stability	*macrostab*	Index of Macroeconomic Stability	Non-Parametric Approach
GDP	*gdp*	GDP growth in Mauritius at constant prices	Statistics Mauritius
Financial Development Index	*findev*	Index of Financial Development	Principal Component Analysis
Trade	*tr*	Export plus Import	MSB
GDFCF	*gdfcf*	Gross Domestic Fixed Capital Formation	Statistics Mauritius
CPI	*inf*	Consumer Price Index	MSB
Real Effective Exchange Rate	*reer*	Exchange rate adjusted for inflation differentials between trading partners and weighed according to importance of trade	Consolidated data II
Mauritius Exchange Rate Index	*meri1*	Weighted average of bilateral exchange rates for the Mauritian rupee against the currencies of its important trading partners	Consolidated data II
T-Bill Rate	*tbill*	3-Month Treasury Bill Rate	MSB
Key Repo Rate	*krr*	Key policy rate of the Bank of Mauritius	MSB
Net open Foreign Exchange Position	*fx*	On- and off-balance sheet assets minus liabilities in foreign currency	FSI
Net Interest Income	*nii*	Income from interest-bearing assets (loans and investments) minus payment on interest-bearing liabilities (deposits and borrowings)	FSI
Deposit rate	*drate*	Weighted average rupee deposits of banks	MSB
Lending Rate	*lrate*	Weighted average rupee loans of banks	MSB
GDP of Europe	gdp_e	Y-o-y growth rate of GDP of EuroArea countries	MSB
GDP of UK	gdp_{uk}	Y-o-y growth rate of GDP of the UK	MSB
GDP of South Africa	$gdps_{afr}$	Y-o-y growth rate of GDP of South Africa	MSB
GDP of India	gdp_{india}	Y-o-y growth rate of GDP of India	MSB
Average Foreign GDP	*gdp**	Y-o-y average growth rate of GDP of Main Partners	MSB
	Variables used in Constructing the Financial Sector Development Index		
Capital	*cap*	Total regulatory capital of the banking system (Tier 1 and Tier 2)	Consolidated data I
Total Assets	*ast*	Total assets of the banking system	Consolidated data I
Total Credit	*TC*	Total credit by the banking system to the private sector, excluding credit to Government or credit extended by the Central Bank	Consolidated data I
Total Deposits	*TD*	Total deposits of banking system, including GBC deposits	Consolidated data I
Broad Money (M2)	*M2*	Notes and coins in circulation plus deposits in banking system (excluding GBC deposits) and debt securities issued by banks	MSB
Operating profit	*op*	Net interest income plus non-interest income minus operating	FSI
Stock exchange Index	*semdex*	Quarterly average SEMDEX	SEM
Net Capital Inflows	*ncap*	Net inflows of capital in the Balance of Payments	MSB

MSB - Monthly Statistics Bulletin of BOM

Consolidated data I - Consolidated Assets and Liabilities from BOM Supervision Department

Consolidated data II - BOM Financial Markets Operations Department

FSI - BOM Financial Soundness Indicators

Estimation Approach

This study used the autoregressive distributed lag model (ARDL) approach proposed by Pesaran, Shin and Smith (2001). The ARDL approach is more appealing than traditional cointegration approaches such as those of Engle-Granger or of Julius-Johansen since it does not require all variables to be integrated of the same order. Rather, ARDL works effectively, irrespective of whether some variables are I (0) or I (1), or are a mix of I (0) and I (1), provided that they are not integrated of higher orders.

V. Empirical Results

The study used Augmented Dickey-Fuller to test stationarity and the results are provided in Annex 2. The study also used appropriate methods to determine the optimal lag length and tested for the presence of a long-term relationship between the variables using the Pesaran et al. (2001) bounds test framework. The results showed an F-Statistic of 11.47, which is greater than the upper critical bound value leading to the rejection of the null hypothesis of no cointegration. Thus, there is a long-run association between macroeconomic stability and financial sector development (Table 26).

Table 26: F-Bounds Test: Null Hypothesis: No Levels Relationship

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.410433	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58
Actual Sample Size	40		Finite Sample: n=40	
		10%	3.21	3.73
		5%	3.937	4.523
		1%	5.593	6.333

In the estimation, the index of macroeconomic stability index is the dependent variable while the index of financial sector development is the independent variable, and the results of the long-run regression are reported in Table 27.

Table 27: Regression Results (Dependent Variable is the Macroeconomic Stability Index

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
MACROSTAB(-1)	0.673665	0.137982	4.882261	0.0000
MACROSTAB(-2)	-0.125278	0.170814	-0.733417	0.4683
MACROSTAB(-3)	0.311880	0.171517	1.818360	0.0778
MACROSTAB(-4)	-0.312671	0.117224	-2.667285	0.0116
FINDEV	0.024816	0.013541	1.832684	0.0756
C	0.085260	0.037891	2.250112	0.0310
R-squared	0.632874	Mean dependent var		0.246230
Adjusted R-squared	0.578885	S.D. dependent var		0.225799
S.E. of regression	0.146529	Akaike info criterion		-0.865712
Sum squared resid	0.730001	Schwarz criterion		-0.612380
Log likelihood	23.31425	Hannan-Quinn criter.		-0.774115
F-statistic	11.72227	Durbin-Watson stat		1.628205
Prob(F-statistic)	0.000001			

*Note: p-values and any subsequent tests do not account for model selection.

In the long run, a 1 percent improvement in financial development will contemporaneously increase macroeconomic stability by 2.48 percent, with the result being significant at the 10 percent level. The results show that the first and third lags of macroeconomic stability explain most of the changes in macroeconomic stability index, with the result being very significant at the 1 percent level for the first lag. The results for the short-run coefficients, denoted by the difference operators, are displayed in Table 28. The coefficient attached to the cointegrating value is negative and statistically significant. This implies that any short-term disequilibrium will self-correct and move to long-term trend at a speed of 45 percent.

Table 28: ARDL Error Correction Regression

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MACROSTAB(-1))	0.126069	0.127154	0.991466	0.3285
D(MACROSTAB(-2))	0.000791	0.120634	0.006555	0.9948
D(MACROSTAB(-3))	0.312671	0.113113	2.764235	0.0091
CointEq(-1)*	-0.452404	0.120869	-3.742941	0.0007

The study also conducted omitted variable tests that indicated that gross fixed capital formation and Euro zone growth are not relevant in explaining macroeconomic stability in Mauritius (Table 29).

Table 29: Omitted Variables Test

Omitted Variables: GDFCF EUR are jointly insignificant

	Value	df	Probability
F-statistic	1.778549	(2, 32)	0.1852
Likelihood ratio	4.216156	2	0.1215

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.073029	2	0.036514
Restricted SSR	0.730001	34	0.021471
Unrestricted SSR	0.656972	32	0.020530

LR test summary:

	Value
Restricted LogL	23.31425
Unrestricted LogL	25.42232

Granger-causality tests have also been undertaken. Granger-causality depicts the pairwise causation between lagged values of the given independent variable, the index of financial sector development, and macroeconomic stability, while keeping all other independent variables (if any) unchanged. Table 30 summarizes the results.

Table 30: Granger-Causality (Null hypothesis: No Granger Causality)

	Observations	*F-Statistic*	*P-Value*
Financial sector development index does not Granger Cause macroeconomic stability	42	4.72002	0.04934**
Macroeconomic stability does not Granger Cause financial sector development		2.72315	0.0788*

**** denotes significance at the 1 percent level; **denotes statistical significance at the 5 percent level; * denotes significance at the 10 percent level.*

The Granger causality tests show causation running from financial sector development to macroeconomic stability as well as from macroeconomic stability to financial sector development.

VI. Conclusion

This study examined the relationship between financial sector development and macroeconomic stability. To address this objective, the study derived a measure of macroeconomic stability by using a non-parametric composite-based approach focusing on GDP growth and inflation and an index capturing financial system development using the PCA approach. The study used ARDL approach to show that there is a positive relationship between financial system development and macroeconomic stability in the long run. The study further conducted Granger causality tests and the results showed a bi-directional relationship between financial development and macroeconomic stability implying a need to quantitatively investigate the impact of macroeconomic stability on financial development in Mauritius.

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Annexes

Annex 1 – Macroeconomic Stability Index and Financial Sector Development Index

Table A1: Deriving an Index of Macroeconomic Stability for Mauritius – A Non-Parametric Composite-Based Approach

1. Deriving a macroeconomic stability indicator is challenging due to the subjective interpretation attached to the notion of 'stability'. The latter concept would necessarily entail the enactment of thresholds that would separate 'stability' from 'instability'. While the thresholds may be scientifically derived as concepts from historical observations, the values attached to them, if subjective, may lead to biased interpretations. Furthermore, there are social stigmas attached to the notion of macroeconomic instability that are often disseminated by the mass media and that tend to market some indicators as being more 'socially acceptable' as representing macroeconomic instability. For instance, high inflation may be signaled as an indicator heralding macroeconomic instability more than external sector vulnerability.

2. The economic features of a country will ultimately influence on the design of an appropriate macroeconomic stability index. Factors affecting those sectors that are macro-critical to growth are usually the kernel of the indicator. For instance, economies that rely on production and exports of non-renewable natural resources (e.g., oil) will witness fluctuations in any measure capturing macroeconomic stability, with big changes in global oil prices. For small open island economies such as Mauritius which are relatively heavily tourism-dependent, shocks in source countries providing tourist flows (e.g., Europe) will usually influence perspectives regarding macroeconomic stability.

3. An appropriate index – usually comprising appropriate coincidental (and potentially leading indicators) - will usually capture the direction of change, but may yield less useful information on magnitude of change. Due to its multi-faceted nature, a measure of macroeconomic stability may entail re-orientation and re-calibration of basic macroeconomic data. Regarding the range of data to be included, it is usually recommended to include those variables that are most likely to epitomize the 'end result' of any episode of instability, namely GDP growth and inflation. Usually a well-designed composite index built along principles of including relevant parsimonious materials would capture the direction of change but may be relatively more silent on magnitude. Thus, care should be exercised in interpreting the results.

4. Due to potential endogeneity problems, care must be taken to avoid double-counting which may lead to an overestimation of any measure of stability or of instability. As mentioned earlier, because focus will be on the 'maximum information with minimum variables' principle, a reliable indicator of macroeconomic stability will focus on those 'high end' variables only, towards which all intermediate indicators of stability / instability will ultimately converge.

Instabilities in the banking system, external sector and fiscal sector will ultimately feed upon GDP growth and hamper any metric designed to capture the nuts and bolts of GDP growth changes. Unemployment dynamics are affected by past GDP growth rate, but in turn, affect the future ones. Thus, we shall be focusing on GDP growth as one of the building blocks of our composite index. The other building block will be inflation which captures monetary sector dynamics, evolution of global prices of commodities, as well as domestic currency depreciations.

5. The '*distance-to-minimum'* concept is used as Non-Parametric approach to represent dispersion of a variable. The macroeconomic stability metric is captured by looking at the 'distance-to-minimum' for GDP growth and for inflation. A higher GDP growth rate at a given point of time than the minimum is synonymous with greater stability.

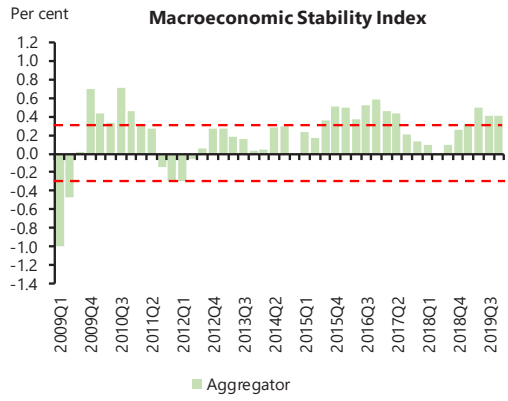
However, higher inflation at a given point of time than the minimum means greater instability. As a result, the measure of aggregation is reached by taking the 'distance-to-minimum' approach for GDP growth minus the one for inflation. The Aggregate Index of Macroeconomic Stability (at time t) with period of analysis being 2009Q1-2019Q4 is as follows:

$$\frac{Y_t - Y_{min}}{Y_{max} - Y_{min}} - \frac{infl_t - infl_{min}}{infl_{max} - infl_{min}}$$

Where: Y_t is the GDP growth at time t; Y_{max} is the maximum value over the series over the period under cover; Y_{min} is the minimum value over the series;$infl_t$ is the inflation rate at time t; $infl_{max}$ is the maximum value over the series; and $infl_{min}$ is the minimum value over the series.

6. No relative weight is attached to GDP growth and to inflation in the composite index. Prior to the COVID-19 pandemic, Mauritius had had a history of stable economic growth. As a result, we do not need to allocate any social-welfare based weights to growth vs inflation. We assume that they are each weighted equally.

Furthermore, because of historically low standard deviation for both of the measures over the period under review, we do not need to account for any persistence factor in compiling the metric. The text diagram below shows the appropriate adjusters being performed on GDP growth and inflation to derive the two components of the composite index, as per the above equation.



7. The aggregate indicator of macroeconomic stability is given by the 'difference' bars. The index is reproduced below as green bars. Over the period under review, the upside (downside) changes each have a mean value of 0.3 (-0.3). These mean values define the bandwidth within which the indicator fluctuates. So long as the indicator lies within the bandwidth, it is regarded as *'normal'*. Within the bandwidth, a rise in the indicator means a 'more stable' situation and a fall means *'less stable'* situation. If the index lies above the upper edge of the bandwidth during a given period, this is synonymous with an *'exceptionally good'* stance, i.e., there are quite high chances that there are exceptional circumstances that have warranted good macroeconomic conditions (e.g., decline in oil prices, growth in partner countries, etc). These may, however, be viewed as temporary though. Below the lower edge of the bandwidth, the macroeconomic situation can be described as *'unstable'*. These unstable episodes would typically be characterized by episodes of 'stagflation', i.e., periods of higher-than-usual inflation and lower-than-usual growth. Years 2009Q1 and Q2 would be classified as *'unstable'* by our metric due to the fallouts of the food price crisis and the knock-on effects of the Global Financial Crisis (GFC) on the Mauritian economy.

8. Our index offers a measure that is specific, intuitive, simple to measure, relevant and timely and whose performance can easily be assessed against 'social norms' ex-post. Our index is sensitive to its two components when they start to flash red lights [17]. This can be shown in the above text chart. In order to be able to assess how good our index really is, we can compare it with 'socially acceptable' notions of instability. Thus, if it is common knowledge that growth is becoming volatile and stalling, our index must show more inclination towards instability. Thus, in the below table, the ratios of $\frac{A}{A+C}$ and of $\frac{D}{D+B}$ must be relatively high. This can be proven with the benefit of hindsight.

Deriving an Index of Financial Sector Development for Mauritius – The Principal Component Analysis (PCA) Method

	Growth becoming volatile and taking a downward trend	Inflation becoming volatile
Signal shows instability on growth side	CORRECT (A)	INCORRECT (B)
Signal shows instability on inflation side	INCORRECT (C)	CORRECT (D)

Non-Technical Background

Suppose we want to estimate a variable, say, financial sector development. This variable is unobservable and needs to be estimated. We have a smorgasbord of variables (e.g., credit-to-GDP ratio, stock market capitalization-to-GDP ratio, deposit-to-GDP ratio etc) that may shed light on the level of financial sector development. However, we know that there may be multicollinearity between these variables if we include them as separate repressors in a regression.

Thus, the question - How can we then best extract a variable (or a few variables only) that best represents financial sector development and that can still retain pretty much of the variation in the observed data? These few variables should retain the algebraic feature that they are orthogonal to each other. By ranking these newly-created independent variables in terms of how much variation in the data they account for, we can choose to focus on one or a couple of them only. These newly created variables are called the Principal Components and the plot that ranks them in descending order is called the Scree Plot.

[17] In a previous and separate work undertaken for the CMI (2019), this author used a Probit / Logit Approach to model macroeconomic variables that were most likely to be relevant in explaining financial fragility, where financial fragility was modelled as a binary outcome in a panel-based dataset. Predictive modelling (i.e., ROC analysis) showed that GDP and inflation were the most important variables there as well.

PCA is thus a dimensionality-reduction technique that focuses on feature extraction from the underlying data [18]. It works when: (a) a researcher is willing to reduce number of variables but cannot identify which ones to eliminate at first sight or with hindsight; (b) the researcher wants to ensure that variables that are retained are independent so that they can be incorporated into a regression without fear of inducing multicollinearity; and (c) the newly created variable may be less interpretable. Thus, interpretability may be sacrificed for the sake of efficiency and effectiveness.

Building the PCA to represent Financial Sector Development in Mauritius

The following raw data variables are believed to reflect financial sector development:

Credit-to-GDP

Deposit-to-GDP

M2-to-GDP

Assets-to-GDP

Capital-to-GDP

Net Capital Inflows-to-GDP

Operating Profit-to-GDP

Semdex-to-GDP

The following steps are taken in deriving the principal components:

Standardize the data so that each series is based on similar footing;

Derive the underlying covariance matrix for the dataset. The correlations between these raw variables are provided in the third table below. The correlations are pretty high due to the non-stationarity elements of some variables.

Compute the eigenvalues and eigenvectors to derive the principal components. The eigenvalues capture the variation in the data accounted for by each component. The first table derives the eigenvalues and the second one the factor loadings.

[18] This feature of dimensionality-reduction is different from a feature elimination process which consists of reducing the feature space by dropping all variables with the exception of those that are most pertinent for the analysis under question. Feature extraction and feature elimination are two ways of reducing dimensionality of the feature space.

Eigenvalues: (Sum = 8, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	4.775862	3.672418	0.5970	4.775862	0.5970
2	1.103444	0.352459	0.1379	5.879305	0.7349
3	0.750985	0.055260	0.0939	6.630290	0.8288
4	0.695725	0.222094	0.0870	7.326015	0.9158
5	0.473631	0.322944	0.0592	7.799646	0.9750
6	0.150687	0.116855	0.0188	7.950333	0.9938
7	0.033832	0.017996	0.0042	7.984164	0.9980
8	0.015836	---	0.0020	8.000000	1.0000

Eigenvectors (loadings):

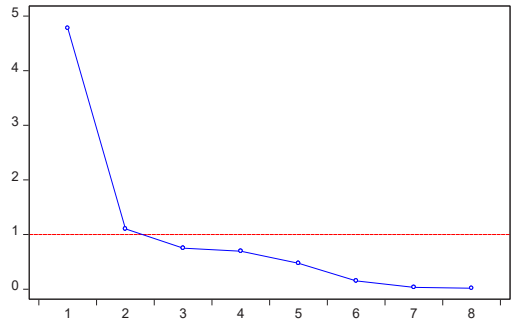
Variable	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8
CREDIT	0.441127	0.048864	0.003299	-0.192886	-0.208696	-0.039607	-0.739676	-0.416605
DEPOSIT	0.326116	0.269623	-0.539112	0.433959	0.185807	0.553723	0.024050	-0.016677
CAPITAL	0.425759	-0.023021	0.043663	-0.346845	-0.267386	0.188649	-0.023641	0.767039
GDFCF	0.270878	-0.023632	0.628102	0.678342	-0.261624	0.018511	0.044339	0.025531
M2	0.427841	-0.101567	0.047570	-0.324511	-0.202269	0.123621	0.648948	-0.470890
NCAP	0.000840	0.874200	0.361042	-0.218516	0.231782	0.015817	0.058974	-0.014866
OPPROFIT	0.314522	-0.355298	0.288225	-0.086563	0.821830	0.064038	-0.063111	0.027996
SEMDEX	0.403034	0.151819	-0.311835	0.182963	0.109265	-0.797658	0.145538	0.120083

Ordinary correlations:

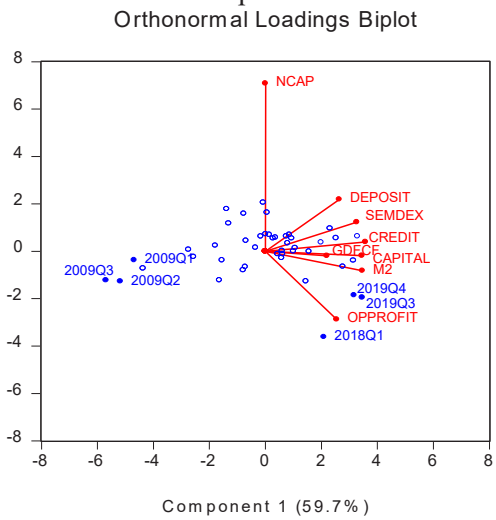
	CREDIT	DEPOSIT	CAPITAL	GDFCF	M2	NCAP	OPPROFIT	SEMDEX
CREDIT	1.000000							
DEPOSIT	0.619852	1.000000						
CAPITAL	0.963221	0.525856	1.000000					
GDFCF	0.504399	0.343913	0.442234	1.000000				
M2	0.945671	0.512070	0.975298	0.451617	1.000000			
NCAP	0.054741	0.071017	0.014939	0.016872	-0.054530	1.000000		
OPPROFIT	0.575574	0.318938	0.577036	0.409515	0.633192	-0.159921	1.000000	
SEMDEX	0.821484	0.797524	0.726115	0.441196	0.731036	0.046057	0.501942	1.000000

Principal components are new variables that are constructed as linear combinations of the initial variables. These combinations are constructed in such a way that the new variables (i.e., principal components) are uncorrelated and most of the information within the initial variables is compressed into the first components. Thus, in our case, since we have an 8-dimensional data, we have 8 principal components. PCA tries to put maximum possible information in the first component, then maximum remaining information in the second and so on. The end result is shown in the scree plot below. The Scree Plot shows how much variation in the data is accounted for by each principal component. As seen below, the first two principal components account for pretty much of the variation we observe in the raw variables.

Scree Plot (Ordered Eigenvalues)



This conclusion is also drawn from the orthonormal loadings biplot below. Loadings for the first two principal components show that the first (=highest ranked) principal component accounts for about 60 percent of variation and the second (= second highest ranked) component accounts for about 14 percent of variation.

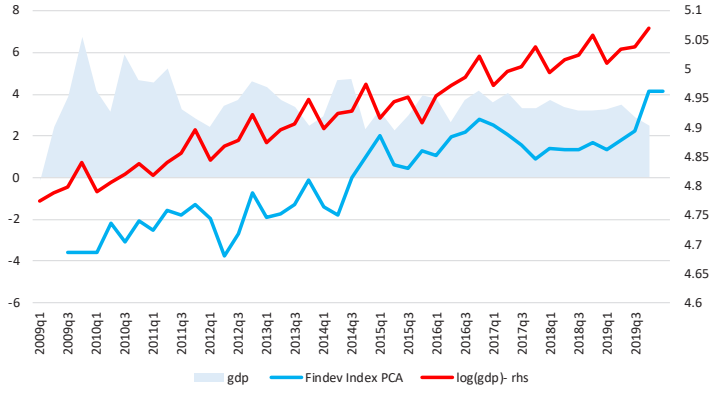


On this basis, we shall use the first (and highest-ranked) principal component as our index representing financial sector development.

The two figures below show the time series of this index of financial sector development and its stochastic relationship with: (i) the evolution of GDP, and (ii) the evolution of themacroeconomic stability index, both, for the period under review.

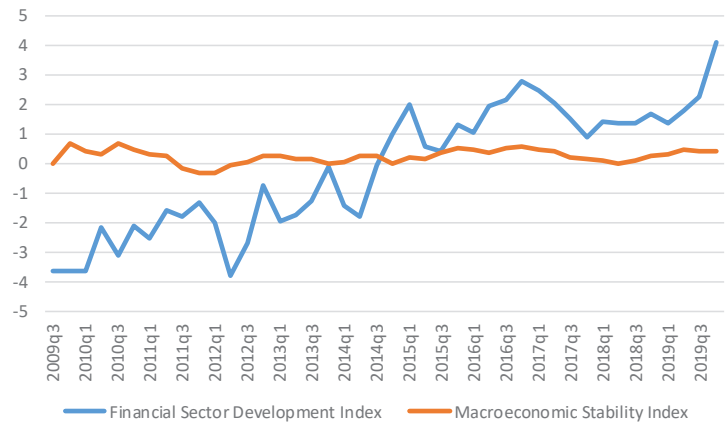
There appears to be a strong relationship between financial sector development and economic activity (measured by log of GDP) in Mauritius, while the relationship is less strong with macroeconomic stability.

Financial Development Index and GDP growth in Mauritius, 2009Q1-2019Q4[19]



[19] The Index of Financial Sector Development which is proposed here differs from the IMF's Financial Conditions Index (2019). The Conditions Index is designed to capture cyclical changes in the economic activity and has a short-term focus. The Development Index is more of structural nature and has a long-term focus.

Financial Sector Development and Macroeconomic Stability, 2009Q1-2019Q4



Annex 2: Unit Root Test Results

Macroeconomic stability index

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.754527	0.0004
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

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

Financial sector development index

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.515382	0.5162
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

6. Impact of Financial Systems Development on Macroeconomic Stability in Eswatini

Zana S Mabuza

I. Introduction

In most African countries, financial development has been the outcome of major reforms in the financial sector, which may have some implications on their economies. Financial development is critical in the life of an economy through different avenues, but most importantly it mobilizes savings, promotes greater information sharing, improves resource allocation, and facilitates diversification and management of risk (IMF, 2015). A developed financial sector minimises costs allowing the sector to perform its key function in the economy (World Bank, 2020). This includes promoting growth, reducing poverty and inequality in most developing countries.

The impact of significant economic and financial reforms that have taken place since 1980s is evident in the pre-crises period of economic growth of African countries (Allen et al, 2011). However, after the 2007-2009 global financial crises, the interventions by governments to stabilize their economic and financial systems brought to the fore growth and stability questions in the financial sector. Financial systems development does not only enhance economic output, it also boosts macroeconomic stability. This is through its ability of relaxing credit constraints and providing instruments to withstand adverse shocks, ameliorating information asymmetry, facilitating more efficient and smooth capital allocation and accumulation, and enabling risk-sharing and portfolio diversification (Ncanywa and Mabusela, 2019; Ito & Kawai, 2018). On the contrary, high levels of financial development can be costly. In essence, there can be instances where costs outweigh the benefits of financial development and cause instability by exposing economies to high-risk, high-return financial instruments, thereby possibly leading to aggressive risk-taking, boom-bust cycles, and amplified volatility. It has therefore become an apparent to monetary authorities that while financial development is one of the ultimate achievements, it should be attained via a stable financial environment.

No consensus exists in the literature on the relationship between financial sector development and economic growth (Ncanywa and Mabusela, 2019). Previous work shows evidence of both negative and positive relationships between financial sector development and economic growth both in emerging and advanced economies. Thus, this has provoked developing countries to investigate and re-estimate their determinants of growth paying more attention on their financial development variables. Another area of interest by most researchers on this subject is causality between financial sector development and various macroeconomic indicators besides economic growth. Noteworthy is that, as the financial systems develop, countries have not only been concerned about growth and improvement in macroeconomic

variables, but also in their stability. This is important as unpredictability in the key macroeconomic variables hampers resource allocation decisions, investment, and growth (Montiel and Serven, 2006). Moreover, theoretical discussions show that macroeconomic instability can manifest in uncertainty in the economy, in the foreign sector through the trade balance, in unfavourable investment and inflation (Mohamed, 2020).

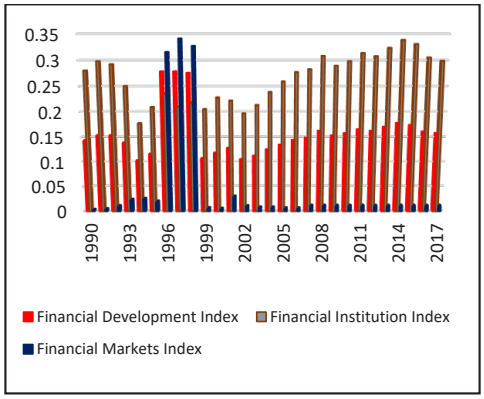
Previous work has mainly focused on the impact of financial development on economic growth and/or other key macroeconomic variables, but less attention has been paid on its impact on the macroeconomic stability despite the critical role of stability in any economy. Furthermore, there is a dearth of knowledge on financial development-macroeconomic stability in small open economies in a common monetary area (CMA) such as Eswatini. Eswatini has a less developed financial sector and its CMA membership could have contributed to the performance of the financial markets. Thus, this study seeks to empirically analyse how financial systems development impacts the macroeconomic stability in Eswatini. As the financial sector development receives attention in Eswatini, ensuring macroeconomic stability will be vital – stability is fundamental in attracting much needed investment in the country, therefore, the findings of this study are applicable. To achieve this objective, the study used vector autoregressive (VAR) models and the Johansen cointegration test developed by Johansen and Juselius (1990) and Johansen (1991).

The rest of study is structured as follows. In section 2, the study provides an overview of financial sector and economic growth in Eswatini while the literature review is provided in section 3. in the study. The methodology and data analysis are outlined in section 4 and the study results are presented and discussed in section 5. Section 6 concludes the study.

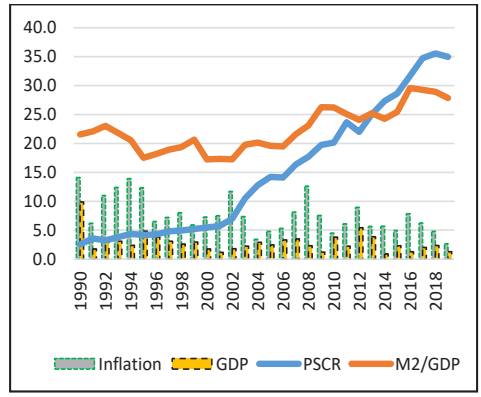
II. Overview of Financial Sector and Economic Growth in Eswatini

Classified as a lower-middle income country, Eswatini is a small, open and highly diversified economy. Following the impressive growth in gross domestic product (GDP) in the 1980s, the country was characterised by slower and stagnant economic growth averaging 3 per cent in the last 20 years. Like other developing countries, the country was affected by the 2008-09 global economic downturn. The effects were felt mostly in the country's capital and investment flows, and exports that slowed economic growth in the country. Post the crisis, the country's economic growth averaged 2 per cent, with little growth prospects. In Figure 24, two estimators of financial sector development; broad money supply to GDP and private sector credit (PSCR) to GDP and selected macroeconomic variables, GDP and inflation in Eswatini are shown. Broad money supply ratio to GDP shows that financial depth has been increasing since 1990 and GDP has been decreasing over the years. During the period, the economy suffered drought conditions, loss of international markets and closure of major mining activity. The PSCR ratio to GDP has also been increasing over the period, gaining support from the discount rate that was slowing over the period. Notably inflation was also slowing during the period. Generally, both financial sector development indicators have been increasing over the study period while GDP and inflation have been decreasing.

Figure 24: Financial Development Index and Selected Macroeconomic Variables



Source: IMF FD Index Data Base



Source: Central Bank of Eswatini

While economic and financial reforms have played a key role in paving the way for the economic recovery of the country, the country remains vulnerable to external shocks, especially from South Africa as the biggest trading partner of Eswatini and, persisting internal deficiencies. Eswatini's CMA membership means the local currency (Lilangeni) is pegged to the Rand and permits the free circulation of the Rand as well as the flow of capital among member countries. The financial sector plays a vital role in financing economic activity in the country, but statistics show a big room for the sector's development. Based on the major components of the financial sector; financial institutions (FI) and financial markets (FM) and using the Financial Development (FD) Index [20] as shown in Figure 24, FD in Eswatini has been on the lower end of the index (lower than 0.2) representing a low developed financial sector. Over the period the FI dominates the financial sector, except between 1996 and 1998 where FM shows greater development. This can be pinned to the development of Eswatini Stock exchange in 1990 that operated as a single stock-broker facility until 1999. FM is generally less active in the country possibly because of the country's membership to the CMA arrangement, and hence pegged currency, and with well-developed and liquid South African financial markets, local growth of financial markets may be hampered.

On the other hand, FI, comprising of the bank and non-bank financial institutions are the most active in the financial sector. The banking sector, regulated by the Central Bank of Eswatini, has 4 commercial banks- 3 South Africa owned and 1 locally owned. Operations in the banks are largely split between deposit taking, payments, investment (long-term deposits) and credit. On aggregate, banks in Eswatini are well capitalised and profitable, reaching a 50 per cent share of GDP in total bank assets 2019; return on assets exceeding zero and a total loan book of 25 per cent of GDP in 2019. Non-bank financial institutions regulated under the Financial Services Regulatory Authority reached 332 in 2019. This includes 1 credit bureau; 162 credit providers; 61 savings & credit cooperative societies

[20] Developed by IMF staff, the FD Index uses data from World Bank Global Financial Development Database on indicators of financial depth, access, and efficiency for financial institutions and markets following the matrix of financial system characteristics developed by Čihák et al., (2012). See Sahay et al. (2015).

and 1 building society. In the last 10 years, the mobile network providers tapped into the financial sector, bringing in innovation in mobile money transaction and over 600,000 subscribers by 2019.

However, there are some gaps identified in the financial sector in terms of stability, modernization, diversity and inclusion. These include: the fragmented legal and regulatory framework, the payment system that is not fully interoperable and access limited to banks as non-bank financial institutions are not able to access the payment system, small and shallow capital markets, incomplete consumer protection framework, incomplete credit information sharing and high costs of banking, among others. The Government of Eswatini formulated the Financial Sector Development Implementation Plan (FSDIP) in 2014-2016 as an initiative to address the gaps and guide financial development in Eswatini. By the time of this study, achievements of the Financial Sector Development Implementation Plan (Financial Sector Development Implementation Plan, 2017) had not been documented.

III. Literature Review

The role of financial development on economic growth has been at the centre of discussions by popular economic theorists such as Schumpeter (1911), Lewis (1956), Kuznets (1955), Rostow (1960) and Smith (1776). Notably, Schumpeter, (1911) drew economists' attention to financial intermediation through banks as a factor of economic growth. Schumpeter argued that economic growth is unbalanced and depends on innovation and entrepreneurship (Piętak, 2014). When the traditional economic theories were getting more criticism, Schumpeter's economic growth policy gained more consideration and validation especially as economies struggled with banking and debt crises (Śledzik, 2013). Empirical research has tabled some evidence that Schumpeter's theory of innovation and entrepreneurship as a driver of economic growth is valid.

The success of a country's economy cannot be determined by economic growth only, but also other macroeconomic variables that help determine stability of an economy. Fisher (1993) suggested that, for a macroeconomic framework to be stable, the behaviour of other variables must be monitored. For instance, low and predictable inflation; appropriate real interest rates; stable and sustainable fiscal policy; competitive and predictable real exchange rate as well as viable balance of payments situation.

A number of empirical reviewed research in this study analysed the impact of the financial sector development on the economy, with a majority focusing on economic growth while a few studies focused on fluctuations on economic growth, analysing the volatility of macroeconomic variables in the presence of financial development. As a proxy of financial development, a considerable number of studies used M2/GDP, indicators of stock markets and banking sector.

Rehman (2018) analyses the banking sector development, stock markets and economic growth using evidence for Saudi Arabia. The study selected GDP per capita; the ratio of broad money to GDP and ratio of stock market capitalization to GDP as proxy variables for financial development. Employing the vector autoregression (VAR) method, the study found no cointegration between all the variables, but showed evidence of a bi-directional

relationship between GDP per capita and M2/GDP. A similar study, but with different methodology, was carried out for Brazil, Russia, India, China, South Africa (BRICS) countries for the period 1993-2014, (Guru and Yadav, 2019). In the study, the Generalized Method of Moments (GMM) was used, where financial development indicators; credit to deposit ratio, domestic credit to private sector, size of financial intermediaries, and the ratio of value of shares traded and turnover; and macroeconomic variables; inflation, exports, enrolment to secondary education were used. While the results were not generic across the countries, but all the banking sector development indicators were found to be positive and significant determinants of macroeconomic stability.

Similarly, an analysis of the relationship between financial development and economic growth for Cameroon based on the Johansen method of cointegration showed that financial development has a positive effect on economic growth in the long run, (Johannes et al., 2011). A long-term causality running from financial development to economic growth was also found. Puatwoe and Piabuo (2017) used auto regressive distributive lag (ARDL) technique of estimation and found similar results for the same country.

Ito and Kawai (2018) considered the aspect of the comparison of quality and quantity measures of financial development, recording the different implications on macroeconomic performance. According to the study, quality indicators reflect the diversity, liquidity and efficiency of financial development, while quantity indicators are a composite indicator of depth, size, banking, equity, bond and insurance variables. The findings of this research indicate that financial development in terms of quantity is significantly and negatively correlated with output volatility for both advanced and developing economies.

Pradhan et al (2014) analysed the impact of stock market development and inflation on economic growth in India for the 1994-2014 period, using the ARDL bounds testing and the vector error correction model (VECM) approaches. The ARDL approach gave evidence that stock market development, money supply, inflation and economic growth are cointegrated. The VECM approach confirmed the existence of both bi-directional and uni-directional causality between economic growth, money supply, inflation and stock market development in India. The impact of financial development on Pakistan was studied by Zaman, et al., (2011), analysing the period 1974 to 2007. The study employed the Johansen and F-Bound cointegration test as well as the VAR method. The results of the study confirmed a long-run relationship between inflation and the financial development variables namely, broad money supply; private sector credit and bank deposits liabilities, all measured as percentage of GDP.

In 2016, Ma and Lin (2016) studied the link between financial development and the effectiveness of monetary policy for 41 economies and found that, the effectiveness of monetary policy declines as the financial systems become more developed. In Eswatini, Ndzinisa (2019) studied the effectiveness of monetary policy within financial innovation space. The study used the GMM method and found that, in the presence of financial development, monetary policy increases its effectiveness on output while decreasing its effectiveness on inflation.

Studying the macroeconomic instability and economic growth in Sudan, Mohamed

(2020) showed how macroeconomic instability has been deterring economic growth. In his approach, the author constructed a macroeconomic index and picked domestic credit by the private sector as a proxy for financial development. Based on the Johansen cointegration method and VECM approaches, the study found a long-run relationship between the variables of interest and also found that GDP instability is affected significantly by financial development. Zhang and Chen (2015) used the SVAR method and found a u-shape relationship between financial development and income inequality in China. In 2013, Dabla_Norris and Srivisal (2013) studied the impact of financial depth on macroeconomic volatility using dynamic panel analysis (GMM panel regressions) for 110 advanced and developing countries. Results from the analysis indicated that, up to a certain point, financial depth plays a significant role in dampening the volatility of output, consumption and investment. Also, deeper financial systems serve as shock absorbers as they mitigate negative effects of real external shocks on macroeconomic volatility.

Denizer et. al., (2002) in their study on finance and macroeconomic volatility found that, countries with more developed financial sectors tend to experience smaller fluctuations in their macroeconomic stability than the less developed ones. Sahay et al., (2015) on the other hand concluded that the relationship between financial development and economic stability was non-linear in emerging markets. In this case, at higher levels of financial development, the effect of financial development on economic growth weakens. The research suggested the need for emerging markets to pay attention to both financial development its speed. Additionally, the study also showed that, growth and macroeconomic stability are enhanced by further financial development, but only at early stages of the development.

IV. Methodology

Various approaches have been used to determine the relationship between financial development and macroeconomic variables. The literature shows the Johansen's VECM yields more efficient estimators of cointegrating vectors than Engle-Granger's two-step procedure (Maysami et al, 2004). Moreover, the study further testifies that Johansen's VECM approach is a full information maximum likelihood estimation model, allowing for a whole equation system cointegration testing in one step while allowing a researcher to avoid first step mistakes carried over to the second step.

The VECM model is in this form,

$$\Delta Y_t = \sum_{i=1}^{p-1} \Gamma_i \, \Delta Y_{t-i} + \Pi Y_{t-1} + \varepsilon_t \tag{1}$$

Where, Y_t is a vector of endogenous variables of interest; p-1 is the optimal lag length; $\Pi = \alpha\beta$ (α represents the adjustment parameters and β is the matrix of long-run; α and β are matrices with k×r dimension). The component $\sum_{i=1}^{p-1} \Gamma_i \, \Delta Y_{t-i}$ in Equation (1) represents the vector autoregressive (VAR). The Johansen (1988) procedure will be used to determine Γ_i and Π that represent the short-run and long-run coefficients respectively, but the study focuses more on the presence of cointegration and error correction term (ECT). Before that, tests for stationarity which test for the presence of unit root in a

series will be done using the Augmented Dickey-Fuller (ADF) test and the Phillip Perron (PP) tests. The purpose of the stationarity test is based on Eryigit (2012) and Toraman et al., (2011) who suggest that if the time series are stationary at level the VAR model is used, but, if the variables are not stationary at levels and the cointegration equations are statistically significant then VECM becomes appropriate.

The appropriate lag length is important as too many lags reduce the power of the test due to the estimation of additional parameters and a loss of degrees of freedom (Maysami et al., 2004). To determine the lag length, a VAR Lag Order selection criterion is followed, selected by the Akaike Information Criterion or the Schwarz Information Criterion. To estimate the existence of long-run relationship between the selected variables and determine the number of cointegrating relationships, the study then follows the Johansen procedure.

Data and Time Series Properties of the Variables

The study used quarterly secondary time series data spanning from 1990 to 2019. The data is sourced from the Central Bank of Eswatini, Central Statistics Office and the Ministry of Finance.

Financial Development Variables

A well-defined set of measures of financial development is required for effective policy formulation, implementation and evaluation (Lynch, 2007). Cutting across the two major components of the financial sector; financial institutions and financial markets, a number of indicators have been developed to proxy financial depth, access, efficiency and financial stability of a country. However, for Eswatini, this study focuses on financial sector development through financial institutions and not the financial markets channel due to its undeveloped state and minimal activities. In this research, financial sector development for Eswatini is captured using two parts; financial depth is measured by the ratio of broad money to GDP (M2/GDP) and financial efficiency is measured by private sector lending (PSCR), capturing the commercial banks' ability to convert deposits to credit. [21]

Macroeconomic Stability and Control Variables

While there could be several measurement variables of macroeconomic stability; calculating the deviation from the variable's equilibrium captures the volatility or stability as in variables such as GDP, export revenues, final consumption (Cariolle, 2012; Sutherland and Hoeller, 2012). Collard and Dellas, (2002), and He and Chen, (2014) use the standard deviation of real economic growth rate (SGDPCL_GR_SD) as a measure of macroeconomic stability. Consistent with previous work, this study used the standard deviation of economic growth rate as a measure for macroeconomic stability.[22] As macroeconomic variable estimation measures volatility, an increase in the variable would suggest that macroeconomic stability was worsening and vice versa. The study

[21] Efficient allocation of credit proxied for by credit to the private sector has been used as an indicator of financial efficiency in previous studies, (Puatwoe and Piabuo, 2017).

[22] GDP data was transformed from lower frequency (annual) to higher frequency (quarterly) using Chow-Lin method (Chow and Lin, 1971; Di Fonzo 2003).

used other macroeconomic variables including and inflation (CPI) and Treasury Bill rate (TBill) as control variable.

V. Empirical Results and Discussion

The study conducted unit root tests to establish the order of integration. It also used standard approaches to establish the optimal lag length. The results for these two tests are reported in Annex 2. The study further tested the existence of cointegration using the Johansen cointegration procedure and the results are presented in Table 31. The cointegration test results show the existence of one (1) cointegrating relationships where the hypothesis of no cointegration was rejected at 0.05 level as confirmed by the trace test.

Table 31: Unrestricted Cointegration Rank Test -Trace

Series: SGDPCL_GR_SD LCPI LTO LEXCH LM2_GDP LPSCR
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.269320	100.0165	95.75366	0.0246
At most 1	0.223477	64.55937	69.81889	0.1223
At most 2	0.125783	35.97835	47.85613	0.3974
At most 3	0.085531	20.78816	29.79707	0.3710
At most 4	0.068924	10.68462	15.49471	0.2316
At most 5	0.022874	2.614837	3.841465	0.1059

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The VECM long-run and ECT estimates are presented in Table 32 which are basically the output from equation (1). The study imposed some VEC long-run normalization and exclusion restrictions on the model. In order to test if the trade variable (TO) and exchange rate (EXCH) variables can be excluded from the estimated VECM long-run relationships, a long-run exclusion test was run. This process tests whether these two variables have a zero effect on the real variables. The results show a p-value of p=0.005 implying that a long-run exclusion of the trade openness and exchange rate in the macroeconomic stability cannot be rejected. Therefore, TO and EXCH were excluded from the long-run output. This suggests that, trade openness and exchange rate have no long-run impact. This is linked to Eswatini' s CMA arrangement where the local currency is pegged to the Rand of South Africa- cushioning the economy from direct exchange rate shocks.

The long-run results indicate that both financial depth (M2/GDP) and financial efficiency (PSCR) are negatively associated with macroeconomic stability in Eswatini, they both indicate a negative relationship with macroeconomic stability (SGDPCL_GR_SD).

Since an increase in the macroeconomic stability variable represents a reduced stability, these inverse long-run results suggest that financial sector development as represented by financial depth and financial efficiency improves macroeconomic stability in Eswatini in the long-run. However, financial efficiency is statistically significant while financial depth is not statistically significant. This outcome could be linked to, through the credit channel, the accommodative monetary policy in Eswatini during the period of study that entice private sector credit. Also, the development/innovation in financial efficiency in form of improved payment systems in Eswatini over the years could be reason for the significant impact. The results are consistent with Denizer et.al (2002) who found that the proportion of credit provided to the private sector explains the volatility of consumption and output and Sutherland and Hoeller (2012) who found an empirical relationship between debt and macroeconomic stability and further opined that additional borrowing contributed to the decline in the macroeconomic instability. The error correction term (-0.447) is statistically significant from zero, implying that 44.7% of disequilibrium in the long-run relationship was corrected in the following period.

Table 32: Long-run Cointegrating Coefficients and ECT

Variable(s)	Coefficient (t-statistic)
SGDPCL_GR_SD	1.000
LogTO	0.000
LogExch	0.000
LogCPI	10.098 (3.499)
LogM2/GDP	-4.635 (-1.266)
LogPSCR	-4.463 (-2.884)
Constant	71.563
Error Correction	**-0.447 (-3.310)**

To evaluate the response of one-time positive shock in each of the financial sector development variables, on the macroeconomic stability and other macroeconomic variables, the study generated impulse response functions and variance decomposition. Since all the variables in the study are I(1) except for the SGDPCL_GR_SD, the VAR(2) was estimated using the stationary transformation of the variables. In this way, the I(1) variables entered the VAR model at their first difference while the I(0) variable in levels. The study assumed that macroeconomic stability and the other macroeconomic variables are ordered ahead of the financial development variables (financial depth and private sector credit). This is on the assumption that in Eswatini, monetary policy enables the development in the financial sector, especially in the financial institutions. Before discussing the VAR model's major outputs, the stability of the model was tested using the inverse roots of the AR characteristic polynomial test and the results are shown in Annex 4. From the figure, there are no roots lying outside the unit circle, proving the stability of the model.

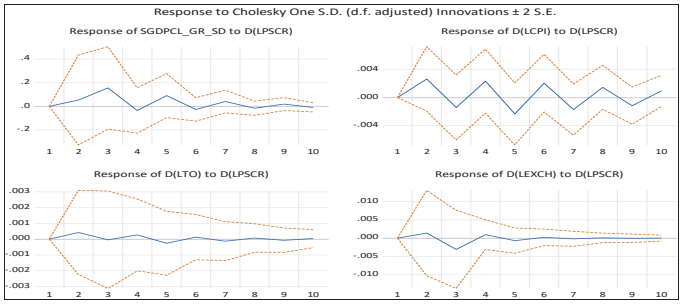
The short-run impact of financial development on the selected macroeconomic variables is presented on Figure 25 and 26. This was done by generating the Impulse Response Functions (IRF) of the VAR that shows how the endogenous variables in the model interact, displaying how they respond to a shock of a selected variable in the model.

Figure 25 presents the response of macroeconomic stability, CPI, Trade-Openness and exchange rate on innovation in financial sector efficiency (private sector credit) while Figure 26 presents the response of the same macroeconomic variables on innovation in financial sector depth (M2/GDP).

Response to Financial Development (Financial Efficiency-PSCR)

From the IRF response shown by Figure 25, we note that in Eswatini a positive financial efficiency (PSCR) shock has an initial positive effect on macroeconomic stability (SGDPCL_GR_SD) and the other macroeconomic variables in the study but the result is not statistically significant.

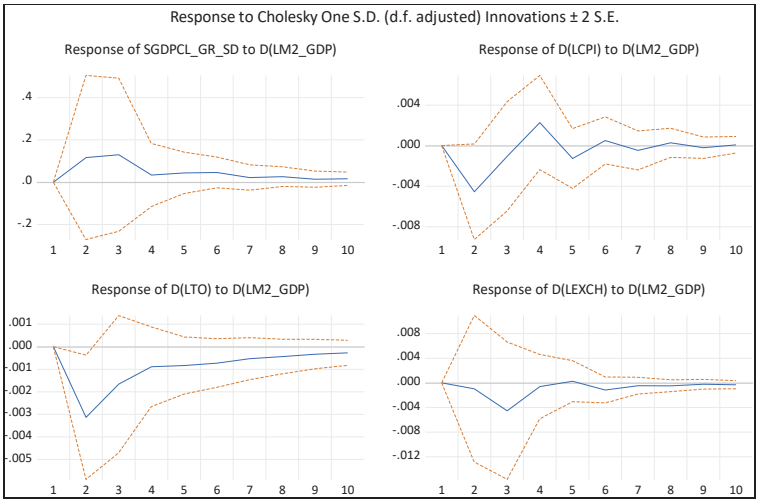
Figure 25: Impulse Response Function; response to shock in PSCR



Response to Financial Development (Financial Depth-M2/GDP)

As presented in Figure 26, the IRF of a positive shock in financial depth has an immediate positive effect on macroeconomic stability, however, the same shock has immediate negative effect on the other macroeconomic variables in the study. However, only the relationship between financial depth and trade openness is significant in the second to third quarter.

Figure 26: Impulse Response Function; response to shocks in Financial Depth (M2/GDP)



Variance decomposition analysis help to determine how much a shock on certain variables influence the dependent variable. The variance decomposition is as shown in Annex 3 and are interpreted in percentages. From the results, the study shows that financial efficiency and financial depth explains less than 1 percent of the variance in macroeconomic stability when GDP is used as an indicator throughout the ten quarters horizon. These results imply that, a shock in financial deepness and financial efficiency have a negligible effect Eswatini's macroeconomic stability. With regards to inflation, the results show that financial depth and financial efficiency influence inflation by 2.7 per cent and 2.9 per cent respectively by quarter 10. Although the explanation of inflation by the financial indicators is still minuscule, the results show that financial development is the largest contributors, besides itself, to the variance in inflation.

VI. Conclusion And Policy Recommendations

In economic discussions, while financial development has been raised as another vehicle for economic development, especially in African countries, concerns for macroeconomic effects have also been raised. Therefore, while financial sector development can drive the economy, the undermining of macroeconomic stability is a concern. Thus, establishing macroeconomic stability is key in setting countries' landscape for economic growth. As the financial sector has so much room for further development in Eswatini and as the economy grows, stability in the economy is essential in supporting the growth. This paper studies the impact of financial systems development on macroeconomic stability in Eswatini.

In this paper, financial systems development focused on is from financial institutions (banks); financial depth and financial efficiency. Specifically, the study used the ratio of money supply as a measure for financial depth(M2_GDP) and private sector credit (PSCR) as a measure for financial sector efficiency. As a measure of macroeconomic stability, the study uses the standard deviation of real growth rate for GDP (SGDPCL_GR_SD). Additional macroeconomic variables are inflation (CPI), trade-openness (TO) and exchange rate (EXCH). The paper followed two approaches; through the Johansen cointegrating test, the paper determined the existence of a long-run relationship between macroeconomic stability and financial sector development variables. The error correction term was also determined by estimating the VECM. The paper then estimated the impact of the financial development on the macroeconomic variables by generating impulse response functions and variance from an estimated vector auto-regression (VAR) model.

In summary, results of the Johansen Cointegration test showed the existence of atleast 1 cointegrating equations between the variables. From the VECM model results, the study concludes that 44.7% of disequilibrium in the long-run relationship is corrected in the following period. The study showed that financial efficiency and financial depth boost macroeconomic economic stability but only the impact of financial efficiency is statistically significant in the long-run. The results of the impulse response functions indicate that financial sector variables have no significant effect in explaining the evolution of macroeconomic stability except when financial depth and trade openness are used as indicators of financial system development and macroeconomic stability, respectively. Given the sensitivity of results to the indicator of financial system development used,

the bank can consider developing a financial development index as a tool to monitor the sector and also test whether a more comprehensive indicator of financial development would better explain macroeconomic stability than a single sector indicator.

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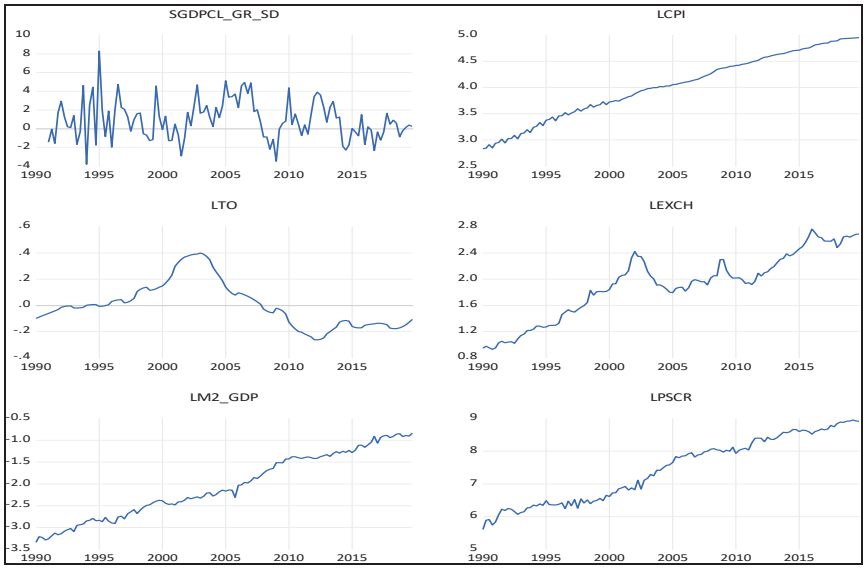
Annexes

Annex 1: Time Series Plot of Key Variables



Annex 2a: Augmented Dickey-Fuller (ADF) Unit Root tests Results

Variable	In Levels	In 1st Difference	Order of Integration
SGDPCL_GR_SD	-2.894**	-	I(0)
LogCPI	-3.366	-3.809**	I(1)
LogM2/GDP	0.560	-2.864*	I(1)
LogPSCR	-0.804	-18.787***	I(1)
LogTO	-1.728	-2.821*	I(1)
LogEXCH	-1.182	-8.764***	I(1)

*, **, and*** represent stationery at 10%, 5% and 1% level of significance respectively

Annex 2b: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-34.69209	NA	8.28e-08	0.720214	0.865031	0.778979
1	769.7707	1509.258	1.03e-13	-12.88090	-11.86718	-12.46954
2	855.2998	151.3788*	4.30e-14*	-13.75752*	-11.87490*	-12.99357*
3	882.0355	44.48061	5.13e-14	-13.59355	-10.84202	-12.47701

* Indicates lag order selected by the criterion
LR: sequential modified LR test statistics (each test at 5% level)
FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Annex 3: Variance Decomposition

Variance Decomposition of SGDPCL_GR_SD:

Period	S.E.	SGDPCL_GR_SD	D(LCPI)	D(LTO)	D(LEXCH)	D(LM2_GDP)	D(LPSCR)
1	2.033979	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.096134	99.52683	0.057999	0.024154	0.018373	0.307138	0.065511
3	2.175692	97.85247	0.055690	0.386508	0.493066	0.637961	0.574301
4	2.196331	97.24331	0.055009	0.679158	0.784616	0.649422	0.588484
5	2.210745	96.47383	0.054464	1.018775	1.023352	0.679880	0.749701
6	2.218066	96.02599	0.055002	1.309372	1.132353	0.718044	0.759237
7	2.222564	95.70141	0.055649	1.517445	1.211488	0.724741	0.789271
8	2.225562	95.47330	0.057261	1.678478	1.262152	0.736425	0.792386
9	2.227330	95.33260	0.057389	1.778288	1.294459	0.739096	0.798167
10	2.228533	95.23549	0.058701	1.849328	1.314280	0.743288	0.798913

Variance Decomposition of D(LCPI):

Period	S.E.	SGDPCL_GR_SD	D(LCPI)	D(LTO)	D(LEXCH)	D(LM2_GDP)	D(LPSCR)
1	0.024421	0.240555	99.75944	0.000000	0.000000	0.000000	0.000000
2	0.028634	0.175091	95.79557	0.115591	0.554247	2.521754	0.837749
3	0.030048	0.177116	95.59351	0.298681	0.534252	2.412225	0.984211
4	0.031247	0.168614	94.78670	0.276210	0.551722	2.759538	1.457215
5	0.031928	0.167887	94.23684	0.330163	0.531685	2.801193	1.932236
6	0.032270	0.175741	93.92746	0.325003	0.520532	2.767066	2.284199
7	0.032456	0.178271	93.66977	0.342498	0.515315	2.756558	2.537587
8	0.032563	0.181584	93.50473	0.340275	0.513231	2.745670	2.714508
9	0.032625	0.182474	93.39013	0.343754	0.511749	2.739441	2.832452
10	0.032660	0.183663	93.32041	0.343168	0.510884	2.734110	2.907763

Variance Decomposition of D(LTO):

Period	S.E.	SGDPCL_GR_SD	D(LCPI)	D(LTO)	D(LEXCH)	D(LM2_GDP)	D(LPSCR)
1	0.014302	4.634597	0.061569	95.30383	0.000000	0.000000	0.000000
2	0.017516	3.099418	0.041217	86.79866	6.802290	3.200392	0.058019
3	0.019237	3.255984	0.234865	83.46061	9.605884	3.394041	0.048619
4	0.020184	3.115704	0.342268	82.53665	10.66580	3.277512	0.062068
5	0.020759	3.051443	0.349743	82.07048	11.19408	3.259672	0.074586
6	0.021108	3.010226	0.368337	81.81432	11.46007	3.271221	0.075820
7	0.021323	2.982889	0.373172	81.66689	11.63144	3.267519	0.078091
8	0.021458	2.966757	0.380872	81.57054	11.73613	3.267477	0.078223
9	0.021541	2.956099	0.382132	81.51591	11.80139	3.265759	0.078714
10	0.021593	2.949770	0.385208	81.48021	11.84010	3.266097	0.078622

Variance Decomposition of D(LEXCH):

Period	S.E.	SGDPCL_GR_SD	D(LCPI)	D(LTO)	D(LEXCH)	D(LM2_GDP)	D(LPSCR)
1	0.062466	0.096154	2.039987	1.742294	96.12156	0.000000	0.000000
2	0.064541	2.092469	2.163335	1.683972	93.99103	0.022450	0.046745
3	0.065078	2.094293	2.366250	2.225364	92.53723	0.507732	0.269131
4	0.065356	2.120817	2.347650	2.967582	91.76337	0.512096	0.288486
5	0.065540	2.116880	2.354787	3.285888	91.43334	0.510898	0.298204
6	0.065650	2.121171	2.355161	3.479941	91.20532	0.540145	0.298261
7	0.065706	2.122811	2.363035	3.590967	91.08038	0.544198	0.298612
8	0.065745	2.122576	2.360221	3.677761	90.99238	0.548706	0.298357
9	0.065769	2.122603	2.360959	3.725756	90.94308	0.549394	0.298205
10	0.065784	2.122407	2.359878	3.757995	90.91037	0.551287	0.298068

Variance Decomposition of D(LM2_GDP):

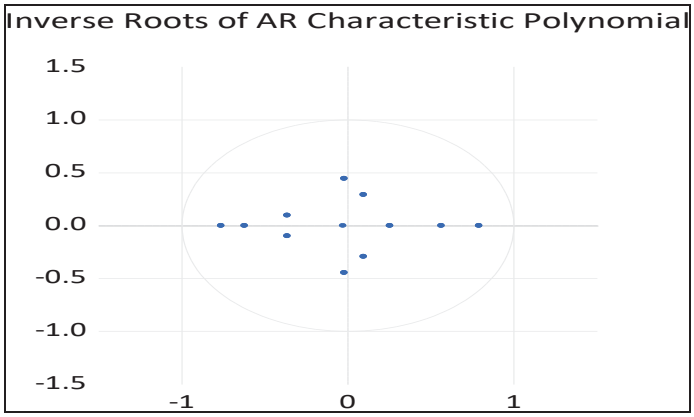
Period	S.E.	SGDPCL_GR_SD	D(LCPI)	D(LTO)	D(LEXCH)	D(LM2_GDP)	D(LPSCR)
1	0.055359	1.190691	2.023685	0.013752	0.053688	96.71818	0.000000
2	0.062208	1.859127	5.784844	0.032666	0.440879	90.26738	1.615102
3	0.062952	2.255200	5.733906	0.174121	1.194128	88.55980	2.082843
4	0.063202	2.265517	6.084108	0.189673	1.203694	88.15965	2.097362
5	0.063269	2.266450	6.233797	0.191399	1.233395	87.97255	2.102409
6	0.063281	2.265662	6.254493	0.198107	1.233652	87.94002	2.108066
7	0.063287	2.265280	6.265140	0.198622	1.234985	87.92763	2.108347
8	0.063291	2.265030	6.273986	0.198693	1.234862	87.91934	2.108089
9	0.063293	2.264915	6.278343	0.198765	1.234879	87.91508	2.108014
10	0.063293	2.264899	6.279955	0.198822	1.234856	87.91345	2.108021

Variance Decomposition of D(LPSCR):

Period	S.E.	SGDPCL_GR_SD	D(LCPI)	D(LTO)	D(LEXCH)	D(LM2_GDP)	D(LPSCR)
1	0.083638	0.052671	0.284599	0.184456	3.705489	0.027185	95.74560
2	0.091698	0.251254	0.557727	0.340087	3.190022	0.091520	95.56939
3	0.097194	0.306454	0.537451	0.308265	2.987147	0.256553	95.60413
4	0.099612	0.322628	0.523361	0.446240	2.846184	0.657302	95.20428
5	0.100710	0.323270	0.525762	0.437360	2.792770	0.755402	95.16544
6	0.101300	0.324154	0.560589	0.488274	2.767607	0.803119	95.05626
7	0.101585	0.323371	0.594551	0.486943	2.754738	0.812780	95.02762
8	0.101752	0.323889	0.630147	0.499956	2.747321	0.822430	94.97626
9	0.101836	0.323632	0.652649	0.500740	2.743773	0.823182	94.95602
10	0.101887	0.323910	0.671803	0.504510	2.741771	0.824468	94.93354

Cholesky Ordering: SGDPCL_GR_SD D(LCPI) D(LTO) D(LEXCH) D(LM2_GDP) D(LPSCR)

Annex 4: Inverse Roots AR Characteristic Polynomial



PART 2

INTERBANK
MONEY MARKETS AND EFFECTIVENESS OF MONETARY POLICY

1. Marché interbancaire et efficacité de la politique monétaire en RDC

Kandolo L. Christian

I. Introduction

Le marché monétaire interbancaire joue un rôle crucial dans la conduite de la politique monétaire. En effet, dans plusieurs pays, les taux d'intérêt auxquels se font les transactions sur ce marché, notamment le taux au jour le jour, sont les variables opérationnelles suivies par les Banques Centrales. Celles-ci offrent ou retirent de la monnaie centrale du marché lorsqu'elles désirent faire baisser ou faire augmenter les taux interbancaires, faisant ainsi du marché interbancaire une pièce centrale du mécanisme de transmission de la politique monétaire (Furfine, 2001).

Depuis deux décennies, le dogme de la stabilité des prix est au centre de la politique monétaire et les taux d'intérêt à court terme sont considérés comme son principal instrument opérationnel. Parmi les taux d'intérêt, ceux du marché monétaire sont les plus en vue, notamment lorsque le facteur privilégié se trouve être la capacité à traduire les signaux de la politique monétaire. Le marché interbancaire, en particulier, permet aux banques de prendre en charge leurs contraintes de liquidité en empruntant ou en prêtant des ressources à leurs pairs (Diane,2012).

Cependant le lien entre le marché interbancaire et l'efficacité de la politique monétaire dépend de l'existence ou non d'un bon fonctionnement du système financier. De ce fait, le degré de répercussi8on des variations des taux d'intérêt apparaît incomplet dans les pays où le système financier repose principalement sur les banques (Kwapil et Scharler, 2010). En dépit de cette contrainte du système financier, Il apparaît d'une manière générale que le degré de répercussion des variations des taux d'intérêt directeurs de la Banque centrale sur les autres taux d'intérêt pertinents revêt une importance cruciale pour l'efficacité de la politique monétaire (Marotta, 2009 ; Rocha, 2012).

En République Démocratique du Congo (RDC), en raison du faible degré d'approfondissement financier et du degré relativement élevé de dollarisation financière, les impulsions de politique monétaire ont une incidence limitée sur l'économie. En effet, au cours des années 90, le pays a connu des déséquilibres macroéconomiques, lesquels se sont manifesté par de fortes taux d'inflation marquées par des épisodes de crises des changes qui ont entraîné une dollarisation rapide de l'économie congolaise et, en particulier, du système financier. Elle constitue une pierre d'achoppement qui entrave encore davantage le processus de transmission de la politique monétaire.

En conséquence, les distorsions inhérentes au non fonctionnement adéquat du mécanisme de transmission monétaire rendent ineffective la propagation des décisions de politique monétaire et limite la capacité de la Banque centrale à influencer les comportements des banques en matière d'octroi du crédit.

La motivation de cette étude réside dans la nécessité d'identifier les interactions entre le taux directeur et les autres taux d'intérêt pertinents dans l'économie, d'où son importance capitale pour le système financier et l'efficacité de la politique monétaire. En effet, la connaissance imparfaite du mécanisme de transmission de politique monétaire pour la Banque Centrale du Congo (BCC) constitue un facteur à la base d'incertitude et de la mauvaise compréhension des effets des décisions de politique monétaire.

L'intérêt de cette étude réside dans le fait de voir dans le cas de la RDC, si le taux d'intérêt interbancaire s'aligne au taux directeur. Mais également, de vérifier dans quelle mesure les variations du taux interbancaire sont-elles transmises à d'autres taux d'intérêt dans l'économie.

Plusieurs études ont été menées sur le canal traditionnel des taux d'intérêt et le canal du crédit dans la transmission des chocs de la politique monétaire en RDC, telles que, (Fischer et al., 2013; Nsumbu, 2019; Siasi, (COMESA,2017). Globalement, la littérature empirique sur le cas de l'économie congolaise montre que les effets des impulsions monétaires (c'est-à-dire les effets du taux du directeur en tant principal instrument de la politique monétaire) sur l'économie réelle demeurent marginaux et non significatifs ainsi que l'évaluation du canal de crédit bancaire en tant que mécanisme de transmission monétaire est inexistant. Cette situation est attribuable notamment à la forte dollarisation, aux imperfections du marché de crédit, à la faiblesse du système financier, etc…

La présente étude prend en considération uniquement le marché interbancaire comme maillon central dans le mécanisme de transmission de la politique monétaire au reste de l'économie.

De ce fait, l'objectif de cette étude est de comprendre comment les changements de politique monétaire se transmettent aux taux interbancaires, aux taux de prêt et affectent le rationnement du crédit ou la quantité de crédit. Pour ce faire, en plus de l'introduction et la conclusion, ce papier passe en revue la littérature, décrit le cadre de la politique monétaire et la structure du marché interbancaire en RDC, présente la méthodologie économétrique adoptée, décrit les données utilisées, suivies de la discussion des résultats et les recommandations de politique.

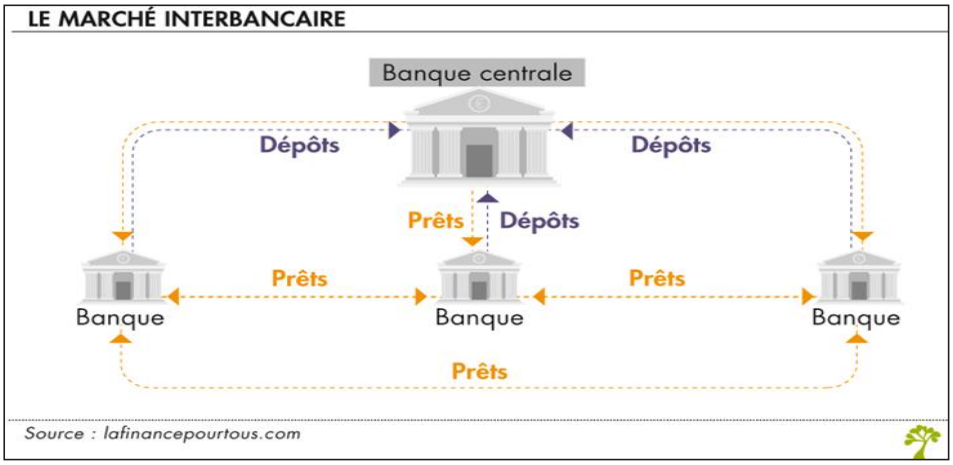
II. REVUE DE LA LITTÉRATURE

Les marchés interbancaires sont des marchés où les banques se prêtent et s'empruntent des fonds pour répondre à leurs besoins quotidiens en liquidités. C'est un marché de gré à gré, cela signifie que les banques traitent et négocient librement entre elles. A cet égard, ce marché permet aux banques d'optimiser la gestion de leur trésorerie. Son bon fonctionnement est nécessaire au financement de l'économie, puisque les liquidités que les banques s'échangent sont ensuite de nouveau prêtées aux agents économiques. Par conséquent, les taux d'intérêt du marché interbancaire, sont les plus en vue, notamment lorsque le facteur privilégié se trouve être la capacité de traduire les signaux de la politique monétaire.

Dans la littérature, l'analyse de la transmission des taux directeurs aux autres taux d'intérêt repose le plus souvent sur des spécifications empiriques. Cependant, nombre d'auteurs ont essayé d'apporter un fondement théorique au comportement des banques dans un contexte défini du marché. Mishkin (1996), le marché interbancaire est un bon indicateur de l'état du marché

monétaire, à cause de leurs maturités qui sont relativement très courtes (moins d'un an). De plus, Fama (2013) estime que les taux du marché interbancaire constituent un bon indicateur de l'évolution des taux en général. En pratique, c'est à partir de l'évolution des taux sur le marché interbancaire que les banques centrales fixent le niv8eau des taux d'intérêt directeurs.

Figure 30: Description schématique du marché interbancaire



En fait, le marché interbancaire est un marché de monnaie centrale, de très court terme, c'est le lieu privilégié des interventions de la Banque centrale et par conséquent de l'expression de la politique monétaire. Ainsi, Dans la mesure où la politique monétaire prend forme sur le marché interbancaire, celui-ci représente la courroie de transmission des impulsions de la Banque Centrale vers l'économie réelle. En outre, les taux du marché interbancaire donnent une bonne image de l'orientation de la politique monétaire d'une Banque centrale.

Dans cette optique, le taux d'intérêt directeur fixé par la Banque centrale, constitue un instrument permettant de contrôler, de façon indirecte, la masse monétaire. Il a une influence forte sur le niveau des taux pratiqués sur le marché interbancaire et ont ensuite une incidence sur l'économie réelle, à travers les crédits accordés aux ménages et aux entreprises [23].

Dans un marché fonctionnant normalement, les variations des taux du marché interbancaire sont rapidement transmises à l'ensemble de la structure des taux d'intérêt et ont pour effet d'affecter les conditions d'emprunt des agents économiques. En influençant les niveaux de liquidité dans le système bancaire, la Banque centrale peut ajuster le taux du marché interbancaire, ce qui envoie des signaux significatifs aux autres taux de marché, notamment les taux de prêt.

[23] Le marché interbancaire est traditionnellement considéré comme l'un des principaux canaux de transmission de la politique monétaire. En effet, en fonction des décisions de la Banque centrale en matière de taux directeur ou de taux des réserves obligatoires, le marché interbancaire sera plus ou moins alimenté en liquidités. Lors de la crise de 2008, le marché interbancaire s'est retrouvé figé devant les incertitudes pesant sur les créances des banques et les taux interbancaires se sont élevés. Dans ce contexte, le crédit a été rationné, ce qui, entre autres, a conduit à la récession qui a suivi.

Enfin, dans le cadre de l'efficience des marchés financiers, un marché interbancaire efficient fournit un mécanisme efficace des prix sur le marché monétaire dans son ensemble. Des déséquilibres temporaires peuvent survenir de temps à autre, mais le marché devrait rétablir l'équilibre et combler l'écart indésirable, sans intervention de la Banque centrale. Par conséquent, les taux interbancaires peuvent être utilisés comme référence pour les prêts, les épargnes, les hypothèques, les actions, et les swaps. De grands écarts entre les taux interbancaires et les taux du marché sont donc un signe d'inefficacité au niveau marché interbancaire qui peut compromettre le rôle du marché interbancaire en tant que mécanisme pour rétablir l'équilibre sur les marchés (Oduor, 2016).

La littérature empirique suggère que le mécanisme de transmission des variations des taux d'intérêt de la Banque centrale aux autres taux d'intérêt est dépendant des caractéristiques des marchés financiers nationaux [24]. Plus précisément, un tel mécanisme est déterminé par le degré de concurrence entre les banques ou entre les banques et les intermédiaires financiers non bancaires, et par la sensibilité de la demande de dépôts et de prêts aux taux d'intérêt (Egert, et al. 2007). Le degré de développement financier influencerait également sur ce mécanisme (Mishra et al., 2010 ; Kovanen, 2011).

En considérant les pays de l'UEMOA, Diop (1998) utilise les données empilées du taux d'intérêt couvrant la période de Juin 1996 à Octobre 1997 et en s'appuyant sur un mécanisme de correction d'erreur pour conclure : (1) qu'à court terme, le taux d'intérêt du marché monétaire exerce une influence significative sur les taux débiteurs des banques et (2) qu'à long terme, c'est le taux de prise en pension de la Banque centrale qui influe sur l'évolution des conditions débitrices des banques.

En outre, les Services de la BCEAO (2012), ont examiné l'effet des taux directeurs de la Banque centrale sur le taux du marché interbancaire. Les séries utilisées dans le cadre de cette étude couvrent la période allant de janvier 1997 à décembre 2011. Les résultats montrent une relation positive entre le taux de prêt marginal de l'institut d'émission et le taux interbancaire. En effet, une augmentation d'un pour cent (1%) du taux de prêt marginal se traduit par une hausse du taux interbancaire à une semaine de 0,61% à court terme et de 1,55% à long terme.

Dans le même ordre d'idée, Sodokin et Gammadigbe (2013), examinent dans une perspective empirique, la transmission des évolutions des taux directeurs et interbancaires aux taux débiteurs des banques commerciales de l'UEMOA sur la période allant de janvier 2005 à Avril 2011. L'étude s'appuie principalement sur une approche multivariée en utilisant un modèle SVAR pour analyser la dynamique et la symétrie relative de l'ajustement des taux débiteurs aux conditions de refinancement. Les résultats révèlent une hétérogénéité des réponses des différentes places bancaires aux chocs sur les taux directeurs et une faible sensibilité des taux débiteurs et de la marge d'intermédiation aux conditions de refinancement de la BCEAO.

Quant à Bech et Monnet (2016), ils présentent un modèle du marché monétaire interbancaire et la mise en œuvre de la politique monétaire dans un système de corridor comme celui utilisé par la Banque Centrale Européenne (BCE). Le modèle est

[24] Voir par exemple, Kwapil et Scharler (2010) et Karagiannis et al. (2010)

conforme à un certain nombre de f8aits stylisés concernant le fonctionnement du marché interbancaire dans la zone euro pendant la période récente de politiques monétaires non conventionnelles. Ils constatent que les améliorations de l'efficience du marché sont bénéfiques pour les banques, mais affectent la Banque centrale en termes de mise en œuvre de la politique monétaire et en termes de réduction au recours à la facilité de prêt marginal.

En étudiant le cas du Maroc, Harraou(2019), analyse la relation entre le taux du marché monétaire et les taux bancaires à travers l'analyse du pass-through et aussi de tester une éventuelle présence d'asymétrie dans la transmission des décisions monétaires dans le cadre des modèles à correction d'erreurs à équation unique. Les résultats ont révélé que les taux bancaires sont très réactifs aux variations du taux interbancaire, à l'exception du taux du crédit à la consommation et des taux créditeurs qui sont peu réactifs et présentent une viscosité dans la transmission, laquelle constitue une entrave à l'efficacité de la politique monétaire.

Kanyumbu, (2021), examine comment le marché interbancaire affecte le mécanisme de transmission de la politique monétaire au Malawi et analyse également la force et la vitesse à laquelle le taux du marché interbancaire affecte les autres taux du marché monétaire. Les résultats concluent que : (i) le taux du marché interbancaire évolue en fonction du taux de politique monétaire ; (ii) le taux du marché interbancaire est bien lié aux autres taux d'intérêt du marché monétaire, en particulier le taux de prêt; et (iii) le marché interbancaire est une plateforme efficace pour la mise en œuvre de la politique monétaire.

Dans le cadre des études sur la RDC, Fischer et al. (2013), étudient à l'aide d'un modèle VECM, l'efficacité de la politique monétaire de la BCC dans un contexte de dollarisation poussée du système bancaire et de faiblesse institutionnelle. Ils concluent que le mécanisme de transmission en RDC n'est pas clairement identifié et que la transmission des effets du taux directeur vers les autres taux d'intérêts et vers la base monétaire n'est pas concluant.

Siasi (2017), dans son étude sur l'évaluation du canal de crédit bancaire en tant que mécanisme de transmission monétaire à l'aide des données de panel de 2010 à 2016, a démontré l'inexistence du canal de crédit bancaire comme propagateur des effets de la politique monétaire.

Nsumbu (2019), dans sa thèse sur l'identification des canaux de transmission des impulsions monétaires en RDC, à l'aide d'un modèle SVAR a conclu que les mécanismes de transmissions des impulsions monétaires en RDC demeurent faibles et limités.

Enfin, Siasi et al. (2020), analysent le mécanisme de transmission de la politique monétaire en RDC, sous la période de 2004 à 2019. Les résultats ont montré que les interactions entre instrument – vecteurs de transmission – cible, pose problème. A cet égard, l'étude révèle une désarticulation du chaînon dans la transmission des effets allant du principal instrument de la politique monétaire (taux directeur) à la variable objectif (inflation).

III. Système financier et Cadre de politique monétaire en RDC

Structure du système financier

Le système financier congolais est peu profond et sous-développé. En effet, le marché financier congolais est dans une phase embryonnaire, caractérisé notamment par l'absence de la finance directe. Par ailleurs, le faible développement des marchés financier2s limite l'incidence des variations du taux directeur sur le reste de l'économie.

Cependant, il y a lieu de noter que le système financier congolais reste dominé par les banques (à plus de 90% du total actif), suivi par les institutions de microfinance et les Coopératives d'Epargnes et de Crédit (COOPEC). De même, rapporté au PIB, le total actif du système financier (23,3%) est tiré essentiellement par le secteur bancaire (21,5%) [25].

En outre, les banques sont fortement dollarisées et leur financement est dominé par la collecte des dépôts dont près de 90 % sont libellés en devises étrangères et déposés sur des comptes à vue. Environ 94 % des prêts sont en devises étrangères, de même que 45 % des découverts (inférieurs à un an) [26]

Figure 31: Evolution du total actif

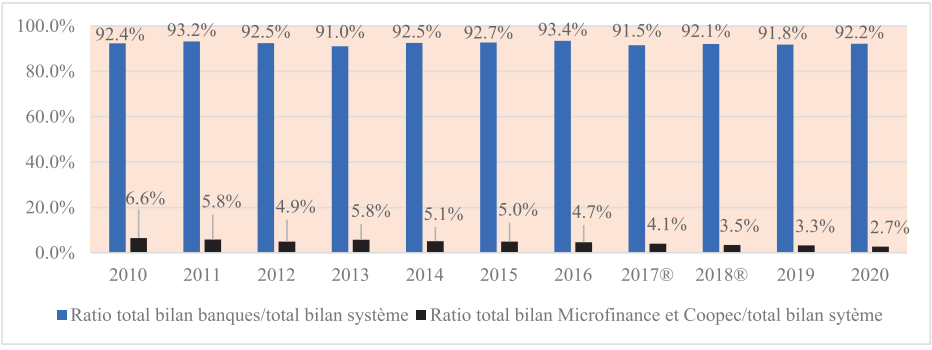
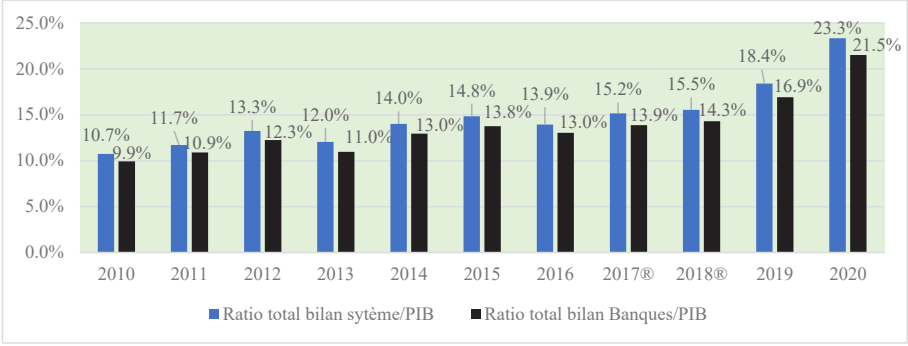


Figure 32: Evolution des ratios total actif/PIB



Source: calcul de l'auteur, à partir des données de la BCC (2020)

[25] La plupart d'informations statistiques renseignées sont tirées des différents rapports annuels de la BCC (Stabilité financière, surveillance des intermédiaires financiers), de 2016 à 2020.

[26] FMI, Rapport sur l'évaluation de la stabilité du système financier de la RDC, Mai 2014

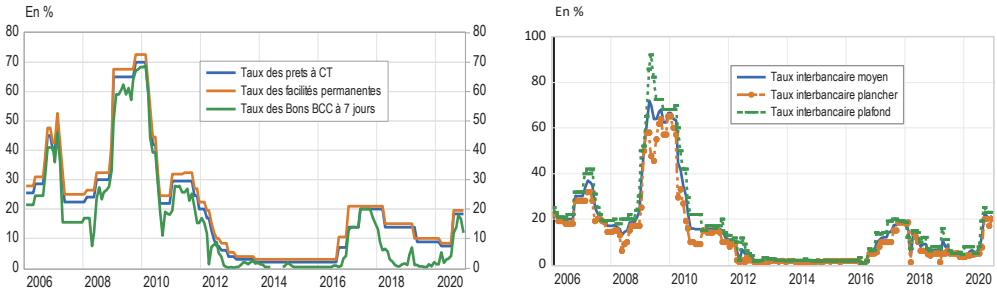
A ce jour, le système financier en RDC comprend au total 241 institutions financières dont: 15 banques commerciales (4 sont sous contrôle national et 11 sous contrôle étranger), 1 Caisse d'épargne, 71 Coopératives d'épargne et de crédit, 21 institutions de microfinance (7 collectrices de dépôt et 14 non collectrices de dépôt), 4 institutions spécialisées, 35 bureaux de change, 80 messageries financières, 4 institutions émetteurs de monnaies électroniques, plus de 20 sociétés d'assurance (y compris les courtiers) et 2 fonds de pension.

Il n'existe pas de marché d'actions. A partir du dernier trimestre 2019 [27], la RDC a lancé l'émission des Bons et Obligations du Trésor sur le marché des titres publics, pour les titres non indexés, et en juin 2021 pour les titres indexés sur la devise étrangère (USD) pour couvrir ses déficits de trésorerie et financer sainement ses projets d'investissements.

Evolution des taux d'intérêt du marché monétaire

Les performances appréciables obtenues en matière de stabilisation des prix à la consommation et du taux de change ont conduit la BCC à enclencher la baisse de ses taux de base. Cette action s'est traduite par une chute des taux d'intérêt dans l'économie au cours de ces dernières années.

Figure 33: Evolution des taux d'intérêt



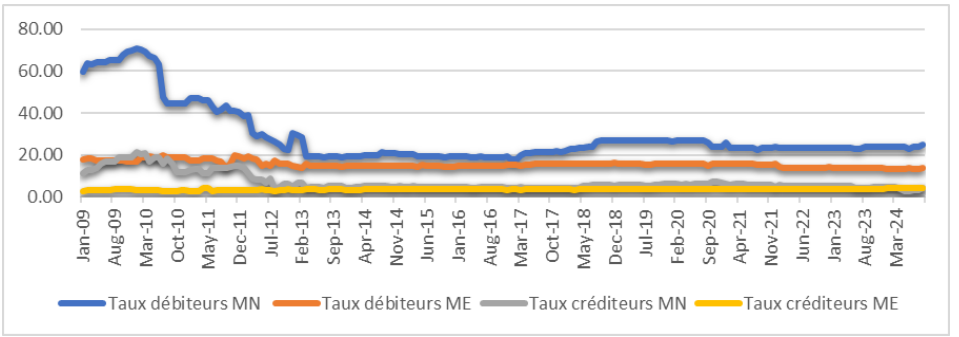
Source: BCC

Au niveau des taux d'intérêt pratiqués par les banques, il est à noter que les ajustements des dispositifs de la politique monétaire ne s'accommodent pas avec les décisions des banques commerciales en matière d'octroi du crédit [28]. Par conséquent, le coût du crédit reste élevé rendant ainsi le marché bancaire congolais moins attractif, à côté duquel s'ajoutent d'autres problèmes structurels qui influent négativement sur la stabilité du cadre macroéconomique et rendent l'environnement économique congolais plus risqué.

[27] Les émissions de titres d'emprunts publics (Bons et Obligations du Trésor) au dernier trimestre (octobre) 2019 étaient conforment aux textes réglementaires en vigueur, notamment le décret n°18/025 du 11 juin 2018, fixant les modalités d'émission et de remboursement des Bons du Trésor et des Obligations du Trésor ; l'Arrêté ministériel n°030/CAB/MIN.FINANCES/2018 du 30 août 2018, portant mesures d'application du décret n°18/025 du 11 juin 2018 ; et la Convention signée le 7 novembre 2018, entre le Ministère des Finances et la BCC

[28] Les modifications du taux directeur s'exercent sur les taux d'intérêt appliqués sur les transactions en monnaie nationale. Les taux sur les crédits et les dépôts en devises, sont relativement rigides.

Figure 34: Evolution des taux d'intérêt des banques commerciales [29]



Source: BCC

Le cadre général de la politique monétaire en RDC

Le cadre général de la politique monétaire de la Banque Centrale du Congo est régi par la Loi n° 18/027 du 13 décembre 2018, relative à l'organisation et au fonctionnement de la Banque Centrale du Congo et principalement en son article 10, points 31 et 17, lequel stipule ce qui suit : « la Banque Centrale du Congo a la responsabilité exclusive de la définition et de la mise en œuvre de la politique monétaire dont elle détermine en toute indépendance les objectifs monétaires intermédiaires, les instruments et les modalités d'exécution qu'elle fixe par voie d'instruction ». A l'instar de celles des plusieurs pays africains, la politique monétaire de la Banque Centrale du Congo se fonde sur le régime de ciblage monétaire.

Dans sa logique de fonctionnement, cette stratégie d'ancrage monétaire a comme cadre de référence l'équilibre tendanciel entre l'offre et la demande de la monnaie. En effet, un excédent ou une insuffisance de l'offre de monnaie par rapport à la demande débouche sur des tensions inflationnistes ou déflationnistes. Dans ce contexte, pour obtenir et maintenir la stabilité du niveau général des prix, la politique monétaire se doit de préserver un niveau adéquat d'offre de monnaie.

Dispositifs des objectifs

L'article 9 de la Loi précitée dispose qu'elle a pour objectif principal d'assurer la stabilité du niveau général des prix [30]. Sans préjudice de l'objectif de stabilité du niveau général des prix, la Banque soutient la politique économique générale du Gouvernement. Cet article consacre la focalisation de la politique monétaire sur la préservation de la stabilité du niveau général des prix, condition nécessaire à la croissance et au développement à long terme.

La Banque Centrale du Congo pratique le régime de ciblage monétaire avec comme objectif intermédiaire l'offre de monnaie en monnaie nationale(M1). L'objectif opératoire

[29] MN : Monnaie nationale et ME : monnaie étrangère. Compte tenu des facteurs explicatifs de l'offre de crédit et de la dollarisation de l'économie congolaise, les taux débiteurs sont supérieurs aux taux créditeurs.

[30] La politique monétaire de la BCC poursuit le maintien de la stabilité des prix à moyen terme. Elle se définit comme une progression annuelle de l'indice des prix à la consommation inférieure ou égale à 7%.

est la base monétaire au sens strict [31]. L'institut d'Emission doit veiller à tout moment à ce que le rapport entre l'offre de monnaie et la base monétaire, en d'autres termes, le multiplicateur monétaire soit stable.

Dans ce cas, la politique monétaire s'assure du contrôle de l'offre de monnaie à partir de la régulation de la base monétaire : toute augmentation ou diminution de la base monétaire entraine une évolution dans le même sens de l'offre de monnaie. Ainsi, en situation de stabilité du multiplicateur monétaire, un lien direct peut être établi entre la base monétaire et le niveau général des prix.

2.2.2 Les instruments de la politique monétaire

Les instruments utilisés par la BCC en vue d'orienter sa politique monétaire sont principalement : (i) le taux d'intérêt sur le refinancement, (ii) les coefficients de la réserve obligatoire, (iii) les appels d'offre des bons BCC et (iv) les interventions sur le marché de change.

a. Taux d'intérêt sur le refinancement

La BCC met à la disposition des institutions collectrices des dépôts de trois guichets de refinancement aux banques en vue de parer à tout asséchement de la liquidité dans le système bancaire, à savoir : prêt à court terme, facilités permanentes et prêt spécial.de refinancement.

- **Taux d'intérêt sur le guichet de prêt à court terme**

Le taux d'intérêt sur le prêt à court terme est le taux directeur [32]. Ce dernier est le point de départ des principales impulsions de la politique monétaire. En tant que taux débiteur, dans un contexte où les banques sont en Banque, une hausse ou une baisse du taux directeur a des répercussions sur les conditions de financement interne de L'économie.

En tant que taux créditeur, le taux directeur détermine les conditions de placement des actifs financiers à travers la rémunération des bons du Trésor et des bons de la Banque Centrale. Les transactions financières y afférentes portent sur le refinancement accordé par la BCC aux banques pour une maturité maximale de 7 jours.

- **Taux d'intérêt sur le guichet des facilités permanentes**

Les opérations des prêts y effectuées permettent à la BCC de fournir la liquidité aux banques pour une durée de 24 heures [33]. Le taux d'intérêt y appliqué est le taux directeur majoré d'une marge, lequel est actuellement de 1,0 point de pourcentage.

[31] Le premier indicateur est composé de tous les billets en circulation en dehors de la banque centrale et de l'ensemble des dépôts en monnaie nationale en les livres de l'Institut d'Emission et le second est constitué des billets en circulation en dehors du syst8ème bancaire et des dépôts à vue en monnaie nationale

[32] Le principe de sa manipulation est la flexibilité et positivité en terme réel.

[33] C'est une variante du taux directeur. Une banque emprunte des liquidités auprès de la BCC mais à un taux plus élevé et doit effectuer le remboursement sous 24 heures. C'est un mécanisme avec une utilité plus ponctuelle et donc sa durée est inférieure aux taux des prêts à court terme.

- **Taux d'intérêt sur le guichet de refinancement spécial**

Le guichet spécial de refinancement a été créé par la Banque pour un objectif spécifique, selon les besoins. En 2020, la Banque Centrale du Congo avait mis à la disposition des banques un guichet spécial, appelé « guichet Covid-19 », d'une maturité de 3 à 24 mois.

Ce guichet visait à : (i) assurer l'approvisionnement des grands centres urbains en denrées alimentaires et autres produits de première nécessité via les importations et les ramassages des productions locales ;(ii) augmenter les ressources des banques et leur permettre d'accroitre le financement de l'économie à des conditions financières 2assouplies.

Le refinancement au guichet spécial est consenti conformément aux garanties particulières définies par la Banque Centrale. Celle-ci tient, à cet effet, une liste des effets et titres admissibles à ce guichet.

b. Coefficients de la réserve obligatoire

En vue de faire face aux chocs structurels de l'économie, la Banque Centrale du Congo fait recours aux coefficients de la réserve obligatoire. Ces derniers sont discriminés, suivant la monnaie et la maturité des dépôts. A cet effet, quatre coefficients distincts sont utilisés [34] :

- Le coefficient sur les dépôts à vue en devises ;
- Le coefficient appliqué sur les dépôts à terme en devises ;
- Le coefficient appliqué sur les dépôts à vue en monnaie nationale ;
- Le coefficient appliqué sur les dépôts à terme en monnaie nationale.

Les différents dépôts et titres sont des assiettes à partir desquelles sont constituées les réserves obligatoires. Jusqu'à fin décembre 2021, les réserves obligatoires étaient levées en monnaie nationale, indistinctement de la monnaie de dépôts [35].

c. Appels d'offres des Bons Banque Centrale du Congo (Bon BCC)

Dans le cadre de la régulation de la liquidité à très court terme, la BCC émet un titre de dette appelé « Bon de la Banque Centrale du Congo » lequel est acheté par les banques commerciales moyennant rémunération via le taux directeur minimum.

Les opérations y relatives sont organisées suivant des fréquences hebdomadaires, mensuelle et trimestrielle. Le remboursement du principal et des intérêts intervient à l'échéance du titre.

d. Interventions sur le marché des changes

Les interventions sur le marché des changes ont eu pour motivation principale l'atténuation des fluctuations élevées du taux de change, et ce en vue d'en limiter les

[34] Les coefficients de la réserve obligatoire sur les dépôts en devises à vue et à terme sont respectivement de 13,0 % et 12,0 % et ceux sur les dépôts en monnaie nationale à vue et à terme sont de 12 ,0 % et 0,0 % respectivement

[35] L'année 2022 a été marquée par l'entrée en vigueur de la réforme portant sur la levée de la réserve obligatoire en monnaie des dépôts. Cette dernière devrait favoriser le financement de l'économie en monnaie nationale et poser les jalons de la dédollarisation de l'économie congolaise

effets sur l'inflation. Ainsi, la BCC peut, en cas de fortes volatilités du taux de change ou pour le besoin de conforter les réserves internationales, intervenir sur le marché des changes par la vente ou les achats des devises selon le cas[36].

2.2.3 Les contraintes de la politique monétaire en RDC

En dépit des avancées notables réalisées depuis 2002 en matière de stabilité des prix, d'importantes contraintes continuent de réduire la portée et l'efficacité de la politique monétaire. Cela inclut le niveau élevé de dollarisation, le faible développement du s8ystème bancaire et des marchés des capitaux, l'exposition de l'économie au risque de volatilité des prix à l'importation, et finalement le faible développement du marché intérieur.

a) **La forte dollarisation de l'économie**

Depuis quelques décennies, l'économie congolaise est fortement dollarisée [37], ce qui a des conséquences sur l'exécution de la politique monétaire, le développement financier et la stabilité systémique. A cet égard, près de 90 % des dépôts et des prêts du secteur bancaire sont en dollars USD et l'essentiel de transactions dans l'économie se réalisent en devises. Etant donné, les instruments de la politique monétaire agissent essentiellement sur la partie en monnaie nationale de la masse monétaire, l'influence des instruments est limitée.

b) Le faible développement du système bancaire et des marchés financiers

L'économie congolaise est faiblement monétarisée et bancarisée. Le taux d'inclusion financière est de 14,8%. L'essentiel des moyens des paiements circule dans quelques grands pôles d'activités. Le faible de développement des marchés financiers limite l'incidence des variations du taux directeur sur le reste de l'économie.

c) L'exposition de l'économie au risque de volatilité des prix à l'importation et à l'exportation

L'économie congolaise est fortement dépendante de l'extérieur. Des tensions sur les marchés internationaux des produits de base, notamment les produits pétroliers et alimentaires se répercutent directement sur les prix intérieurs entrainant ainsi des pressions inflationnistes d'ampleur non négligeable. Il en est de même pour les fluctuations des cours internationaux du cuivre et du cobalt, principaux produits d'exportation de la RDC

2.3. Description du marché interbancaire

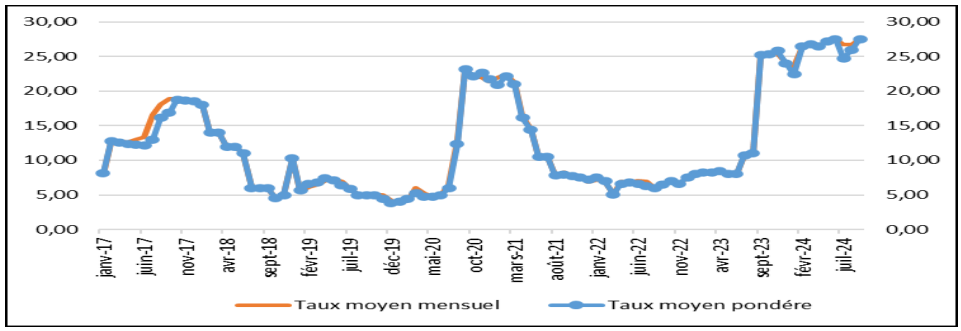
Le marché interbancaire est un compartiment du marché monétaire réservé aux banques sans recours au refinancement près la BCC. Les transactions se réalisent via un système de télécompensation interbancaire, lequel est géré par la BCC. Elles portent essentiellement sur les opérations de prêts et d'emprunt en monnaie nationale. Les participants au marché interbancaire sont libres d'exiger à la contrepartie le nantissement des effets et titres publics ou privés de bonne qualité en couverture de leurs prêts.

[36] Elle intervient alors par voie d'adjudication, essentiellement sur la base de la méthode hollandaise.

[37] Le taux de dollarisation financière s'élève à 88,7%.

Les échanges entre les banques se font au taux du marché interbancaire : le prix 2de l'argent au jour le jour. Ce prix est calculé en faisant la moyenne des taux pratiqués dans la journée. La Figure (35) présente l'évolution du taux moyen et du taux moyen pondéré qui représentent le coût du crédit sur le marché interbancaire.

Figure 35: Evolution des taux sur le marché interbancaire



Source: BCC

Le marché interbancaire est caractérisé par la présence d'un nombre limité des banques compte tenu de sa structure oligopolistique. Concernant le nombre d'opérations effectuées par année sur ce marché, il augmente fortement de 2007 à 2010, passant de 127,5 millions de CDF à 2153,3 millions de CDF, se stabilise entre 2011 et 2012 suite à la stabilité du cadre macroéconomique, avant de connaitre une remontée en 2014.

Table 35– Transactions quotidiennes sur le marché interbancaire

Emprunteuse	Banque Prêteuse	Date Opération	Montant	Taux	Nbre Jours
ECOBANK	TMB	9-juil.-24	15 000 000 00,00	27,50	7,00
EQUITY BCBC	TMB	11-juil.-24	40 000 000 00,00	27,50	1,00
ECOBANK	TMB	16-juil.-24	25 000 000 00,00	27,50	7,00
ECOBANK	FBNB	16//07/2024	10 000 000 00,00	26,00	7,00
SOFIBANK	FBNB	17-juil.-24	10 000 000 00,00	26,00	7,00
SOFIBANK	FBNB	25-juil.-24	10 000 000 00,00	26,00	14,00
SOFIBANK	SOLIDAIRE	14-août-24	1 500 000 000,00	26,00	7,00
SOFIBANK	SOLIDAIRE	21-août-24	1 500 000 000,00	26,00	14,00
UBA	TMB	3-sept.-24	10 000 000 00,00	27,50	1,00
ECOBANK	FBNB	2-oct.-24	10 000 000 00,00	26,00	7,00
ECOBANK	TMB	14-oct.-24	20 000 000 00,00	27,50	7,00
ECOBANK	TMB	18-oct.-24	20 000 000 00,00	27,50	3,00

Source : BCC

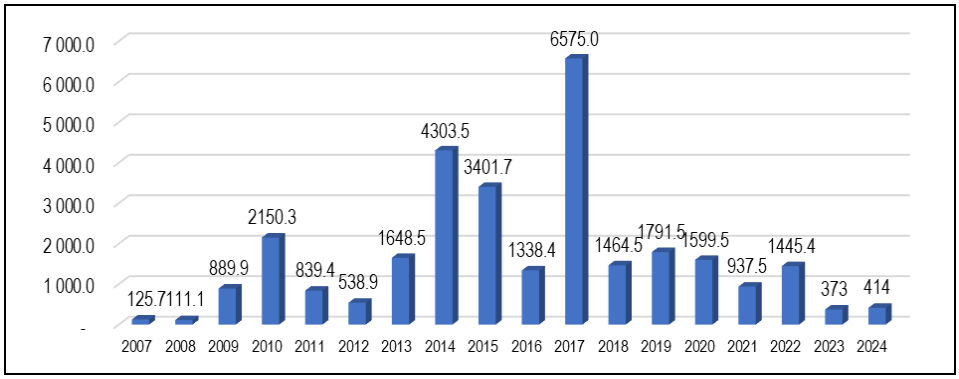
Les échanges sur le marché interbancaire ont continué de s'intensifier entre 2015 et 2016 malgré un niveau bas lié notamment à la baisse de la confiance constatée dans le système

bancaire, consécutivement aux décisions de redressement des banques en difficulté et de leur suspension en chambre de compensation.

A l'exception de l'année 2012, le volume des transactions interbancaires passe progre8ssivement de 125,7 millions en 2007 à 6575,0 millions de CDF en 2017. Ceci s'explique par le fait que les banques qui étaient en position courte en monnaie nationale ont recouru au marché interbancaire de manière active dans un contexte de surchauffe sur les principaux marchés [38].

Il sied de noter que généralement les banques recourent au marché interbancaire a un coût moins élevé que de se refinancer auprès de la Banque centrale lorsque celle-ci augmente son taux directeur et que les opérations en interbancaire, sont faites essentiellement pour raison du respect des exigences de réserve obligatoire et à ses engagements à court terme. Par conséquent, ils ne constituent pas une source de financement de taille pour les banques commerciales dans l'octroi de crédit.

Figure 36: Evolution du volume annuel des transactions sur le marché interbancaire (en millions de CDF)[39]



Source : BCC

IV. Cadre D'analyse Emprique

Méthodologie

La littérature empirique s'est largement appuyée sur la méthodologie VAR. Depuis les travaux pionniers de Sims (1980), cette méthodologie s'est imposée comme un cadre bien indiqué pour étudier les effets des chocs de politique monétaire sur les variables macroéconomiques (Bernanke et al., 2005 ; Belviso et Milani, 2006). L'un des principaux avantages de l'utilisation de VAR réside dans sa capacité à prévoir les effets d'un choc sur une autre variable. Dans ce contexte, les effets des chocs de politique monétaire sur les taux d'intérêt pertinents et sur le volume du crédit.

[38] Relèvement du taux directeur (de 7 à 14%, puis de 14 à 20%) suite aux tensions observées sur le marché des biens et services induite par la forte dépréciation observée sur le marché de change, en 2017.

[39] La quasi-totalité des prêts supérieurs à 10 milliards de CDF se font entre les banques de grande taille et la plupart des transactions concernent des maturités inferieures à un mois.

Selon la revue de littérature sur les modèles VAR et leurs extensions, La méthode de décomposition des chocs initialement préconisée par Sims (1980) reposait sur la décomposition de Cholesky suivant un schéma récursif. Les processus VAR structurel ont ensuite permis d'introduire une méthode d'identification reposant sur des restrictions issues de la théorie économique et non nécessairement récursives.

Dans un premier temps, les travaux initiaux de Sims (1992) et Bernanke (1986) ont été poursuivis par l'article séminal de Blanchard et Quah (1989) dans lequel les auteurs fixent des restrictions sur les éléments de la matrice des variances de long terme (On peut également signaler les travaux de Shapiro et Watson (1988).

Le modélisateur fixe alors les contraintes sur l'effet multiplicateur cumulé total de long terme d'un choc sur une variable. Par exemple, il peut poser comme contrainte qu'un choc monétaire n'a pas d'effet de long terme sur le taux de change réel, c'est-à-dire qu'à la suite de ce choc, le taux de change réel peut varier à court et moyen terme mais qu'à long terme il tend asymptotiquement vers sa valeur initiale.

Dans un deuxième temps, Galí (1992) propose un schéma d'identification combinant contraintes de court et long termes afin de différencier les chocs de demande suivant qu'ils aient ou non un effet à long terme sur le PIB. Plus récemment, une série d'articles (Faust, 1998 ; Canova et De Nicolò, 2002 ; Uhlig, 2005) a introduit une nouvelle méthode d'identification ayant recours à des restrictions sur les signes des réponses. Dans ce cas, le modélisateur suppose, théorie économique à l'appui, que certaines réponses aux chocs doivent avoir un signe spécifique (Gossé et Guillaumin, 2011).

Le modèle SVAR (structural VAR) a ainsi permis à de nombreux auteurs de quantifier les effets multiplicateurs, instantanés et dynamiques, des politiques économiques (monétaire, budgétaire et fiscale) sur l'activité économique. (On peut citer, entre autres, (Bernanke, 1986; Blanchard et Watson, 1986; Sims, 1992; Gerlach et Smets, 1995; Blanchard et Perotti, 2002).

Au regard de la littérature empirique, le cadre économétrique choisit en vue d'analyser empiriquement la façon dont les changements de politique monétaire se transmettent aux variations des taux interbancaires, des taux débiteurs et du volume du crédit est la modélisation SVAR. La motivation du choix de cette modélisation tient du fait qu'elle est appropriée en vue de simuler les chocs politique monétaire sur les autres variables d'intérêt.

Données et Description des variables

Les données utilisées sont tirées des différents rapports de la Banque Centrale du Congo couvrant la période 2012-2021, et sont observées sur une fréquence mensuelle. Dans le cadre de notre étude, nous avons retenu les variables suivantes :

- *le taux d'intérêt directeur nominal de la BCC(TX_DIR)* : Il représente le taux auquel les banques empruntent directement de l'argent au guichet de la banque centrale pour se refinancer ;
- *le taux d'intérêt interbancaire(TMM)* : Il indique le taux auquel les banques se prêtent entre elles sur le marché interbancaire. C'est la moyenne des taux des prêts

remboursables en un jour que les banques se sont accordées entre elles ;

- *le taux d'intérêt débiteur des banques commerciales(TX_BCM)* : il correspondant au taux auquel les banques accordent les crédits à l'économie. Il est capté précisément en termes de moyenne des taux débiteurs nominaux des banques en monnaie nationale ;
- *le crédit à l'économie(CREDIT).* : Il s'agit du stock de crédit au secteur privé octroyé au niveau du secteur bancaire congolais en monnaie nationale.

Spécification du modèle

Considérons un modèle VAR représenté sous forme réduite comme suit :

$$Y_t = \sum_{i=1}^{L} B_i Y_{t-i} + u_t, t = 1, \dots, T \; E[u_t u_t'] = \Sigma \qquad (1)$$

Où Y_t représentent *m x 1* vecteurs et L désigne la taille du modèle VAR, sont les mxm matrices des coefficients et µt est l'erreur de prévision. En supposant qu'il existe m choc mutuellement indépendants et normalisés à la variance 1, nous aurons $E[u_t u_t'] = I_m$.

Le processus d'identification de ces chocs revient à identifier la matrice A, telle que $u_t = Av_t$ et $AA' = \Sigma$.

De ce qui précède, la forme réduite du modèle VAR peut être représentée comme suit :

$$X_t = \mu_0 + A(L)X_{t-i} + u_t \qquad (2)$$

$$E[u_t] = 0; E[u_t, u_t'] = \Sigma; \; E[u_t, u_s'] = 0 \; for \; s \neq t$$

Avec $X_t = \{Taux \; directeur, taux \; interbancaire, taux \; débiteur, \; crédit\}$

Où μ_0 est le vecteur des constantes, *A(L)* représente la matrice des coefficients et u_t désigne les vecteurs d'erreur de prévision.

La transformation du modèle VAR de la forme réduite (équation1) à la forme structurelle, consistera à la multiplier par la matrice pour donner ce qui suit :

$$A_0 X_t = A_0 \mu_0 + A_0 A(L) X_{t-i} + A_0 u_t \qquad (4)$$

Où $Be_t = A_0 u_t$ décrit la relation entre les chocs structurels e_t et les erreurs de mesures de la forme réduite u_t. Les chocs structurels sont supposés non-auto corrélés et la matrice variance-covariance des chocs structurels Σ_e est supposée diagonale. La matrice A_0 décrit les relations contemporaines entre les variables composantes du vecteur X_t.

En principe, la modélisation VAR considère toutes les variables comme étant endogènes et la plupart des contributions à la littérature des modèles SVAR se sont essentiellement basées sur les restrictions sur la matrice A_0 des coefficients contemporains en vue de donner au modèle une structure économique.

Dans le cadre de cette étude, les variables du modèle sont classées selon l'ordre suivant :

$$y_t' = (Tx\_dir_t, Tmm_t, Tx\_bcm_t, Credit_t,) \qquad (5)$$

L'imposition des restrictions sur la matrice des coefficients contemporains se présente comme suit :

$$\begin{vmatrix} 1 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 \\ a_{41} & a_{42} & a_{43} & 1 \end{vmatrix}$$

La détermination du nombre de retards optimal du modèle VAR à estimer, sur base de la comparaison des critères d'information LR, AIC, SC et FPE suggèrent un décalage optimal de 2 (cfr. Annexe n°4). Globalement le modèle satisfait aux tests usuels post estimation (stabilité, autocorrélation des résidus, (cfr. Annexe n°5 et 6)

V. Présentation et interprétations des résultats

L'analyse des fonctions des réponses impulsionnelles

L'analyse des fonctions des réponses impulsionnelles consistent à analyser l'effet de chaque choc aléatoire sur chacune des variables du système dynamique estimé. Cette analyse va permettre à évaluer les réactions des autres variables suite aux chocs simulés sur certaines variables.

En vue d'évaluer la manière dont les changements de politique monétaire se répercutent sur les variations des taux interbancaires, des taux de prêt et affectent le volume du crédit, il a été retenu à cet effet trois variables de chocs, à savoir : le taux directeur, le taux du marché interbancaire et le taux débiteur des banques. Les principaux résultats sont présentés dans les Figures (1.3) ; (1.4) et (1.5) qui contiennent différents graphiques regroupés.

a) Effet d'un choc positif provenant du taux directeur

Le choc sur le taux directeur à un effet positif sur le taux d'intérêt du marché interbancaire au cours des trois premiers mois avant de s'estomper au bout de 6 mois après la survenance du choc). Ceci s'expliquerait le fait que le taux interbancaire est influencé par le comportement du taux directeur[40] **(Graphique n°1).**

Le choc sur le taux directeur a un effet positif sur le taux débiteur des banques en monnaie nationale. En effet, l'analyse des réponses impulsionnelles **(Graphique n°2)** révèle que le taux débiteur des banques réagit faiblement et positivement à une révision à la hausse du taux directeur pendant les deux premiers mois mais a un effet non significatif sur le taux débiteur des banques en monnaie nationale [41]. Ce résultat peut s'expliquer entre autres par la prépondérance des autres paramètres, notamment la prime

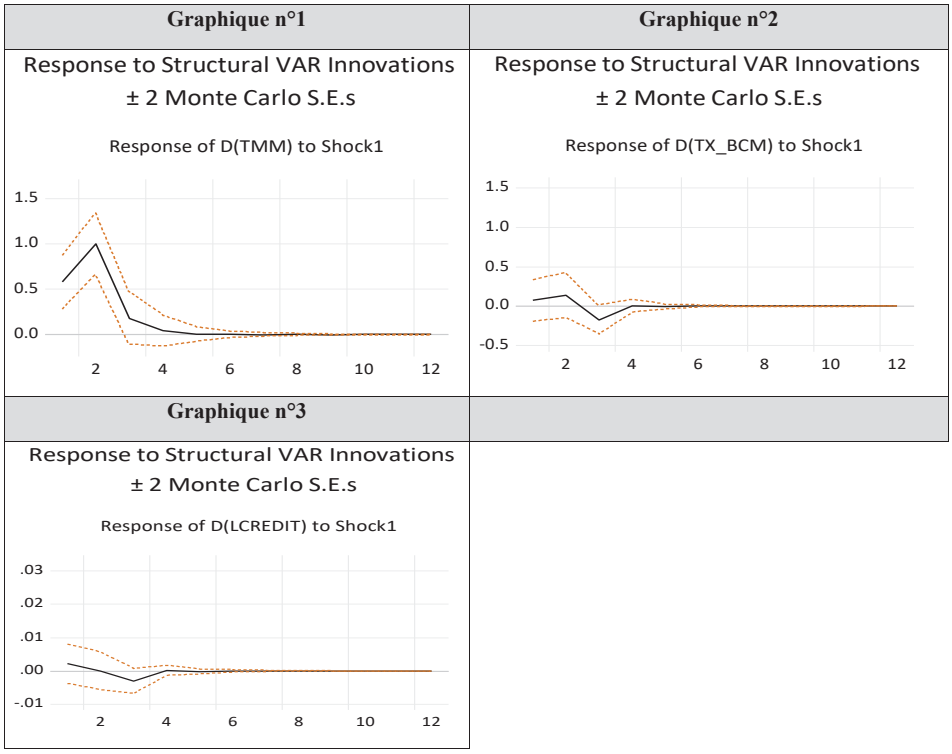
[40] En effet, le marché interbancaire est une constituante du marché monétaire. Ce dernier est directement influencé par les taux directeurs que pratiquent les banques centrales.

[41] Les analyses monétaires et économiques au sein de la BCC mettent en évidence un lien réel, bien que distendu et décalé dans le temps, entre les variations du taux directeur et les taux débiteurs.

de liquidité, la marge de risque des crédits et les coûts d'exploitation, dans la structure du taux débiteur en monnaie nationale.

Le choc sur le taux directeur exerce un effet non significatif sur le volume du crédit en monnaie nationale **(Graphique n°3)**. Cet effet s'expliquerait par le fait que le taux d'intérêt directeur de la BCC a très peu d'influence sur les décisions d'emprunt, qui se prennent surtout en dollars US. De ce fait, toute modification de l'instrument principal de la politique monétaire, qui n'agit que sur la partie des crédits accordés en monnaie nationale, n'aura qu'un impact marginal sur l'ensemble du portefeuille du crédit [42].

Figure 37: Réponse des variables suite à une hausse du taux directeur



b) Effet d'un choc positif provenant du taux interbancaire

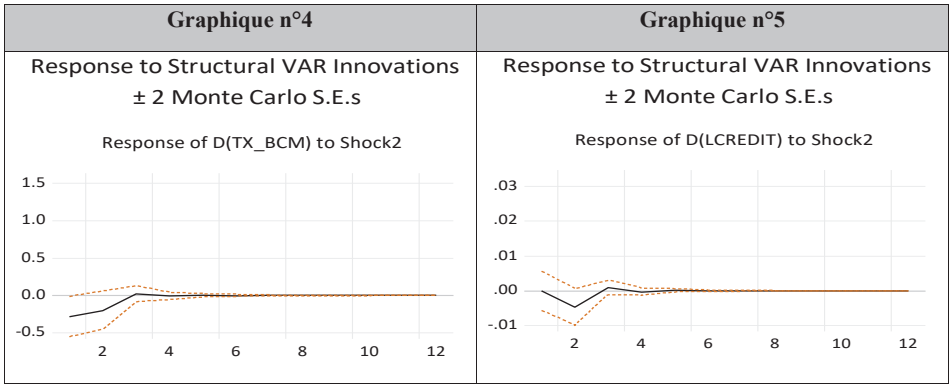
Le choc sur le taux interbancaire a un effet globalement négatif et non significatif sur le taux débiteur des banques (Graphique n°4). Cela s'expliquerait par le fait que les banques en RDC s'en serviraient difficilement pour fixer leur taux débiteur (problème de maturité avec ces emprunts qui couvrent essentiellement les besoins de liquidité).

Le choc provenant du taux interbancaire a un effet négatif et non significatif sur le volume du crédit en monnaie nationale (Graphique n°5). Cet effet non significatif se justifierait par le fait que les banques sont obligées de détenir suffisamment de monnaie

[42] Le crédit libellé en monnaie nationale ne représente que près de 10% à 12% dans l'ensemble du portefeuille du crédit avec un coût très élevé. Quel que soit le niveau du taux directeur, les banques préfèrent accorder les prêts en monnaies étrangères qu'en monnaie nationale

nationale pour satisfaire aux impératifs de réserves obligatoires, ce qui a pour effet d'évincer le crédit en monnaie nationale[43].

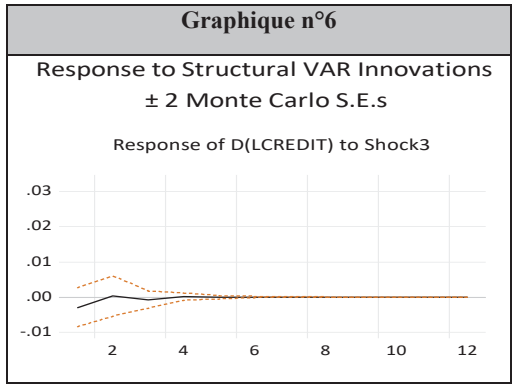
Figure 38: Réponse à un choc du taux interbancaire



c) Effet d'un choc positif provenant du taux débiteur

La hausse du taux débiteur des banques a un effet faible et n'a pas d'impact significatif sur le crédit en monnaie nationale. Cet effet non significatif s'explique par le fait que du coût très élevé du crédit dû aux charges d'exploitation, au risque pays, au niveau de la dollarisation et à l'étroitesse du marché.

Figure 39: Réponse à un choc du taux débiteur



Analyse de la décomposition de la variance

La décomposition de la variance de l'erreur de prévision a pour objectif de calculer pour chacune des innovations sa contribution à sa variance de l'erreur.

La variation du taux débiteur des banques est expliquée à 90,95% par sa persistance, à 2,32% par la variation du taux directeur, à 5,00% par la variation du taux

[43] Les opérations en interbancaire sont essentiellement faites pour raison du respect des exigences de réserve obligatoire ce qui a pour effet d'évincer les prêts en monnaie nationale.

interbancaire et à 1,72% à celles du crédit.

Hormis sa persistance qui explique à 61,04% la variance du taux interbancaire, l'analyse de la décomposition de sa variance révèle qu'il est expliqué à 35,8% par les variations du taux directeur. Quant au taux débiteur et au crédit, leurs variances expliquent celles du taux interbancaire respectivement à 2,1% à et à 0,9%.

Enfin, la variation du crédit en monnaie nationale est expliquée à 95,39% par sa persistance, à 1,33% par la variation du taux directeur, à 2,33% par la variation du taux interbancaire et à 0,93% à celles du taux débiteur.

Discussions des résultats

Il ressort des résultats de l'estimation du modèle SVAR qu'il existe en RDC, une désarticulation entre les taux d'intérêt et le volume du crédit en monnaie nationale. En effet, ils indiquent une transmission significative du taux directeur au taux du marché interbancaire et une absence de transmission du marché interbancaire aux taux débiteurs des banques et au marché du crédit. A cet égard, les variations du taux du marché interbancaire ne sont pas transmises à l'ensemble de la structure des taux d'intérêt et n'affectent pas les conditions d'emprunt des agents économiques.

Ces résultats rejoignent ceux trouvés par plusieurs études, qui affirment que la répercussion du taux directeur vers les autres taux d'intérêt dans l'économie est faible et limitée. (Fisher et al., 2013 ; Nsumbu, 2019 ; Siasi et al., 2020).

Cependant, ils contredisent les conclusions des études qui ont trouvés que les variations du taux directeurs se répercutent sur les autres taux d'intérêt pertinents dans l'économie, (Kwapil et Scharler 2010; Karagiannis et al., 2010 ; Mishra et al., 2010; Kovanen, 2011; Kanyumbu, 2021).

En RDC, ces résultats sont attribuables du fait d'un faible degré d'approfondissement financier et d'un niveau relativement élevé de dollarisation financière. Par conséquent, la profondeur et la liquidité limitées du marché interbancaire empêchent le système bancaire de transférer efficacement les impulsions monétaires aux marchés financiers.

VI. Conclusion Et Recommandations De Politique

Selon les termes de référence de l'étude édicté par l l'Institut monétaire du COMESA (IMC), les principaux objectifs de l'étude sur les marchés interbancaires et l'efficacité de la politique monétaire sont d'examiner : i) dans quelle mesure les taux interbancaires sont alignés sur la politique monétaire ; et ii) avec quelle force et quelle rapidité les variations des taux interbancaires sont transmises à d'autres taux d'intérêt pertinents.

De ce fait, le cadre analytique suggéré a mis en évidence le marché interbancaire comme mécanisme de transmission de la politique monétaire. L'approche empirique utilisant la modélisation SVAR a mis en exergue le taux d'intérêt directeur et le taux d'intérêt du marché interbancaire susceptible d'influencer les taux débiteurs des banques d'une part et le volume du crédit d'autre part.

Ainsi, les principaux résultats de cette étude montrent que (i) le taux sur le marché interbancaire s'aligne sur le taux directeur ; (ii) le volume du crédit en monnaie nationale n'est pas sensible aux variations des taux d'intérêt ; (iii) le taux débiteur des banques est moins réactif aux variations du taux interbancaire et au taux directeur de la Banque centrale.

Ces résultats traduisent que la transmission de la politique monétaire en RDC est très faible : Les interventions monétaires sur les marchés interbancaires et de crédit sont entravées par l'absence de marché monétaire efficace, un système financier peu développé dans contexte de forte dollarisation de l'économie congolaise.

Dans le cadre d'une extension pour les recherches futures, l'efficacité de la politique monétaire pourrait être évaluée par rapport à l'efficacité des processus sous-jacents au mécanisme de transmission et par rapport au but final, qui est l'inflation.

Ainsi, cette étude appelle les recommandations suivantes :

◈ La BCC devrait renforcer les mesures (supervision bancaire, surveillance des marchés, système de résolution des défaillances bancaires.) visant la solidité du secteur bancaire permettant une meilleure allocation des liquidités entre les établissements financiers et la fixation du prix de la liquidité, lequel influe sur le marché du crédit ;

◈ Poursuivre les mesures dédollarisations de l'économie congolaise à moyen et long terme ;

◈ Accroitre le degré de développement financier (notamment le développement du marché secondaire et du dépositaire central des titres, la mise en place de l'autorité du marché) pour une meilleure transmission de la politique monétaire au reste de l'économie.

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Annexes

Annexe n°1: Statistiques descriptives

Date: 11/09/24
Time: 02:08
Sample: 2012M01 2024M07

	TX_DIR	TMM	TX_BCM	LCREDIT
Mean	1.998133	1.689529	3.118796	15.13434
Median	2.140066	1.796747	3.149311	15.04663
Maximum	3.218876	3.314186	3.662022	16.94295
Minimum	0.693147	-1.386294	2.840247	13.74975
Std. Dev.	0.870496	0.979513	0.152079	0.844230
Skewness	-0.348021	-0.163382	0.463698	0.348916
Kurtosis	1.805965	2.230736	3.564672	2.194939
Jarque-Bera	12.01830	4.394991	7.417362	7.141621
Probability	0.002456	0.111081	0.024510	0.028133
Sum	301.7182	255.1189	470.9382	2285.285
Sum Sq. Dev.	113.6645	143.9170	3.469188	106.9086
Observations	151	151	151	151

Annexe n°2 : Test de corrélation

Covariance Analysis: Ordinary
Date: 11/09/24 Time: 02:10
Sample: 2012M01 2024M07
Included observations: 151

Correlation Probability	TX_DIR	TMM	TX_BCM	LCREDIT
LRATE	1.000000 -----			
LIBM	0.911765 0.0000	1.000000 -----		
LLR	0.634045 0.0000	0.456101 0.0000	1.000000 -----	
LCREDIT	0.598408 0.0000	0.690989 0.0000	0.277349 0.0006	1.000000 -----

Annexe n°3: Test ADF

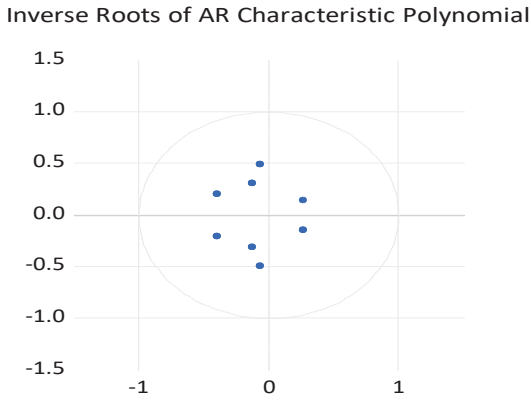
Variables	Test ADF	
	Niveau	1ère différence
TX_DIR	-2.946867 [0.1511]	-10.91146 [0.0000]
TMM	-2.271840 [0.4462]	-16.82281 [0.0000]
TX_BCM	-3.421220 [0.0525]	-4.000255 [0.0001]
LCREDIT	-0.037552 [0.9954]	-6.374093 [0.0000]

Annexe n°4 : Sélection du lag optimal du modèle VAR

VAR Lag Order Selection Criteria
Endogenous variables: D(TX_DIR) D(TMM) D(TX_BCM) D(LCREDIT)
Exogenous variables: C
Date: 11/08/24 Time: 23:02
Sample: 2012M01 2024M07
Included observations: 142

Lag	LogL	LR	FPE	AIC	SC	HQ
0	471.9340	NA	1.61e-08	-6.590620	-6.507357*	-6.556785
1	511.2648	75.89182	1.16e-08	-6.919223	-6.502909	-6.750050*
2	529.0414	33.29975	1.13e-08*	-6.944245*	-6.194880	-6.639733
3	537.6884	15.71085	1.26e-08	-6.840682	-5.758267	-6.400832
4	549.9215	21.53700	1.33e-08	-6.787626	-5.372160	-6.212438
5	562.8266	21.99331	1.40e-08	-6.744037	-4.995519	-6.033510
6	580.9672	29.89369*	1.36e-08	-6.774186	-4.692618	-5.928322
7	589.8200	14.08963	1.52e-08	-6.673521	-4.258902	-5.692318
8	593.6855	5.934301	1.82e-08	-6.502612	-3.754942	-5.386071

Annexe n°5 : Test de stabilité



Annexe n°6 : Test post estimations

VAR Residual Serial Correlation LM Tests
Date: 11/08/24 Time: 23:05
Sample: 2012M01 2024M07
Included observations: 148

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	14.65568	16	0.5500	0.916625	(16, 403.9)	0.5501
2	51.31022	16	0.0000	3.357525	(16, 403.9)	0.0000
3	19.93654	16	0.2231	1.255007	(16, 403.9)	0.2232

PART 3

IMPLICATIONS OF FINTECH ON FINANCIAL STABILITY

1. Implications of Fintech on Financial Stability Evidence from Zambia

Nason Kapako, Maureen M. Mulenga, Abraham Alutul, Wise Banda and Mulenga Chonzi Mulenga

I. Introduction

The increased application of technology in the financial sector has revolutionized the delivery of financial services and products globally. Fintech, which is commonly referred to as the use of technology in the provision of financial services, has been credited with accelerating positive change in the financial sector. From the development of innovative financial products ranging from loans, insurance, payments, and investment services to enhancing efficiency, reducing costs, and accelerating financial inclusion, fintech is reshaping the financial system as we know it. In achieving this, FinTech has increasingly become interdependent with other segments of the financial system. The fintechs on the one hand, either elevate vulnerability through competition with financial institutions subjected to stringent regulation or create regulatory arbitrage. On the other hand, it enhances financial stability by enabling financial institutions to leverage on technologies that vet borrowers and manage asset and liabilities, which minimize credit and liquidity risks. Hence, the contribution of fintechs to financial system stability is an empirical question

Therefore, this paper attempts to answer the question of whether fintech development has an implication on financial stability in Zambia. Studies on the relationship between fintech and financial stability are few in Zambia even if regulatory bodies have compiled data on fintechs to monitor their growth and development as well as their impact on the financial system. However, to the best of our knowledge, this paper provides an initial attempt to empirically analyze the impact of technological advancement on the financial sectorial stability in Zambia. This will shade some light on how financial innovations underpin financial stability or create vulnerability in Zambia. Specifically, the study attempts to identify and describe measures of financial sector stability in Zambia and assesses the impact of digital products and services on banks' non-performing loans, liquidity, profitability, and capital adequacy.

Empirical results reveal that fintech promotes financial stability as digital remittances help improve banks' liquidity and solvency, while increased usage of point-of-sale dampens credit risk. Conversely, digital remittances undermine financial stability by weighing on banks profitability. Therefore, to encourage the adoption and usage of mobile payments, digital remittances and point of sale services, there is need to reduce costs of using these channels and developing regulations that encourage competition and innovation.

The rest of the study is structured as follows. Section 2 highlights the background information in terms of fintech trends, their growth, and financial stability concepts. Section 3 outlines the literature review, while section 4 describes the

methodology used in the study. Section 5 highlights a discussion of research findings while section 6 concludes the study.

II. Evolution of Fintech Trends and Financial Stability

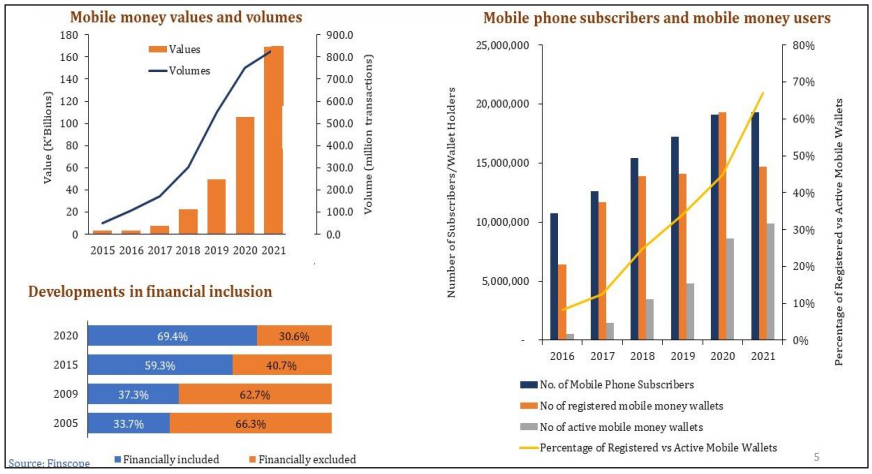
The growing trend towards the need for fast and efficient payment solutions for most people globally has led to the increased uptake of digital mobile payment platforms leveraging technology (Flejterski & Labun, 2016). Whereas fintech is simply defined as the usage of technology in providing new and improved financial services (Thakor, 2019), the Financial Stability Board's (FSB) broad definition emphasizes the technological aspect of innovation in the financial sector that results in new products, models, processes, or applications and these can materially affect the financial markets and the provision of financial services (Financial Stability Board, 2017). It includes among others, cloud computing; robotics; artificial intelligence (AI) and machine learning; mobile applications; big data analytics; blockchain or distributed ledger technology (DLT); cryptography; and quantum computing. Financial areas affected by Fintech include resource mobilization such as crowdfunding, investment, exchanges, and crypto currencies.

In Zambia, the application of technology in the provision of financial services and products includes debit and credit cards, internet and mobile banking, automated teller machines (ATMs), point of sale (PoS), e-commerce, mobile money, and digital credit. There is also an increase in the application of WhatsApp and barcodes in facilitating payments and other financial services. There are broadly 78 entities which are deemed fintech related, of which 43 are payment systems businesses. Of the fintech services offered, the fastest growing has been mobile banking. Against a backdrop of a sharp increase in mobile phone and subscription bases, the adoption of mobile money (MoMo) platforms in the country has increased rapidly. Considering that mobile phones allow individuals to transact anywhere and anytime, the rise in mobile payments is arguably an indicator that fintech has had positive impact on the financial sector and financial inclusion, (Figure 40).

It can be observed from Figure 40 that in Zambia, mobile platforms constitute key channels through which Fintech developments are thriving. Fintech technologies are now integrated through the traditional banking sector and other utility services platform for push and pull transaction processing as well as bill payment, insurance, travel bookings, among others.

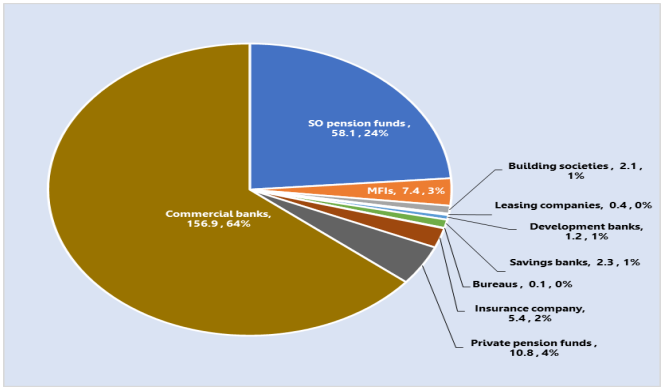
Furthermore, Zambia's MoMo platforms have equally been used to provide digital credit in partnership with the traditional banking systems. As at end of second quarter of 2022, the value of digital loans disbursed through the mobile money operators increased by 54% to K1.0 billion ($63.0 million) while the volume of loans disbursed increased by 39% to 3,462,642.

Figure 40: Mobile Money, Subscription and Financial Inclusion



According to Financial Stability Board, financial system is deemed stable if it is resilient to shocks and able to sustain intermediation of funds, facilitate payments and distribute risks across agents and overtime. The effectiveness of financial institutions to intermediate funds and risks decline when their liquidity, solvency and viability reduces. Therefore, financial soundness indicators mainly include capital adequacy, asset quality, liquidity and profitability. The banking sector constitute a significant proportion of the financial system and hence, its stability affects the stability of the financial system and the economy. As a result, policy makers have employed supervisory and regulatory measures to enhance the stability of the banking sector (Barth et al., 2006). In Zambia, commercial banks dominate the financial system, accounting for 64% of the financial sector's total assets (Figure 41)

Figure 41: Financial Sub-Sector Assets, K'billion, % Share as of 31 Dec 2021

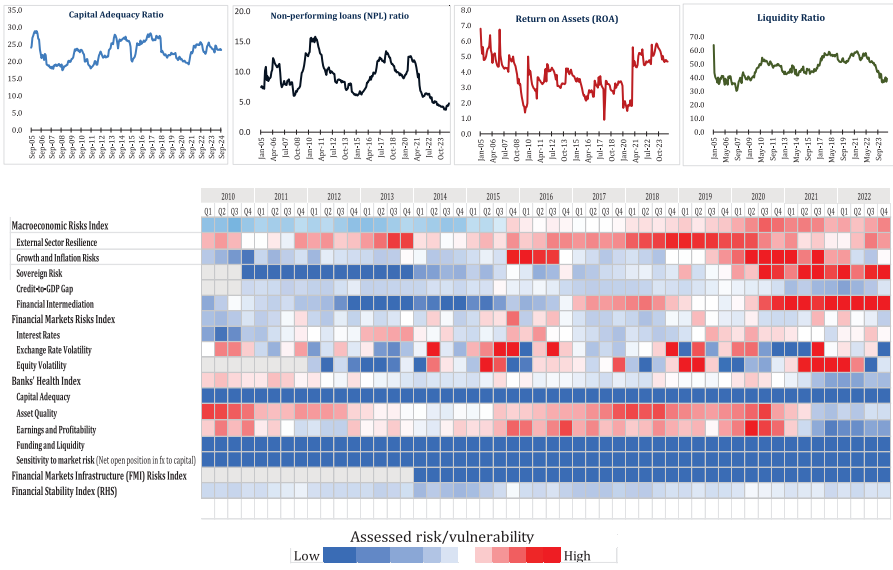


Just like most African economies, Zambia experienced shocks that have had implications on the financial sector over the period under review. For instance, foreign exchange shocks caused a decline in copper prices and unsustainable public debt increased volatility in the foreign exchange market, leading to the depreciation of the Kwacha by

72 % in 2015. On 28 September 2015, the exchange rate depreciated by 16% against the dollar, the largest intra-day loss of all time. Consequently, inflation tripled to 21.1% at the end of 2015, and the central bank reacted by increasing its policy rate by 600 bps, restricting access to the overnight lending facility and tightened the statutory reserve requirement (see heatmap in Figure 42)[44] .

These shocks were transmitted to the banks which experienced a deterioration in the quality of assets, as well as decline in profitability. A decline in profits reduces reserves which are used to build capital and liquidity buffers to shocks. The increase in banking sector NPLs moderated, when the impact of tightening of monetary policy filtered into the economy, which led to a slowdown in the depreciation of the Kwacha against regional and international currencies. The monetary policy actions stabilized the exchange rate, inflation and interest rates. However, tight monetary policy conditions reduced uptake of new loans and slowed down economic growth and reduced the ability of borrowers to repay their loans. As a result, NPLs increased, which compelled banks to increase loan loss provisioning. Profitability also declined, with ROA declining to a 4-year low of 0.8% and ROE to 6.6%. Although commercial banks' liquidity and solvency were adversely affected, they still remained robust largely due to the capital reforms of 2012 that boosted their capital buffers.

Figure 42: Zambia CAELS and Financial Stability Heatmap



Digital financial developments, both domestic and foreign, have improved the provision of financial services, uptake and utilization of financial services as well as increased

[44] A heat map is a two-dimensional representation of data in which values are represented by colours. It shows a visual summary of information and becomes relevant when used to present the historical evolution and movement across many time series. Ideally, a heat map displays the evolution of distress in the financial system and the macroeconomy based on prescribed risk categories. These are low, moderate, and high. They are the assigned colours, namely, green for low risk, amber for moderate and red for high. While the colours are assigned to fixed scales in the case of those indicators with pre-determined trigger points, they are assigned to relative values where the percentile system is used

the diversity of assets and liabilities, leading to enhanced stability of financial services providers. However, the fintechs increases interlinkages and interconnectedness in the financial system, thereby elevating contagion risks. Fintech also have developed to either compete with or cooperate with existing traditional financial systems as they serve the same market segments. The increase in competition in the financial sector compels financial services providers to take excessive risks (Financial Stability Board, 2017). In addition, risks in the financial sector are augmented by nascent regulatory framework for fintechs as well as the tendency of regulation lagging innovations in the financial sector (IMF, 2021).

The FSB (2017) further argues that the impact of fintech on financial stability is limited due to the small transactions and loans dispensed compared to those extended by traditional financial intermediaries. Hence, fintech increase financial inclusion, diversity in loan portfolio and borrowers as well as increase competition, which is catalyst for innovation to improve efficiency in the financial sector. Risks on the other hand include potential deterioration of lending standards, increased procyclicality of credit provision, and a disorderly impact on traditional banks, for example through revenue erosion or additional risk-taking.

III. Literature Review

As an emerging phenomenon, fintech has generated a great deal of interest from scholars and there is growing literature on this subject. From increasing financial inclusion to development of new innovative products that are reshaping the financial system, the field of fintech is constantly evolving. Many scholars have argued that fintech has brought meaningful changes in the delivery of financial services and has also increased the interconnectedness of the financial sector with other sectors such as the telecommunication and utilities sectors, Daud et al (2022) and Feyen et al (2021). This increased interconnectedness has amplified the risks and vulnerabilities of the traditional financial system.

However, critics of this view such as the Financial Stability Board (2017) argued that the risks of fintech on financial stability are not compelling and could be mitigated. According to this view, mitigating three priority areas would ensure fintech achieved financial stability. These areas, which include the operational risk arising from third party service providers, cyber risks, and lastly macro financial risks, are of great concern and should be monitored and addressed to derive the maximum benefits and potential of fintech.

Minto et al (2020) compliments this view and suggests that developments in financial technology are beneficial to financial stability. By analyzing the impact of financial technologies on non-performing loans (NPLs), their studies found that financial institutions that adopted fintech had lower NPLs and originated more loans to the economy than those that did not during the 2008 global financial crisis. They argued that contrary to the increased risk-taking behavior as maintained by some studies, financial innovation helped banks to select better borrowers and produce more resilient loans.

Wang and Luo (2022) investigated the influence of financial inclusion on bank stability

using data from more than 1500 commercial banks covering 2004–2018 in 36 emerging countries. Their findings provided more evidence that financial inclusion increases bank stability but added that, this was dependent on the business cycle, financial circumstances, governmental intensity, and policy environments. Furthermore, the positive correlation between financial soundness and financial inclusion indicated that higher levels of financial inclusion led to more risk-taking behavior by banks which presented a threat on the institutions' stability.

Pierri, and Timmer (2020) found that high FinTech adopters experienced a significantly smaller increase in non-performing loans (NPLs) on their balance-sheets relative to other banks and provided more credit to the economy during the 2008 global financial crisis. However, loans originated by high-fintech banks in the USA experienced lower delinquency rates during the crisis even when they were securitized. Although high and low- Fintech adopters were not differentially exposed to the crises in terms of geographical location and business model, fintech adoption helped banks to select better borrowers and produce more resilient loans contrary to conclusions drawn by Wang and Luo (2022).

Khan (2022) took a different approach and investigated the effect of bank competition on macroeconomic stability. He separated this assessment into economic and financial stability. Financial stability was assessed through the volatility of private credit to gross domestic product (GDP). He applied a two-step dynamic panel system (GMM) to macroeconomic data from 48 developing nations spanning the period 1999 to 2018. The author's findings revealed that more competition promotes macroeconomic and financial stability of the banking sector up to a certain optimal level. Economic and financial stability improves through lower volatility of output growth, private credit, and the probability of bank default.

Elsayed et al (2022) on the other hand, examined the interaction between monetary policy and financial stability in the Gulf Cooperation Council (hereafter GCC) countries by introducing a new composite financial stability index to monitor the financial vulnerabilities and crisis periods. They estimated a nonlinear autoregressive distributed lag model (NARDL) over the period from 2006-Q4 to 2020-Q2. Using financial variables, they constructed an aggregated composite index of Financial Stability Indictors (FSI) for each country which comprised of four financial sectors: banking sector, equity market, bonds market, and foreign exchange market. For the banking sector, the systematic risk was derived from the capital asset pricing model (CAPM). Their empirical findings revealed that monetary authorities react significantly to negative or positive shocks to financial stability, but they react differently in the short or long term.

Other scholars such as Daud et al (2022) built a model to examine the relation between financial stability and interconnectedness among banks. They used value-at-risk rule to determine capital ratios and assessed the impact of FinTech on financial sector stability using panel data of 63 countries. They constructed a new FinTech index that represented FinTech developments across countries. Their results indicated a positive correlation between fintech and financial stability and a positive correlation between market concentration and FinTech and financial stability. These findings revealed that higher

financial integration hurts financial stability while higher levels of interconnectedness had the tendency to deplete the capital requirement. Capital depletion is a major source of concern for regulators and an indicator of a struggling institution which may require supervisory action.

On the other hand, Murinde et al. (2022) analysed the statistical movements of key indicators of the changing banking landscape arising from the advent of FinTech and concluded that FinTech is unlikely to replace banks as it is fully integrated or interconnected to the existing banking systems. This is because banks have resorted to developing their own FinTech products, or work with FinTech startups thereby ensuring they remain relevant in the financial sector. They studied the impact of FinTech on financial sector stability using panel data of 63 countries. Their approach examined the competition created by FinTech on financial stability and constructed a new FinTech index that represented FinTech developments across countries. Their findings indicated a positive correlation between fintech and financial stability and also a positive correlation between market concentration and FinTech and financial stability.

Similarly, empirical evidence by Funga et al (2020) found a significant positive correlation between FinTech and financial stability although the correlation was market specific. The study established that the profitability of financial institutions in emerging markets improved after introduction of FinTech innovations compared to developed markets. This implied that for emerging markets, Fintech enhances the financial stability of institutions while for developed markets it achieved the opposite. However, when market dynamics were ignored, there was no net effect of fintech on financial stability of institutions as its positive and negative effects balanced out each other. Hence financial innovation should be encouraged in developing markets for savings mobilization, while developed markets, innovations mitigate fragilities in the financial systems.

Existing empirical evidence shows that fintechs improve efficiency, speed and reduce cost of financial services, which increases their uptake and utilization. However, theoretical and empirical studies have no consensus on the impact of FinTech on the financial system stability. On the one hand, studies show that fintechs enhance stability of financial system by increasing access and utilization of financial services by diverse consumers, which increases the volume and diversity of assets and liabilities. On the other hand, fintechs undermine stability of financial system by increasing competition in financial sector, which reduce profits and facilitate risky agents to access and use financial service.

IV. Methodology

This section provides specification of the econometric model definition and measurement of variables, estimation methods and data sources used to analyse the impact of fintech on financial stability in Zambia. We measure financial stability of banks using liquidity ratio (LQDR), non-performing loans ratio (NPLR), return on assets (ROA), and the banking sector capital adequacy ratio (CAR) (Table 36). The choice of financial stability variables is consistent with previous studies, (Babecky et al. 2013, Reinhart and Rogoff, 2013, Ješić, 2013, Ozili, 2018 and Barra and Zotti, 2019). We also develop a financial

stability index using LQDR, NPLR, ROA and CAR. Five models are estimated, in which LQDR, NPLR, ROA, CAR and the financial stability index are dependent variables and fintech variables are the independent variables.

Model 1

$$lnLQDR_t = \varphi_0 + \varphi_1 lnPOSP_t + \varphi_2 lnMOBP_t + \varphi_3 lnDREM_t + \varphi_4 lnLNDR_t + \varphi_5 lnEXCR_t + \varphi_6 INFR_t + \varphi_7 COVD_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where: the dependent variable lnLQDRt is the natural logarithm of bank liquidity at time t and is used as a proxy for financial stability. The independent variables which are proxies for fintech include: lnPOSPt which is the natural logarithm of point-of-sale payments at time t, lnMOBPt the natural logarithm of mobile payments at time t and lnDREMt, natural log or digital remittances at time t. Controlling variables include: lnLNDRt, lnEXCRt, INFRt, and COVDt, representing value of interest rates, exchange rates, inflation rate, and covid-19 at time t.

Model 2

$$lnNPLR_t = \varphi_0 + \varphi_1 lnPOSP_t + \varphi_2 lnMOBP_t + \varphi_3 lnDREM_t + \varphi_4 lnLNDR_t + \varphi_5 lnEXCR_t + \varphi_6 INFR_t + \varphi_7 COVD_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where: the dependent variable lnNPLRt is the natural logarithm of the non-performing loans ratio at time t and is used as a proxy for financial stability.

Model 3

$$lnROA_t = \varphi_0 + \varphi_1 lnPOSP_t + \varphi_2 lnMOBP_t + \varphi_3 lnDREM_t + \varphi_4 lnLNDR_t + \varphi_5 lnEXCR_t + \varphi_6 INFR_t + \varphi_7 COVD_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where: the dependent variable lnROAt is the natural logarithm of the return on assets at time t and is used as a proxy for financial stability.

Model 4

$$lnCAR_t = \varphi_0 + \varphi_1 lnPOSP_t + \varphi_2 lnMOBP_t + \varphi_3 lnDREM_t + \varphi_4 lnLNDR_t + \varphi_5 lnEXCR_t + \varphi_6 INFR_t + \varphi_7 COVD_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where: the dependent variable lnCARt is the natural logarithm of the banking sector capital adequacy ratio at time t and is used as a proxy for financial stability.

Model 5

$$FSI_t = \varphi_0 + \varphi_1 lnPOSP_t + \varphi_2 lnMOBP_t + \varphi_3 lnDREM_t + \varphi_4 lnLNDR_t + \varphi_5 lnEXCR_t + \varphi_6 INFR_t + \varphi_7 COVD_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where: the dependent variable FSIt is the financial stability index at time t and is used as a measure of financial stability.

Table 36: Outlines the variables used in the estimation, their definition and measurement.

Description	Variable	Definition	Measurement
Dependent	LQDR	Bank Liquidity Ratio	Ratio of liquid assets to total deposits and short-term liabilities. According to Gadanecz and Jayaram (2009), bank liquidity ratio shows the ratio of bank's readily available short-term resources that can be used to meet short-term obligations. High levels of this ratio promote financial stability.
	NPLR	Non-performing Loans Ratio	Ratio of overdue loans (non-performing loans) to total gross loans (a measure of credit risk) of the banking sector. An increase in the NPL ratio means a worsening of the credit quality and this could lead to increased bank provisioning, thus resulting into huge capital losses for banks hence financial instability (Funyina and Muhanga, 2021).
	ROA	Return on Assets	It refers to banks' profitability and is calculated as the ratio of net-income to total assets. A higher ROA indicates better profit prospects for growth and resilience to shocks and should thus be associated to financial stability (Funyina and Muhanga, 2021).
	CAR	Capital Adequacy Ratio	It is measured as a ratio of total capital to risk weighted assets of the banking sector at time. Bank capital is a measure of bank solvency and ability to absorb risk, hence higher CAR reflects financial stability.
	FSI	Financial Stability Index	This measure is developed based on LQDR, NPLR, ROA, CAR.
Independent	POSP	Point of Sale Payments	A Point of Sale (POS) system is a technology used by merchants, retailers, and other businesses to accept payments from their customers. It was originally developed to accept payments but has evolved to include other uses in the banking industry. This study used the value of point-of-sale payments.

	MOBP	Mobile Payments	Mobile payments are payments made through a portable device such as a phone, tablet, smartwatch among others and is facilitated by Mobile Network Operators (MNOs). This study used the value of mobile payments.
	DREM	Digital Remittances	Remittances in general include fund transfers between residents and non-residents and earnings transfer from short-time workers from other countries to their country of origin. The study used the value of international inbound remittances.
	LNDR	Commercial bank lending rate	The commercial bank lending rate is the cost of borrowing. In other words, it is the price that commercial banks charge to provide credit to borrowers. This study used average lending rates as compiled by the Bank of Zambia from 20012 to 2018.
	EXCR	Exchange Rate	This is the nominal exchange rate measured as the domestic currency units per unit of foreign currency i.e., the Kwacha units per unit of the United States Dollar. We use the Bank of Zambia mid-rate.
	INFR	Inflation rate	It is measured as the change in the consumer price index (CPI) for all items of the current year compared with the CPI for all items in the previous year expressed as a percentage. An increase in inflation may raise interest rates thus lead to financial instability. Patnaik et al., (2019) find robust evidence of a trade-off between price and financial stability.
	COVD	Covid-19 Dummy	Takes the value of 1, post Covid-19 period and O, otherwise.

This study used quarterly time series data for 2012Q1 to 2022Q2. Data on LQDR, NPLR, ROA, CAR POSP, MOBP, LNDR, EXCR, INFR was obtained from Reserve Bank of Zambia, while DREM and COVID 19 were obtained from Zambia Statistics Agency and Ministry of Health, respectively. Most time series data tend to fluctuate, with time dependent mean and variance, hence methods used to analyze non-stationary series yield biased, inconsistent and inefficient parameters, (Shrestha and Bhatta, 2017). Therefore, this study conducted an augmented Dickey Fuller test for unit roots in each of the variables to infer their stationarity and the unit root test results are reported in Annex 2.

The study utilized autoregressive distributed lag (ARDL) model, which is the most appropriate for variables with mixed orders of integration. In specifying the regression equations, the study therefore carried out cointegration tests to determine subsequent steps of estimation depending on whether there was cointegration or not. In cases of cointegration, error correction models were estimated, (Pesaran and Shin 1999 and Pesaran et al. 2001). However, in the event that cointegration was not established, a short run model was estimated using the ordinary least squares methods[45].

V. Discussion of Results

Descriptive statistics for variables included in the analysis is provided in Annex 3. The descriptive statistics show that the standard deviations for all the series in the model were quite large signifying that they were large enough to explore variations in the data. With all the series except the inflation, which is at level, having a Jarque-Bera probability statistic greater than 0.05, it follows that they follow a normal distribution and as such derived results can easily be applied.

The study a cointegration test was carried out using the bounds testing technique to assess the long run equilibrium relationship among the variables. As can be seen from the Table 37 below, the calculated F-statistic of 5.59 is greater than all the critical value bounds at 1 %, 2.5 %, 5 % and 10 %. This implies that the null hypothesis of no-cointegration is rejected, and we can therefore conclude that the variables exhibit a long run relationship.

Table 37: Bounds Cointegration Test Results

Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	5.591274	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06

The study further estimated the long run equation given the evidence from the cointegration tests. The long run results are provided in Table 38 and they show that the (LNDREM) and commercial bank lending rates (LNLNDR) have a positive significant impact on bank liquidity (LNLQDR) in the long run, while the inflation rate (INFR) has a negative significant impact on bank liquidity (LNLQDR) in the long run. The results in equation 5.1 signify that, in the long run, a 1 % increase in the digital remittance (LNDREM), leads to a 0.10 % increase in the bank liquidity ratio on average and a 1 % increase in commercial bank lending rates (LNLNDR) will result in a 0.31 % increase in the bank liquidity ratio on average in the long run. However, a 1 unit increase in the inflation rate (INFR) will result in a 0.72 % reduction in the bank liquidity ratio on average in the long run.

[45] Tests for serial correlation and heteroskedasticity were not conducted due to the estimation methods and techniques employed. For instance, serial correlation was corrected by the autoregressive character of the estimation method used, while heteroskedasticity was taken care of through the log transformation of the variables.

Table 38: ARDL Long Run Results (The Dependent Variable is LQDR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMOBP	-0.006630	0.010717	-0.618654	0.5404
LNDREM	0.101815	0.029723	3.425487	0.0017
LNLNDR	0.308190	0.106034	2.906523	0.0065
INFR	-0.007217	0.003613	-1.997305	0.0541

High levels of the liquidity ratio promote financial stability as it reflects banks' ability to meet short term liabilities as they fall due. Therefore, the positive coefficient of digital remittances imply that higher levels of remittances improve the liquidity ratio by balancing out banks' liabilities. This finding is consistent with the findings of Barajas et al., (2018) and Naceur et al., (2020) who contended that higher remittances contribute to the development of financial services (financial stability) particularly more so in fragile economies.

The results of the positive and significant coefficient of the lending interest rate and liquidity level are consistent with the results found by Tavasharovich, (2019). Higher commercial bank lending rates induce banks to invest more in short term instruments thereby enhancing their liquidity position and ensuring financial stability. The result on the negative relationship between the inflation rate and bank liquidity is also consistent with the finding by Krishnamurthy and Vissing-Jorgensen (2013) who established that an increase in the inflation rate is likely to reduce the real interest rate of a banks thereby reducing the banks liquidity.

The results of the short run equilibrium relationship between the variables are tabulated in Table 39 below. The value of the error correction term (CointEq) of -0.59 indicates that the short-run disequilibrium converges to the long-run equilibrium at a speed of 59 percent. The results of the short-run model shows that only the current period commercial bank lending rates (LNLNDR) have a significant effect on the bank liquidity ratio (LNLQDR).

Table 39: Error Correction Model Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.708931	0.126227	5.616332	0.0000
D(LNLNDR)	-0.279819	0.147695	-1.894579	0.0669
D(INFR)	0.003953	0.002727	1.449384	0.1567
CointEq(-1)*	-0.593249	0.105963	-5.598662	0.0000
R-squared	0.468802	Mean Dependent var		0.003903
Adjusted R-squared	0.425732	S.D. dependent var		0.065585
S.E. of regression	0.049701	Akaike info criterion		-3.073130
Sum squared resid	0.091396	Schwarz criterion		-2.905952
Log likelihood	66.99916	Hannan-Quinn criter.		-3.012253
F-statistic	10.88463	Durbin-Watson stat		2.153896
Prob(F-statistic)	0.000029			

Table 40 presents the results from the bounds cointegration test. The computed F-statistic of 4.23 is greater than the 5 % upper bound, signifying that the null hypothesis of no-cointegration is rejected and we therefore conclude that the variables exhibit a long run relationship.

Table 40: Bounds Cointegration Test Results

Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	4.225942	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06

The long run results in Table 41 tabulated below show that the lending rate (LNLNDR) was the only statistically significant variable, showing that, on average a 1 % increase in the lending rate leads to a 2.84 % increase in the non-performing loans ratio (LNNPLR) in the long run. This result implies that, the larger the commercial bank lending rates, the higher the incidence of NPLs. This finding is consistent with the finding by Bredl (2018), who identified lending rates as one of the factors that cause NPLs. As interest rates rise, good borrowers are priced out of the market, as they will not be willing to pay more than market rates. As such, banks will attract credit risk customers who are willing to pay more and have a highly likelihood of default.

Table 41: ARDL Long Run Results (The Dependent Variable is LNNPLR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMOBP	-0.106079	0.099916	-1.061687	0.2971
LNDREM	-0.207831	0.229597	-0.905201	0.3728
LNLNDR	2.840777	1.295229	2.193263	0.0365
INFR	-0.017972	0.02324	-0.773321	0.4456

The short run results in Table 42 show that in the short run, mobile payments and the previous period digital remittances negatively and significantly affected non-performing loans though the impact of the was rather weak. On average, a 1 % increase in mobile payments lead to a 0.04 % reduction in non-performing loans whereas a 1 % increase in digital remittances in the previous period results into a 0.18 % reduction in non-performing loans. The result of the negative relationship between mobile payments and non-performing loans may be implying that mobile payments affect the convenience of cash payments, which in turn may affect the volume of cash transactions facilitating economic agents to be inclined to repay their debt. This result also supports the findings by Minto et al. (2020) who contend that financial institutions that adopted fintech had lower NPLs compared to those that did not, as financial innovation helped banks to select better borrowers and produce more resilient loans. This result was however in contrast to the finding by Tiriongo and Wamalwa (2020), who found that mobile money could be associated with the growth in NPLs in the banking sector.

Table 42: Error Correction Model Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.025536	0.017452	-1.463220	0.1542
D(LNMOBP)	-0.035665	0.012566	-2.838127	0.0082
D(LNDREM)	0.054205	0.101236	0.535436	0.5964
D(LNDREM(-1))	-0.180016	0.103651	-1.736746	0.0930
D(LNLNDR)	-0.271658	0.275266	-0.986890	0.3319
D(INFR)	0.008737	0.005346	1.634208	0.1130
CointEq(-1)*	-0.169462	0.034560	-4.903483	0.0000
R-squared	0.473662	Mean dependent var		-0.011578
Adjusted R-squared	0.377964	S.D. dependent var		0.112486
S.E. of regression	0.088716	Akaike info criterion		-1.849114
Sum squared resid	0.259730	Schwarz criterion		-1.553560
Log likelihood	43.98228	Hannan-Quinn criter.		-1.742251
F-statistic	4.949559	Durbin-Watson stat		1.675448
Prob(F-statistic)	0.001037			

The results also established that digital remittances negatively impacted the non-performing loans ratio, particularly in the short run. Digital remittances and the associated information complement traditional banking instruments for the assessment of creditworthiness and therefore reduce the possibility of extending loans to risky borrowers. Digitization of remittances channels has reduced cost and enabled firms and individuals to receive funds, which have contributed to lowering poverty, inequality, improved access to financial services and ability to meet financial obligations.

The error correction term of -0.17 shows that it takes an average speed of 17.0 percent to adjust from the short run equilibrium to the long run equilibrium.

The results from the bounds cointegration test are presented in Table 43. The computed F-statistic of 5.64 is greater than the 5 % upper bound, implying a rejection of the null hypothesis of no-cointegration in favour of the alternative hypothesis of cointegration.

Table 43: Bounds Cointegration Test Results

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.644559	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06

The results in Table 44 show that the only significant variable explaining variations in banks profitability (proxied by return on assets) in the long run was digital remittances (LNDREM). However, despite being significant at 5 %, LNDREM was negatively

related to banks return on assets (LNROA) in the long run. The results reveal that on average, a 1 % increase in digital remittances leads to a 0.40 % decrease in banks return on assets (LNROA) in the long run.

However, the result has a perverse sign since apriori, a positive result is expected. A high ROA is expected to lead to positive perception of a bank, leading to attraction of depositors and borrowers, reduction of early withdrawals as well as increases in working capital from retained earnings. This negative sign may be attributed to the fact that digital remittances are volatile and hence not amenable for intermediation. In addition, fintech enables households and firms to remit money across countries and within the country, which enables banks to earn fees and commission for facilitating sending and receiving money. However, fees and commission are smaller relative to cost of providing remittances, which reduces profitability. The result of this study is contrary to findings by Fung et al (2020), whose results found that fintechs increase profitability in emerging markets but reduces profitability in advanced countries.

Table 44: ARDL Long Run Results (The Dependent Variable is LNROA)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMOBP	-0.024500	0.051406	-0.476592	0.6366
LNDREM	-0.403229	0.194356	-2.074697	0.0454
LNLNDR	-0.613135	0.668735	-0.916859	0.3655
INFR	0.019891	0.021564	0.922436	0.3626

The short run results in Table 45 reveal that it takes an average speed of 89 % to adjust from the short run equilibrium to the long run equilibrium.

Table 45: Error Correction Model Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.653735	1.728424	5.585283	0.0000
CointEq(-1)*	-0.891091	0.158900	-5.607875	0.0000
R-squared	0.446402	Mean dependent var		-0.028730
Adjusted R-squared	0.432207	S.D. dependent var		0.677499
S.E. of regression	0.510509	Akaike info criterion		1.540735
Sum squared resid	10.16417	Schwarz criterion		1.624324
Log likelihood	-29.58507	Hannan-Quinn criter.		1.571173
F-statistic	31.44826	Durbin-Watson stat		2.059411
Prob(F-statistic)	0.000002			

The results from the bounds test in Table 46 indicate that the F-statistic of 2.64 is less than the lower bound at 5 % level of significance, indicating that there is no long run equilibrium relationship among the variables.

Table 46: Bounds Cointegration Test Results

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	2.635011	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Since there is no cointegration, we only estimated the short run model and the results are presented in Table 47. To do this, we first identified the appropriate lag length using the VAR lag order selection criteria. The model was estimated using the least squares method. The results show that a one-period lagged capital adequacy ratio has a positive effect on the current capital adequacy ratio in the short run. In this case, a 1 % increase in the previous period capital adequacy ratio leads to a 1.03 % increase in the current period bank capital adequacy ratio. The result imply that previous capital buffers enhance the resilience of the banking sector to shocks.

Table 47: Short run least square results (The Dependent Variable is InCAR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCAR(-1)	1.038227	0.201946	5.141102	0.0000
LNCAR(-2)	-0.000169	0.302759	-0.000557	0.9996
LNCAR(-3)	-0.017279	0.228955	-0.075468	0.9405
LNMOBP(-1)	-0.009106	0.014224	-0.640176	0.5281
LNMOBP(-2)	0.001397	0.012475	0.111954	0.9118
LNMOBP(-3)	0.011744	0.009856	1.191488	0.2451
LNDREM(-1)	0.006919	0.089964	0.076906	0.9393
LNDREM(-2)	0.120392	0.113184	1.063681	0.2981
LNDREM(-3)	-0.131955	0.102871	-1.282717	0.2118
LNLNDR(-1)	0.242099	0.316000	0.766135	0.4511
LNLNDR(-2)	-0.264880	0.498109	-0.531771	0.5998
LNLNDR(-3)	-0.016756	0.340436	-0.049219	0.9612
INFR(-1)	0.004433	0.005545	0.799516	0.4318
INFR(-2)	-0.005671	0.008121	-0.698318	0.4917
INFR(-3)	0.005830	0.005158	1.130298	0.2695
R-squared	0.759908	Mean dependent var		3.166339
Adjusted R-squared	0.619854	S.D. dependent var		0.107685
S.E. of regression	0.066394	Akaike info criterion		-2.302696
Sum squared resid	0.105796	Schwarz criterion		-1.662865
Log likelihood	59.90258	Hannan-Quinn criter.		-2.073130
Durbin-Watson stat	2.125052			

In summary, the first four models which use various proxies of financial stability have established that digital remittances, commercial bank lending rates, inflation rates, risk

and mobile payments are key in explaining variations in the various measures of financial stability.

Model 5 aggregated proxies for financial stability into a financial stability index, which is then used as a dependent variable, to check the robustness of the of the results from the other four models. The computed F-statistic of 5.67 in Table 48 which is greater than the 5 % upper bound, implies a rejection of the null hypothesis of no-cointegration in favour of the alternative hypothesis of cointegration, i.e., the presence of a long run relationship among variables.

Table 48: Bounds Cointegration Test Results

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.668256	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06

The results from the long run model with an unrestricted constant and no trend presented in Table 49 show that the only significant variable explaining variations in financial stability (financial stability index) in the long run was mobile payments (LNMOBP). The results reveal that on average, a 1 % increase in mobile payments leads to a 0.02 % increase in bank stability (FSI) in the long run. An increase in mobile money transactions, increases the diversity and value of deposits in the banking sector, which improve liquidity and funding base for bank assets. An increase in liquidity and diversity of deposits provides a stable funding base for assets, which enhances profitability and stability of banks. This finding is consistent with that of the Bank of Ghana (2017), which showed that mobile money has a positively correlation with private sector credit.

Table 49: Long Run Results for Model 5 (The Dependent Variable is FSI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMOBP	0.015574	0.006128	2.541307	0.0161
LNDREM	-0.012936	0.021114	-0.612669	0.5444
LNLNDR	-0.021526	0.061538	-0.349804	0.7288
INFR	0.002749	0.001991	1.380876	0.1769

The results in Table 50 show the existence of a short run relationship between the dependent and independent variables and that it takes an average speed of 65 % to adjust from the short run equilibrium to the long run equilibrium. The results further reveal that digital remittances (LNDREM) in the previous period were significant in explaining the financial stability in Zambia in the short run. On average, a 1 % increase in the previous period digital remittances lead to a 0.13 % increase in financial stability in the short run.

Table 50: Error Correction Model Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.141383	0.027163	5.204896	0.0000
D(LNDREM)	0.043692	0.036732	1.189479	0.2430
D(LNDREM(-1))	0.129917	0.037561	3.458866	0.0016
CointEq(-1)*	-0.651745	0.115423	-5.646586	0.0000
R-squared	0.525247	Mean dependent var		0.000867
Adjusted R-squared	0.485684	S.D. dependent var		0.046621
S.E. of regression	0.033435	Akaike info criterion		-3.863810
Sum squared resid	0.040243	Schwarz criterion		-3.694922
Log likelihood	81.27621	Hannan-Quinn criter.		-3.802746
F-statistic	13.27628	Durbin-Watson stat		1.860152
Prob(F-statistic)	0.000005			

VI. Conclusion

The increased application of technology in the finance value chain has revolutionized the delivery of financial services and products globally. Fintech, which is commonly referred to as the use of technology in the provision of financial services, has been credited with accelerating positive change in the financial sector. on the one hand, fintech increase deposit, efficiency and enable banks to accurately appraise borrowers and forecast liquidity, which increase profitability and stability of banks. However, on the other hand, fintechs increase competition in the banking sector which reduces profits and enables risky agents to consume financial services, which accentuate instability. This paper attempt therefore sought to understand the impact of fintechs on financial stability of banks in Zambia, using quarterly data for the period 2012Q1 to 2022Q2. The empirical results show that fintechs as measured by digital remittances promotes financial stability. This can be explained by the facts that digitization of remittances improves banks' profits, liquidity and solvency while increased usage of point-of-sale dampens credit risk. The adoption of point of sale and digitization of remittance also increases stability. The results imply that fintechs enhance financial stability of banks in Zambia.

In order to facilitate adoption and usage of mobile payments, digital remittances and point of sale services, transaction costs associated with these channels should be reduced through moral suasion and introducing regulatory reforms, that increase competition and innovation. Policy reforms that enhance competition and innovation, reduce cost of services, while encouraging fintechs to undertake research and development, which results to new and improved technologies as well as better services are recommended. The innovations that also encourage cooperation between fintechs and banks, enabling them to complement each other's operations would enhances profitability and stability of the financial system.

The collaboration between fintechs and banks require creating a favourable environment,

including enhancing the regulatory and supervisory framework, within which the fintech can grow and its associated risks curtailed. In this regard, regulatory sandboxes could be useful in promoting the development of financial technologies while at the same time monitoring and testing strategies to mitigate and ease the associated risks. It could also include promoting an efficient pricing model that would ensure increased consumer adoption and usage of these digital services and sustenance of banks profitability. Therefore, policy responses should be designed to strike a balance between promoting increased usage of fintech channels to promote financial stability and putting in place measures that would help mitigate risks associated with their growth.

This study focused on the core measures of financial stability due to data limitations. Besides the core financial soundness indicators used to measure the health of banks including capital adequacy, non-performing loans and liquidity ratios, the scale of financial intermediation, the ease of effecting payments and pricing risk are other indicators used in the literature. Therefore, this paper can be extended by analyzing the effect of fintechs on non-core indicators of financial stability. Besides risks fintechs pose to financial stability due to their interconnectedness with core functions, future research should aim to provide insights on the risks the competition between fintech and banks pose to financial stability.

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Annexes

Annex 1: Corrélation Matrices

Model 1

	FSI	LNPOSP	LNMOBP	LNDREM	LNLNDR	LNEXCR	INFR	COVD
FSI	1.000000	0.400844	0.437892	0.483046	0.231117	0.509753	0.522037	0.463255
LNPOSP	0.400844	1.000000	0.973996	0.316832	0.242111	0.275518	0.170517	0.392655
LNMOBP	0.437892	0.973996	1.000000	0.444770	0.256938	0.381071	0.189993	0.509137
LNDREM	0.483046	0.316832	0.444770	1.000000	0.633624	0.947564	0.625722	0.836470
LNLNDR	0.231117	0.242111	0.256938	0.633624	1.000000	0.763443	0.489908	0.379708
LNEXCR	0.509753	0.275518	0.381071	0.947564	0.763443	1.000000	0.700248	0.770220
INFR	0.522037	0.170517	0.189993	0.625722	0.489908	0.700248	1.000000	0.635678
COVD	0.463255	0.392655	0.509137	0.836470	0.379708	0.770220	0.635678	1.000000

Model 2

	LNLQDR	LNPOSP	LNMOBP	LNDREM	LNLNDR	LNEXCR	INFR	COVD
LNLQDR	1.000000	0.427798	0.518565	0.716150	0.611265	0.705857	0.269784	0.532650
LNPOSP	0.427798	1.000000	0.973996	0.316832	0.242111	0.275518	0.170517	0.392655
LNMOBP	0.518565	0.973996	1.000000	0.444770	0.256938	0.381071	0.189993	0.509137
LNDREM	0.716150	0.316832	0.444770	1.000000	0.633624	0.947564	0.625722	0.836470`
LNLNDR	0.611265	0.242111	0.256938	0.633624	1.000000	0.763443	0.489908	0.379708
LNEXCR	0.705857	0.275518	0.381071	0.947564	0.763443	1.000000	0.700248	0.770220
INFR	0.269784	0.170517	0.189993	0.625722	0.489908	0.700248	1.000000	0.635678
COVD	0.532650	0.392655	0.509137	0.836470	0.379708	0.770220	0.635678	1.000000

Model 3

	LNNPLR	LNPOSP	LNMOBP	LNDREM	LNLNDR	LNEXCR	INFR	COVD
LNNPLR	1.000000	0.228018	0.252259	0.098319	0.373553	0.210375	-0.07157	-0.012896
LNPOSP	0.228018	1.000000	0.973996	0.316832	0.242111	0.275518	0.163892	0.392655
LNMOBP	0.252259	0.973996	1.000000	0.444770	0.256938	0.381071	0.189993	0.509137
LNDREM	0.098319	0.316832	0.444770	1.000000	0.633624	0.947564	0.625722	0.836470
LNLNDR	0.373553	0.242111	0.256938	0.633624	1.000000	0.763443	0.489908	0.379708
LNEXCR	0.210375	0.275518	0.381071	0.947564	0.763443	1.000000	0.700248	0.770220
INFR	-0.071569	0.163892	0.189993	0.625722	0.489908	0.700248	1.000000	0.635678
COVD	-0.012896	0.392655	0.509137	0.836470	0.379708	0.770220	0.635678	1.000000

Model 4

	LNROA	LNPOSP	LNMOBP	LNDREM	LNLNDR	LNEXCR	INFR	COVD
LNROA	1.000000	-0.205210	-0.299874	-0.587250	-0.449542	-0.635873	-0.274720	-0.424478
LNPOSP	-0.205210	1.000000	0.973996	0.316832	0.242111	0.275518	0.170517	0.392655
LNMOBP	-0.299874	0.973996	1.000000	0.444770	0.256938	0.381071	0.189993	0.509137
LNDREM	-0.587250	0.316832	0.444770	1.000000	0.633624	0.947564	0.625722	0.836470
LNLNDR	-0.449542	0.242111	0.256938	0.633624	1.000000	0.763443	0.489908	0.379708
LNEXCR	-0.635873	0.275518	0.381071	0.947564	0.763443	1.000000	0.700248	0.770220
INFR	-0.274720	0.170517	0.189993	0.625722	0.489908	0.700248	1.000000	0.635678
COVD	-0.424478	0.392655	0.509137	0.836470	0.379708	0.770220	0.635678	1.000000

Model 5

	LNCAR	LNPOSP	LNMOBP	LNDREM	LNLNDR	LNEXCR	INFR	COVD
LNCAR	1.000000	-0.529297	-0.569704	-0.329001	-0.070051	-0.357567	-0.387975	-0.418315
LNPOSP	-0.529297	1.000000	0.973996	0.316832	0.242111	0.275518	0.170517	0.392655
LNMOBP	-0.569704	0.973996	1.000000	0.444770	0.256938	0.381071	0.189993	0.509137
LNDREM	-0.329001	0.316832	0.444770	1.000000	0.633624	0.947564	0.625722	0.836470
LNLNDR	-0.070051	0.242111	0.256938	0.633624	1.000000	0.763443	0.489908	0.379708
LNEXCR	-0.357567	0.275518	0.381071	0.947564	0.763443	1.000000	0.700248	0.770220
INFR	-0.387975	0.170517	0.189993	0.625722	0.489908	0.700248	1.000000	0.635678
COVD	-0.418315	0.392655	0.509137	0.836470	0.379708	0.770220	0.635678	1.000000

Annex 2: Unit Root Test Results

Variable	Level			First Difference	
	t-statistic	p-value		t-statistic	p-value
lnLQDR	-1.803	0.374		-7.746	0.000
lnNPLR	-1.859	0.348		-4.517	0.000
lnROA	-1.379	0.582		-7.249	0.000
lnCAR	-2.472	0.13		-5.321	0.000
lnPOSP	-3.664	0.008			
FSI	-3.163	0.03			
lnMOBP	-2.032	0.272		-6.256	0.000
lnDREM	0.391	0.98		-6.585	0.000
lnLNDR	-2.097	0.247		-5.564	0.000
lnEXCR	-0.795	0.81		-4.625	0.001
INFL	-2.994	0.4			

Annex 3: Descriptive Statistics

	LNLQDR	LNNPLR	LNROA	LNCAR	FSI	LNPOSP	LNMOBP	LNDREM	LNLNDR	LNEXCR	INFR
Mean	3.90573	2.19504	0.7824	3.1577	0.2883	21.9099	22.2437	19.3933	3.13286	2.29233	11.114
Median	3.91369	2.22624	1.0521	3.1491	0.2929	21.8165	22.1385	19.2365	3.20598	2.29425	7.9390
Maximum	4.08281	2.56037	1.5602	3.3197	0.3867	26.0876	26.6582	20.9565	3.37324	3.11408	23.713
Minimum	3.66477	1.73942	-0.8189	2.9537	0.1814	18.8937	19.0979	18.2098	2.78425	1.59591	6.2536
Std. Dev.	0.10980	0.24114	0.6369	0.10974	0.05037	1.91189	2.27012	0.82629	0.18873	0.46543	5.7413
Skewness	-0.0868	-0.2163	-0.8956	-0.1149	-0.2515	0.5800	0.2927	0.5548	-0.7389	0.0822	1.0532
Kurtosis	1.8831	1.8878	2.7749	1.6742	2.3183	2.8481	1.8805	2.1938	2.2527	1.8596	2.5676
Jarque-Bera	2.2357	2.4910	5.7229	3.1744	1.2611	2.3952	2.7931	3.2922	4.7998	2.3232	8.0918
Probability	0.3269	0.2878	0.0572	0.2045	0.5329	0.3012	0.2475	0.1928	0.0907	0.3129	0.0175
Sum	164.041	92.192	32.865	132.63	12.111	920.216	934.236	814.517	131.580	96.2779	466.821
Sum Sq. Dev.	0.49431	2.38412	16.635	0.4938	0.1040	149.86	211.291	27.9935	1.46035	8.88144	1351.4
Observations	42	42	42	42	42	42	42	42	42	42	42

PART 4:

EQUILIBRIUM REAL EFFECTIVE EXCHANGE RATE AND MONETARY POLICY IMPLEMENTATION

1. Real Effective Exchange Rate Misalignment and Monetary Policy in Zambia

Francis Z. Mbao, Kafula W. Longa, Liuwa Liuwa and Patrick B. Mulenga

I. Introduction

The Real effective exchange rate (REER) is an important macroeconomic variable, playing a pivotal role as an indicator of international competitiveness of a nation in comparison with its trade partners. As a gauge of competitiveness, the REER not only influences but also determines the performance of the export sector Click or tap here to enter text.Given the allocative and competitive functions of the REER, institutions like the International Monetary Fund (IMF) typically advocate for developing and emerging economies to maintain the actual REER in close proximity to the equilibrium real exchange rate (EREER)[46].

In the 1990s, Zambia undertook economic reforms, leading to the liberalization of the current and capital accounts. Consequently, the exchange rate emerged as a pivotal factor influencing short-term capital flows, the dynamics of exports and imports of goods and services, and the maintenance of external equilibrium. Additionally, fluctuations in the exchange rate exert an impact on inflation through pass-through effect on imported goods. Therefore, a deep understanding of the factors determining the equilibrium real effective exchange rate is essential for effective economic management in general and particularly in the formulation of exchange rate policies. Previous studies on the REER on Zambia have assumed integer order of integration of the data. Therefore, none of these studies have explored the role of long-range dependency in the data and thereby establish whether the Zambian REER and its determinants are fractionally integrated. This is in view of recent empirical evidence showing that most economic and financial variables have long memory (Tarasova and Tarasov, 2018 and Baillie, 1996).

It is against this background that this study sought to examine the evolution of the nominal exchange rate, determinants of the REER and impact of monetary policy on the REER.

Understanding long memory processes is crucial because these processes display nonintuitive properties where many familiar mathematical results fail to hold (Graves et al., 2017). Failure to recognize fractional cointegration in this regard may result into generating policy relevant information (forecasts and or structural analytics) that could lead to policy regrets.

While most of the studies on Zambia have not focused on a specific period of notable economic development, this study focuses on the period between 2006 and 2021 known as the post Highly Indebted Poor Country Initiative (HIPC) debt relief era. The period

[46] The EREER is defined as the value of the REER that aligns with a simultaneous realization of internal and external equilibrium.

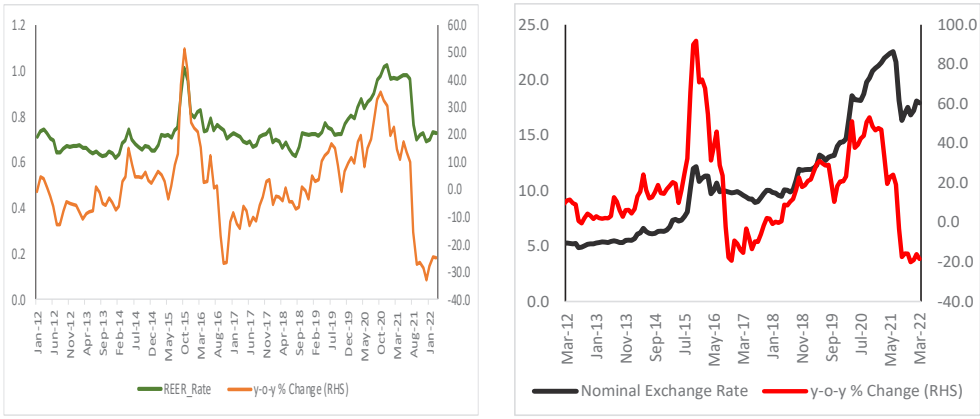
from 2006 to 2012 was characterized by high economic growth while subsequent periods were identified with low growth as well as unsustainable fiscal deficit and debt levels thereafter with possible implication on the REER. Additionally, studies on the REER in most Sub-Saharan countries have utilized methods based on integer order of integration. This study adds value by using the fractional cointegration, which has not been previously used in Zambia.

The rest of the study is structured as follows. Section 2 provides evolution of the exchange rate while section 3 outlines theories of determination of the equilibrium real effective exchange rate as well as the empirical literature review. Section 4 describes the methodology and data sources. The results and discussion are presented in section 5 and section 6 concludes the study.

II. Recent Developments in the Nominal and Real Effective Exchange Rates

Over the period January 2012 – March 2022, the REER has undergone two major depreciations followed by sharp corrections (Figure 43). The first period, June – October 2015, the depreciation of the REER was largely occasioned by the depreciation in the nominal exchange rate following monetary policy normalization and ending the unconventional monetary policy (UMP) – previously pursued by US Federal Reserve Bank (FRB) in response to the 2008 global financial crisis. The eventual rise in interest rates by the FRB and cessation of its asset purchase programme, resulted in a decrease in commodity prices and capital outflows from frontier and emerging market economies. Commodity backed currencies like the Kwacha were hit hard leading to marked depreciations during the period as terms of trade deteriorated.

Figure 43: REER and Nominal Exchange Rate Developments



The depreciation of the Kwacha also led to the rise in inflation. The second depreciation episode lasted from May 2020 to November 2021. This was largely due to the nominal exchange rate depreciation owing to rising debt service amidst declining reserves and reduced foreign exchange supply. However, in the month of December 2021 there was a sharp appreciation in the REER which can be traced to the appreciation in the nominal

exchange rate that benefited from improved foreign exchange supply owing to high copper receipts in view of rising commodity prices at the time as well as higher inflows from non-resident investors in Government securities and positive market sentiments that arose from better macroeconomic prospects, including expectations and eventual allocation of the Special Drawing Rights (SDRs) by the IMF. The appreciation of the exchange rate in 2016 was also due to portfolio debt inflows from non-resident investors in Government securities, and constrained aggregate demand due to the tight monetary policy stance, Bank of Zambia Annual Report (2016).

III. Literature Review

In this section, we discuss various theories of equilibrium REER determination, their derivation, key variables used and the associated strengths and weaknesses.

Purchasing Power Parity

Since the pioneering work of Cassel (1918) , the Purchasing Power Parity (PPP) concept has been widely discussed in several research works. Its basic argument hinges on a proposition known as the law of one price (LOP), which provides a building block to variations of PPP. The LOP argues that without impediments to international trade and capital flows (such as tariff barriers and capital controls); with both domestic and foreign economies operating at full employment level in a market-based price system, identical goods (i) sold in different countries must sell for the same price if expressed in the same currency.

$$P^i = P^{*i}.E \tag{1}$$

where P^i is domestic price, P^{*i} is foreign price, and $\boldsymbol{E}$ is the PPP exchange rate.

The concept of PPP generalizes the LOP proposition and asserts several important claims. First is that general price level of a basket of similar products in different countries will always be equalized when they are measured in a common currency (a concept known as the absolute PPP) as shown in Equation (2) below:

$$P = P^i.E \tag{2}$$

Put differently, the central notion of PPP theory claims that price levels determine equilibrium exchange rate (Equation 3). Ceteris Paribas, a rise in local price level should raise $\boldsymbol{E^{PPP}}$, i.e., a depreciation of the local currency. All things being equal, a rise in the domestic price level relative to the foreign price level is expected to raise $\boldsymbol{E^{PPP}}$, which implies a depreciation in the domestic currency.

$$E^{PPP} = \left(\frac{P}{P^*}\right) \tag{3}$$

Secondly, the PPP real exchange rate is always constant and equals to one. This can easily be shown by substituting Equation (3) into the equation of the real exchange rate, $Q = \left(\frac{\boldsymbol{E.P^*}}{\boldsymbol{P}}\right)$ and solve for the real exchange rate (Q). Given the basic assumption of price rigidity in the short run, the prevailing nominal exchange rate may however deviate from the PPP rate. Thus, the PPP is often referred to as the long-run equilibrium exchange rate.

When $\left(\frac{E}{E^{PPP}}\right) > 1$, the local currency is undervalued, and if $\left(\frac{E}{E^{PPP}}\right) < 1$, an overvaluation has taken place. The presence of stickiness in nominal prices, coined in the seminal work by Dornbusch (1976) on the overshooting exchange rate, led to popular arguments that temporary deviations from the PPP should take place in the short-run, but one would, at least theoretically, expect convergence in the long-run. Frankel (2007) argues that one way to deal with a sufficiently slow convergence to purchasing power parity rate is to have observations over a long span of period.

Due to the simplifying assumptions regarding the PPP, there are a number of other limitations in explaining the shocks or changes that impact the nominal and real equilibrium exchange rate. In addition, the LOP may not hold due to a number of factors such as trade inhibitions (existence of tariff and non-tariff barriers), capital controls, and administered pricing.

Even when LOP holds, changes in shares or weights of different sectors or products may lead to the failure of PPP. In the long run, due to a series of factors, consumers may acquire different preferences and producers choose different products to maximize profits. The weights thus vary overtime in both domestic and foreign markets, and they may diverge significantly. As a result, PPP in this case is a flawed measurement as the baskets of goods being compared may consist of completely different products, in turn, violating the assumption of identical basket of goods on which the theory is based. The existence of non-tradable goods also undermines the validity of the PPP concept. Hence, PPP fails to capture shocks in the non-tradable sector resulting in persistence divergences between PPP and the prevailing real exchange rates.

The Fundamental Equilibrium Exchange Rate (FEER)

The concept of the fundamental equilibrium exchange rate (FEER) attempts to capture other factors beyond monetary variables in determining equilibrium exchange rates (Williamson, 1994). This phenomenon is built on the real effective exchange rate simultaneously securing internal and external balances [47]. Several factors determine the level of the FEER among them potential output growth, potential gaps in productivity growth and sustainable current account (Balassa, 1964).

Generating a FEER involves two sequential steps, that is, identifying the external balance by equating the current account balance (CA) to capital account balance (KA) as specified in equation 4 (Clark and MacDonald, 1998; MacDonald, 2000).

$$CA = -KA \tag{4}$$

The current account, using the FEER approach can be expressed as follows:

$$CA = ntb + nfa \tag{5a}$$

$$ntb = \delta_0 + \delta_1 q + \delta_2 y_d^- + \delta_3 y_f^- \tag{5b}$$

[47] Internal balance is attained when the economy is at full employment output and operating in a low inflation environment while external balance is characterized as a sustainable balance of payment position over a medium-term horizon, ensuring desired net flows of resources and external debt sustainability.

Where,

$$\delta_1 > 0, \delta_3 > 0, \text{and } \delta_2 < 0$$
$$nfar = f(q) \quad (5c)$$

where CA is the current account, ***nf ar*** is returns of net foreign assets, ***ntb*** is the net trade balance, $\bar{y}_d$ and $\bar{y}_f$ are the full employment outputs of both the local and foreign economies, and is the real effective exchange rate. In most applications of the FEER approach, the level of equilibrium capital account KA^* over the medium term is exogenously determined. It is important to underline here that KA^* excludes speculative capital flows. The medium-term balance of payment equation (6) is generated by combining equations 4, as well as 5a to 5c holding the basic assumptions above:

$$CA = f\left(q^{REER}, \bar{y_d}, \bar{y_f}\right) = -KA^* \quad (6)$$

There are three vital elasticities that underlie the FEER approach, namely: the elasticity of the current account (CA) to domestic activity ($\bar{y}_d$), elasticity of CA to foreign output ($\bar{y}_f$), and the elasticity of CA to the real (effective) exchange rate (q^{REER}). Given an assumption of full employment, outputs of the local and foreign economies, ($\bar{y}_d$) and ($\bar{y}_f$) respectively, and the medium-term equilibrium (KA^*), the level of real exchange rate, FEER, is derived from equation (6). The q^{REER}) obtained from equation 6 ensures a sustainable current account or a path to achieve macroeconomic balance—internal and external.

$$q^{REER} = f\left(KA^*; \bar{y_d}; \bar{y_f}\right) \quad (7)$$

The key criticism of the FEER approach is that the size of currency misalignment estimated by FEER is likely to be inaccurate largely on account of the assumption of sustainable current account or external balance that are considered unrealistic when used to calculate trade elasticity, a pitfall pointed out by MacDonald (2000). In addition, relying too much on trade elasticity may generate an inaccurate estimate of the FEER trajectory. Further, a depreciation of the real exchange rate in the domestic currency would not only lead to an improvement in the net trade balance but may also increase the return on net foreign assets. If the FEER only captures the changes in net trade balance while assuming an exogenously determined impact on the return on net foreign assets, then the size of FEER appreciation may be overestimated.

The Behavioral Equilibrium Exchange Rate (BEER)

The BEER approach is an improvement of the FEER approach in that it incorporates the cyclical and temporary changes as determinants of the exchange rate. Hence, the underlying assumption of macroeconomic balance of the FEER approach is absent under the BEER approach. The theoretical foundations of the BEER approach are underpinned by the works of MacDonald (1997) and Clark and MacDonald (1998), which allow for the short-run or temporary analysis of the real exchange rate, and rests on the concept of uncovered interest rate parity (UIP):

$$E_t(e_{t+1}) - e_t = i_t - i_t^* \quad (8)$$

Where ,

$E_t(e_{t+1})$ represents the expected value of the nominal exchange rate in period, **t,** for period t+1. $\boldsymbol{e_t}$ is the nominal exchange rate at period t, defined in terms of domestic currency per unit of foreign currency. Thus, a rise in e implies a depreciation of the local currency. $\boldsymbol{i_t}$ and $\boldsymbol{i^*_t}$ denote local and foreign nominal interest rates, respectively. The risk premium component is assumed to be absent in Equation (8), as the primary objective here is to provide a simple construction of the BEER approach to equilibrium exchange rate determination.

Subtracting the expected inflation differential from both sides of equation (8), yields the real interest parity as shown in equation (9)[48]

$$E_t(q_{t+1}) - q_t = r_t - r_t^* \qquad (9)$$

Where,

$\boldsymbol{E_t(q_{t+1})}$ denotes the expected real exchange rate for period t+1. $\boldsymbol{q_t}$ is the observed real exchange rate, r_t is the domestic real interest rate[49] ,r_t^* =is the foreign real interest rate [50].

Rearranging equation (9), the observed real exchange rate $\boldsymbol{q_t}$ can be represented as a function of the expected value of real exchange rate $\boldsymbol{E_t(q_{t+1})}$, and the current real interest rate differential.

$$q_t = E_t(q_{t+1}) - (r_t - r_t^*) \qquad - \quad (10)$$

Under the BEER approach, the unobservable expectation of real exchange rate,$\boldsymbol{E_t(q_{t+1})}$, is assumed to be determined solely by long-run economic fundamentals **(Zt)** . In other words, the BEER approach produces estimates of equilibrium real exchange rate $\boldsymbol{q_t^{BEER}}$ which incorporates both the long-run economic fundamentals $E_t(q_{t+1}) = f(Z_t)$ and the short run interest rate differentials such that

$$q_t^{REER} = f(Z_t, (r_t - r_t^*)) \qquad (11)$$

Different authors have used various variables to represent the vector **(Zt)**. For instance, Clark and MacDonald (1998) assumed three long-run determinant variables of vector **(Zt)**, are terms of trade **(tot)**, the relative price of non-traded to traded goods **(tnt)** , and net foreign asset (nfa). Thus,

$$E_t(q_{t+1}) = f(tot_t^-, tnt_t^-, fa_t^-) \qquad (12)$$

Clark and MacDonald (1998) added the role of the time-varying risk premium component to the uncovered interest parity[51]. Combining equation (11), equation (12) and the risk premium component, the BEER is expressed as:

$$BEER = f\left((r_t - r_t^*), tot, tnt, nfa, \left(\frac{gdebt_t}{gdebt_t^*}\right)\right) \qquad (13)$$

48 $(E_t(p_{t+1}) - p_t) - E_t(p^*_{t+1}) - p^*_t) = E_t(\Delta p_{t+1}) - E_t(\Delta p^*_{t+1})$

49 $r_t = i_t - E_t(\Delta p_{t+1})$

50 $r_t^* = i_t^* - E_t(\Delta p^*_{t+1})$

51 The ratio of domestic and foreign government debt $\left(\frac{gdebt_t}{gdebt_t^*}\right)$.

Hau (2002) empirically employed a cross-sectional analysis on 48 (25 non-OECD and 23 OECD) countries. The author used the real effective exchange rate (REER) volatility measured as the moving sample standard deviation of REER percentage changes over a three-year-period. The study found that economic openness and real exchange rate volatility were inversely related. Another estimation was implemented for OECD countries only, based on the premise that they were more homogenous[52]. The results also showed a negative relationship between real exchange rate volatility and trade openness.

Mathisen (2003) demonstrated that for Malawi different components of public expenditure had varying effects on the real effect exchange rate. The study showed that an increase in government spending, excluding salaries and wages led to a real appreciation. On the other hand, an increase in government spending on salaries and wages exerted pressure on the current account, and occasioned a real depreciation. The study also found that real per capita growth also exerted an influence on the real effective exchange rate.

It is nonetheless worth noting in view of the findings on Malawi about the effect of fiscal operations (based on different components) on the REER that mixed results have been established for developing countries on the relationship between fiscal deficit and the REER. In a panel estimation involving developed and developing nations, Nguyen et al., (2020) found a negative relatrionship between government spending (military spending to be specific) and the REER for developing countries while the relationship established for developed countries was a positive one. The negative relationship has some theoretrical support either from the real business cycle model or the Keynessian counterpart as documented by Moreno Badia and Segura-Ubiergo (2014).

Mungule (2004) found that terms of trade, closeness of the economy and the nominal devaluation are important factors that determine the level of the real effective exchange in Zambia. While excess supply of domestic credit and the growth in nominal exchange rate/ nominal devaluation were important short-run determinants. Additionally, a univariate analysis of Zambia's REER by Phiri (2020) established that the Zambian REER is non-linear and mean reverting. Vural (2018), using the VECM framework found that the productivity differentials largely determined the Turkey equilibrium real effective exchange rate. An increase in turkey's productivity relative to trading partner countries occasioned an appreciation of the REER. However, the study found that an increase in real oil prices led to an appreciation, contrary to an expectation of a real depreciation. Eckstein and Friedman (2011) found that relative per capita GDP and terms of trade were the most significant factors that explained Israel's real exchange rate fluctuations and trends. Other variables such as government expenditure and the dependency ratio did not impact the real effective exchange rate.

Studies on the REER using fractional integration techniques have become common due to the possibility that economic and financial variables being characterized by the phenomenon of long memory.[53] The case of long memory is one where past observations

[52] This was based on the notion that these countries experience similar shocks that are relatively similar in magnitude.

[53] See, for example, Baillie (1996), Škare and Stjepanović (2013), Tarasov and Tarasova (2016), Ngene, Tah and Darrat (2017), Tarasova and Tarasov (2018), Zheng, Liu and Li (2018), Tarasov and Tarasova (2018), Mensi, Tiwari and Al-Yahyaee (2019) and Nguyen et al., (2020).

in a given variable are non-trivially correlated with distant future counterparts (Campbell et al., 2007). This implies that such variables may be fractionally integrated as opposed to the commonly held view that they have an integer order of integration. The time series realizations with long memory are characterized by autocorrelation function which exhibits persistence that is neither consistent with an I(1) process nor I(0) process (Baillie, 1996). In other words, variables with long memory and thus fractionally integrated are characterized by slowly decaying autocorrelation functions (Campbell et al., 2007).

An early study to explore the possibility of fractional integration and cointegration among real exchange rates (RER) established the presence of fractional integration among developed countries and confirmed their fractional cointegration, (Cheung and Lai, 1993). Although this appears to be the case for the industrialized countries, it does not preclude a test for the same for developing countries, since for most of these countries, their real effective exchange rates are linked to foreign inflation as well as nominal exchange rates by virtue of trade. Therefore, there could be a possibility that developing countries REER variables may be fractionally integrated. This is through their linkage with developed countries' variables since interaction between economic variables are influenced by the memory function that connects them (Tarasov and Tarasova, 2018).

One of the other early studies to consider fractional integration in the real exchange rate and make conclusions about the fractional cointegration of the variables was done by Holmes, (2002). The study sought to establish whether the PPP based on the Real Exchange Rate (RER) for developing countries that included some sub-Saharan Africa countries (SSA) hold. The Geweke and Porter-Hudak (GPH)'s semi-parametric method was used. It was established that the PPP holds for eight countries including South Africa from the SSA countries in view of the respective real exchange rates being fractionally integrated. The author concluded that the spot exchange rate, foreign prices, were fractionally cointegrated. However, it is our considered view that Holmes (2002) view may be too strong a conclusion on fractional cointegration in the absence of formal test for fractional cointegration as for instance suggested by Johansen and Niels (2012) and implemented by Gunay (2018) and Salisu et al. (2020) on precious metal prices and Islamic stocks, respectively.

Caporale and Gil-Alana (2004) also tested for fractional cointegration of the real exchange rate with other variables – real and monetary variables. They argue in the paper that a fractionally integrated and cointegrated structure could be the best modelling approach for real exchange rates. They are of the view that the error correction term's response to shocks is slower than inferred by classical methods such as the Johansen (1995). They argue that the equilibrium errors obtained with classical methods may exhibit fractionally integrated property of displaying slow mean reversion. This is the case where the error correction term may show signs of a long memory process with deviations from equilibrium being highly persistent. This is the case, in our view, akin to relationships characterized by very slow speed of adjustment to the equilibrium when estimated with classical cointegration methods and may thus require the use of fractional cointegration techniques. The results by Caporale and Gil-Alana (2004) found the real exchange rates of the Deutsch Mark–US dollar and the Japanese Yen–US dollar pairs

to be fractionally cointegrated with real interest rate and labor productivity differentials. Similarly, Gil-Alana and Trani (2019) employed fractional integration technique to examine whether the G7 trade weighted REERs were mean reverting, arguing, in support of the use of fractional integration methods, that changes in the REER are very persistent and this makes it difficult to detect stationarity, and therefore mean reversion, by using conventional univariate unit-root test techniques.

Regarding the interaction of monetary policy impulses with the REER, Ndung'u (1999) assesed whether the exchange rate of Kenyan currency is affected by monetary policy adjustments and if these effects were permanent or transitory. The real exchange rate was decomposed into cyclical and permanent components. Causality tests were performed between several measures of monetary shocks and the cyclical component of the exchange rate. The results showed that excess money supply affected the cyclical movement of the real exchange rate in the short run only, an indication that its effect is temporal. This is consistent with an earlier theoretical proposition and application in a study by Calvo, Reinhart and Végh (1995) on some Latin American countries. It has also been established and argued that the steady state real exchange rate is independent of permanent changes in monetary policy. They asserted that this result depends on the fact that there is no direct steady state link in theory between inflation and real exchange rate, implying that monetary effects are transitory.

In a recent study, and specifically on a SSA country, Iddrisu and Alagidede (2020) found monetary policy impulses to affect South Africa's in which case monetary policy tightening was accompanied by an appreciation in the REER. Similar results were found by Mundra and Bicchal (2023) but on India.

IV. Methodology

Economic variables normally interact as a system where a shock on one variable affect others either contemporaneously or with a lag. Most of the studies done in sub-Saharan Africa especially on the equilibrium real effective exchange rate and monetary policy have mainly used classical approaches on time series where it is assumed that the time series properties follow the integer order of integration. However, as highlighted elsewhere in the study, most economic, and financial time series data often exhibit long memory, a feature that has significant implication for monetary implementation. This study therefore used fractional cointegration approach. The issue of fractional integration and fractional cointegration presents a host of models/methods available for testing this phenomenon. A detailed review of such methods has been well documented by Baillie (1996) with the accompanied application of the methods to analyze economic and financial data. The study also used Bayesian VAR with sign restrictions procedure to establish the dynamic impact of monetary policy shocks on the REER.

Estimation

Since our interest is to determine the long-run and short-run determinants of the REER for Zambia under the assumption that variables in the system may be fractionally integrated, as argued in modern literature on time series economic and financial data, a

fractionally cointegrated VAR (FCVAR) model is used. This is a non-restrictive model when compared to the cointegrated VAR (CVAR) counterpart where restrictions of I(0) and I(1) are imposed in the assumption of the order of integration of the data. In this regard, for a given time series with a dimension of its FCVAR model of the error correction form (Johansen and Niels, 2012) is expressed as

where, ε_t is p-dimensional i.i.d. $(0,\Omega)$, Δ^d is the fractional difference operator, and $L_b=1-\Delta^b$ is the fractional lag operator. Long run parameters are represented by α and β, which in both cases are $p \times r$ matrices such that $0 \leq r \leq p$ In this set up, r is the fractional cointegration rank while β represents, by its columns, the r fractional cointegration vectors and α is the speed of adjustment to the equilibrium for each of the variables. The combination $\beta' Y_t$ represents the fractional cointegration of the variables in the system. The parameters d and b are the fractional parameters with d representing the fractional order of integration for the given time series while b determines the degree of fractional cointegration. In the model above, when $d = b = 1$, you obtain the Johansen (1995) CVAR model.

The estimates obtained by fitting the above model with Zambian data were used to assess the dynamic behaviour of the equilibrium REER relationship with its determinants and the medium-term outlook. Estimations were done using the FCVAR package obtained from the Comprehensive R Archive Network. The steps involved in the estimation procedure are as follows:

i. Undertake a lag length selection based on the likelihood ratio (LR) and or Akaike information criterion (AIC) in order to get a well behaved VAR;

ii. Carry out a Cointegration test (Trace test) using maximum likelihood methods and determine the number of cointegrating relationships based on the LR;

iii. Estimate the model(s) using information obtained by steps (1) and (2) above with parameter space for d and b ranging between 0.01 and 2.0. Other initial values incorporated; and

iv. Establishing the suitability of the FCVAR model (Johansen and Niels, 2012) vs CVAR model (Johansen, 1995).

To estimate the impact of monetary shocks on the REER, an unrestricted VAR (equation 15) was estimated to recover necessary parameters. Its impulses were allowed to interact with appropriate sign restrictions using Bayesian techniques to trace dynamic impulse response functions. Sign restrictions are only amenable in a Bayesian framework and that structural shocks can be identified by determining whether the signs of the corresponding IRFs are consistent with economic theory (Cha and Bae, 2011). Bayesian techniques are ideal for short observations and data with long memory (Harjes and Ricci, 2010; Carlin and Jonas, 1985). Furthermore, Bayesian techniques also take care of nonlinearities in the data, which may be present in long memory processes, (Kablan and Kaabia, 2018).

$$y_t = \alpha + \sum_{i=1}^{L} \boldsymbol{B}_i y_{t-L} + \varepsilon_t \quad (15)$$

where,

$t = 1, - - - - -, T$;

$\alpha = 1 \times \rho$ unknown vector of intercepts;

$\boldsymbol{B}_i$ = unknown $\rho \times \rho$ matrix of coefficients, $i = 1, - - - - -, L$; and

$\varepsilon_t = \varepsilon_1, - - - - -, \varepsilon_T$, the independent and identically distributed error terms.

The error terms are normal, i.e. $N_\rho(0, \theta)$ with $\rho \times \rho$ unknown covariance matrix $\boldsymbol{\theta}$.

Economic meaning may be extracted from the model above based on the property that a one step ahead forecast errors of a reduced form VAR is linked to structural innovations (Cha and Bae, 2011; Danne, 2015) under the relationship;

$$\boldsymbol{A}\varepsilon_t = e_t \quad (16)$$

where, $\boldsymbol{A}$ is an $n \times n$ matrix of structural parameters with e_t being the structural shocks such that $e_t \sim iidd(0,1)$. The structural parameters can be recovered from the reduced form VAR by invoking on the system the property expressed in equation (17)

$$\boldsymbol{A}\acute{\boldsymbol{A}} = \Sigma = E[\varepsilon_t \acute{\varepsilon_t}] \quad (17)$$

The $E[\varepsilon_t \acute{\varepsilon_t}]$ can then be obtained by estimating the VAR using the Ordinary Least Square (OLS) method. Recovering the structural shocks from the estimated $\widehat{\varepsilon_t}$, requires the identification of $\boldsymbol{A}$ (Cha and Bae, 2011; Danne, 2015). To ensure the results are consistent with economic theory, sign restrictions are imposed also. However, the identification procedure that also takes into account sign restrictions will not be feasible with the traditional Cholesky decomposition method as it may yield inconsistent results. Notwithstanding, the use of Bayesian techniques can help generate impulse responses amidst sign restrictions that are consistent with economic theory (this is only possible with the use of Bayesian techniques Granziera, Moon and Schorfheide, 2018; and Danne, 2015). The Bayesian techniques for sign restrictions compute cumulative impulse responses and then check if the range of the impulse responses generated are compatible with the sign restrictions imposed. Successful draws are done based on an uninformative prior, usually the uniform prior using Bayesian methods.

The Bayesian VAR with sign restriction based on the Uhlig (2005) algorithm was adopted for this study to deal with the problem of establishing the dynamic impact of monetary policy impulses on the Zambian REER. The Bayesian estimation is achieved through a Markov Chain Monte Carlo (MCMC) process with the credibility of the procedure (how well the model is specified) determined by the number of rejected draws (Danne, 2015). Zero or few rejections means the estimation procedure is reliable, but too many rejections implies the model estimated is not better than alternative models that fit the data and satisfies sign restrictions (Fry and Pagan, 2011 and Danne, 2015)[54].

The Uhlig (2005) penalty function method was used with a positive (+) sign restriction imposed on the monetary policy rate while a negative (-) sign restriction was imposed on

[54] See details of steps involved in Bayesian VAR with sign restrictions estimation in Danne, (2015)

the nominal exchange rate in line with economic theory. No sign restriction was imposed on productivity differential and the REER because we wanted the outcome to be data determined and thus draw insights on the impact of tight domestic monetary policy on the REER and productivity differential for Zambia.

Data Description

The choice of the sample period from the first quarter of 2006 to the fourth quarter of 2021 was based on the characteristics of economic developments during this period. The variables used in this research are given in Table 51.

Table 51: Variable Description

S/N	Variable	Definition	Data Source
1.	The Real Effective Exchange Rate	This is defined as the nominal effective rate between Zambia and its five major trading partners (China, South Africa, United States of America, United Kingdom and the Euro Area) adjusted for inflation differentials	The data was obtained from the Bank of Zambia's research database
2.	The real productivity differential	This is the difference between the geometric mean [55] of the per capital GDP of Zambia's five major trading partners and the Zambia's per capital GDP.	The data for Zambia's per capita GDP was obtained from the Bank of Zambia's research database whilst the data on per capital GDP for the major trading partners, except, China were obtained from the Eurostat database. The data on GDP for China was from the National Bureau Statistics of China [56]. The population figures for China were obtained from database maintained by the Atlanta Federal Reserve Bank while the exchange rate was obtained from the IMF website
3.	Real Copper Prices	This is the value of one metric ton of copper in USD divided by the value for 2012Q1.	The nominal values were obtained from the Bank of Zambia
4.	Fiscal Deficit	This was obtained by dividing total expenditure by total revenue with the value above 1 indicating a fiscal deficit. Otherwise, it is a fiscal surplus.	The data was obtained from the Bank of Zambia's research database

[55] The computation makes use of country trade weights used in the calculation of the real effective exchange rate.

[56] The GDP per capita for China was computed as the ratio of its GDP and population size while for the rest of the countries, GDP per capita was obtained as provided from the respective sources.

5.	Monetary Policy Rate[57]	This is the key interest rate used by the Bank of Zambia to signal the monetary policy stance to the markets.	The data was obtained from the Bank of Zambia's research database
6	Inflation	Computed as a log of the consumer price index	Data was obtained from the Zambia Statistical Agency.

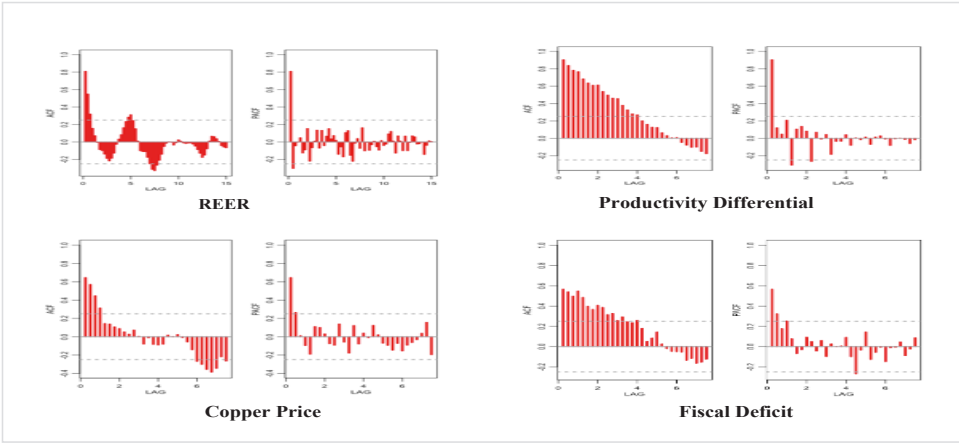
Source: Authors

Statistical investigations of the REER suggest that the series is neither an I(0) nor an I(1) process, but one that is fractionally integrated given the fractal signal classification estimates that suggest that the series is an *fGn* process in view of the estimated result of $\beta < 1$ (Table 52) and the slow decay of its ACFs (Figure 44)[58]. The possible determinants of the REER for Zambia, the real copper prices and the productivity differential are also not integrated of the integer order with the former being an anti-persistent *fBm* process ($\beta < 2$) while the latter is a persistent *fBm* process given that $\beta > 2$ (Table 52). The fiscal deficit is also an anti-persistent *fBm* type of process. The ACFs for the four variables equally decay slowly (Figure 44). [59]

Table 52: Fractal Signal Classification

Variable	β Estimates	Fractal Signal Classification
Real Effective Exchange Rate (REER)	0.1367362	fGn
Real Copper Prices (Cup)	1.387995	Anti-persistent *fBm*
Productivity Differential (Prodif)	2.1234220	Persistent *fBm*
Fiscal Deficit	1.699726	Anti-persistent *fBm*

Figure 44: The ACFs and PACFs



[57] Although the Monetary Policy Rate started in the second quarter of 2012, for prior periods, the 91-day treasury bill rate was used as a proxy for the stance of monetary policy.

[58] These are based on the R Package called PSD that uses Power Spectral Density (PSD) or periodogram approach. We specifically employ the lowPSD option in the package. Details of the PSD estimation procedures are documented by Schaefer *et al*, (2014), Stadnitski (2012) and Eke *et al* (2002

[59] See Annex 2 for details on the literature review on fractional cointegration

V. Discussion of Empirical Results

Tests for Cointegration and Estimations

To get appropriate variables and an optimal model that explains the REER for Zambia in the context of its possible determinants a general to specific estimation strategy was employed[60]. The satisfactory combination was achieved with the model for five variables (four macroeconomic and one dummy) having a lag of one, although the AIC and LR favoured a model with three lags. The choice of one lag was settled for in the spirit of parsimony given a relatively short span of the data and small number of observations. The trace test for parsimonious model also showed that two cointegrating equations exist (Table 53). However, when the estimations imposed a rank of one to just focus on the variable of interest being the REER as the dependent variable and the real copper prices, fiscal deficit, productivity differential and the dummy variable as independent variables resulted in a well-behaved estimated model.

Table 53: Likelihood Ratio Tests for Cointegrating Rank (Lags = 1)

Dimensions of system:		3	Number of observations in sample:		64
Number of lags:		1	Number of observations for estimation:		64
Restricted constant:		No	Initial values:		0
Unestricted constant:		No	Level parameter:		Yes
Rank	d	b	Log-likelihood	LR statistic	P-value
0	0.500	0.500	306.544	39.329	0.000
1	0.478	0.478	320.971	10.464	0.033
2	0.687	0.678	325.455	1.496	0.607
3	0.574	0.754	326.203	…..	…..

The results involving the five variables (REER, real copper prices, productivity differential, fiscal deficit and a dummy) show that cointegration relationship of fractional order ($d = 0.167$) exists among the four economic variables and they move together as a stationary process given that the fractional parameter is less than (Table 54).

The characteristics roots are within the unit circle (Annex 3a). The two independent variables, copper prices and productivity differential have a negative relationship with the REER as expected. A rise in copper prices is more likely going to lead to an appreciation in the REER, which may be possible through the appreciation of the nominal exchange rate. A rise in copper prices could be a signal to foreign portfolio investors that Zambia dollar liquidity may be augmented through the increase in foreign exchange supply in form of mining tax payments and other domestic obligations. This provides an incentive for investors to increase their exposure to Kwacha denominated assets and thereby augmenting foreign exchange supply, leading to the appreciation of the nominal exchange rate, and subsequently the REER.

While empirical estimates show a negative coefficient for fiscal deficit, implying a rise in fiscal deficit is followed by an appreciation in the REER. This is not surprising as

[60] This involved the terms of trade, productivity differential, interest rates differential, fiscal deficit, net foreign assets, and foreign reserves.

it is consistent with the mixed results established in empirical literature especially for non-developed countries data such as Zambia's. The implication is that Zambia's fiscal deficit has been to an extent financed by foreign borrowing. Between 2007 and 2021, Zambia's public external debt increased to US$13.04 billion from US$1.11 billion in 2006 following the HIPC completion point in 2005. Some of these debt flows were in form of portfolio flows that included the euro bond amounting to US$3.0 billion and foreign investors exposure to Government securities estimated to be US$2.96 billion at end December 2021.

Table 54: Fractional Cointegration Results for REER, Productivity Differential, Real Copper Prices, and Fiscal Deficit

Dimension of system:	5	Number of observations in sample:	64
Number of lags:	1	Number of observations for estimation:	64
Restricted constant:	No	Initial values:	0
Unrestricted constant:	No	Level parameter:	Yes
Starting value for d:	0.800	Parameter space for d:	(0.010 , 2.000)
Starting value for b:	0.800	Parameter space for b:	(0.010 , 2.000)
Cointegrating rank:	1	AIC:	508.973
Log-likelihood:	-214.486	BIC:	595.328
log(det(Omega_hat)):	-7.487	Free parameters:	40

Fractional Parameters

Coefficient	Estimate	Standard error
d	0.167	0.061

Cointegrating equations (beta):

Variable	CI equation 1
Var1 (Real Effective Exchange Rate)	1.000
Var2 (Real Copper Prices)	0.004
Var3 (Productivity Differential)	0.008
Var4 (Fiscal Deficit)	0.002
Var54 (Dummy)	-0.369

Further, imposing a restriction $d = b = 1$, that is the three variables are best estimated by the CVAR model of Johansen (1995) as opposed to the FCVAR (the unrestricted model), the results show that the FCVAR is preferred to the CVAR (restricted) given a higher likelihood ratio of -214.486 for the unrestricted model compared to -240.470 in respect of the restricted counterpart (Table 55). In addition, the restricted model has its characteristic roots falling outside the unit circle (Annex 3b). This is evident that the CVAR model may not be appropriate for the data involving the five variables used in this study.

Table 55: Likelihood Ratio Test Results Between two Models

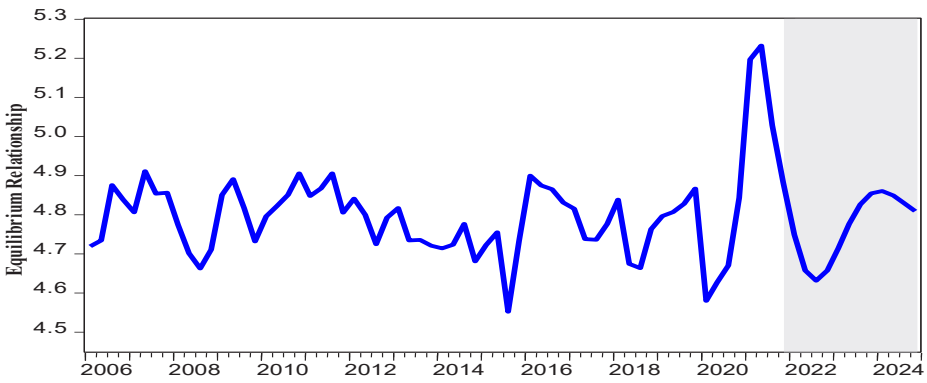
Unrestricted log-likelihood:	-214.486
Restricted log-likelihood:	-240.470
Test results (df = 1)	
LR statistic:	51.967
P-value:	0.000

The implication of these results is that the FCVAR model is appropriate in estimating the REER for Zambia during the period under review. This means that the real effective exchange rate for Zambia is fractionally cointegrated with its determinants as opposed to being of integer order of integration. Its long run equilibrium is primarily determined by the productivity differential between Zambia and its major trading partner countries, real copper prices as well as the fiscal deficit. The results also mean that a shock to the REER is neither transitory nor permanent. Equally, the effects of the shock to the productivity differential and or the real copper prices as well as the fiscal deficit does not have a permanent or a transitory effect on the REER over the sample period. This implies that shocks to the REER die out slowly as confirmed by the ACF in Figure 44. The results are somewhat in line with the findings by Phiri (2020) who established that Zambia's REER is non-linear.

The equilibrium relationship has an equally slow movement but stationary (Figure 45, note that values are in logs). The stationarity in the equilibrium real effective exchange rate for Zambia can be seen if we give it some compact form with the bounds being in some epsilon neighbourhood of 4.54 (lower limit) and 5.24 (upper limit). This is even more apparent if we disregard the over shooting in the period 2021Q1 – 2021Q3 by letting the upper limit be in the infinitesimal neighbourhood of 4.95 as most of the observations will lie within the 4.54 – 4.95 corridor. The slow but stationary movement in the equilibrium REER is even more likely to continue three years ahead (2022Q1 – 2024Q4) as indicate in the forecasted trends in Figure 45. There is, therefore, a high likelihood that the equilibrium REER for Zambia could be indeed mean reverting but with a relatively slow speed of adjustment to its long run average.

To validate mean reversion behaviour of the equilibrium relationship and its slow speed of adjustment to its steady state value observed in Figure 45, we carried out a Beta (β) convergence estimation (See Annex 1 for the details including hypothesis testing). The choice of a Beta convergence procedure is to also get a sense of the long run steady state value around which the series making up the equilibrium oscillate. In this procedure, the negative sign of the β coefficient in the model used implies mean reversion in the series of interest. Further, the value of the β parameter ($\beta \in [-1, 0)$) which are possible values of a stationary or mean reversion process) indicates the speed of adjustment to the long run average (steady state value) while the ratio of the intercept (α) and the β coefficient (specifically, $-\alpha / \beta$) estimates the long run steady state value around which the equilibrium is established.

Figure 45: Equilibrium Relationship, Including Forecasting.



The results confirm our suspicion. The equilibrium relationship is indeed a stationary process given the negative sign of the β coefficient and is characterised by a slow speed of adjustment to the long run average. The value of β is -0.37333 (i.e. β = -0.37333 while the steady state value is 4.80410361 (i.e. $\frac{\alpha}{\beta} = 4.80410361$). Therefore, if there is a shock to the system of the three variables used in this study, the speed of adjustment of the equilibrium relationship to its long run average of 4.80 is 0.37 (or 37 percent), which is slow.

The result on the equilibrium REER's mean reversion behaviour is broadly consistent with the findings by Phiri (2020) on the actual Zambian REER which was established to be mean reverting in a univariate analysis. This was based on the exponential smooth transition autoregressive model whose estimated threshold values showed adjustment back to equilibrium.

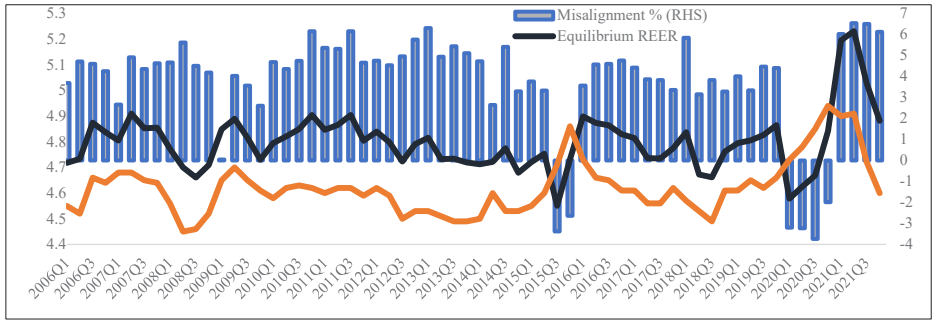
Misalignments of the REER

To get a sense of the extent of the misalignment of the actual REER from the estimated equilibrium REER presented above, the following metric was used to compute the values which are an indicator of the level of misalignment:

$$misalignment = \frac{\widehat{REER} - REER}{REER} * 100 \quad (24)$$

The values obtained were compared to zero with an interpretation that observations above zero imply an overvaluation of the REER whilst the values below zero can mean the case of undervaluation.

Figure 46: Actual versus Equilibrium REER and Misalignment



The results show that the REER has largely been overvalued in the post HIPC era with exceptions being only during the periods of globally induced shocks such as seen in the first quarter of 2009, third and fourth quarter of 2015 as well as the year 2020. The undervaluation cases identified coincides with the global financial crisis (GFC), the commodity price crisis that ensued when the Federal Reserve Bank normalised monetary policy with the end of the unconventional monetary policy (UMP) and the COVID-19 shock.

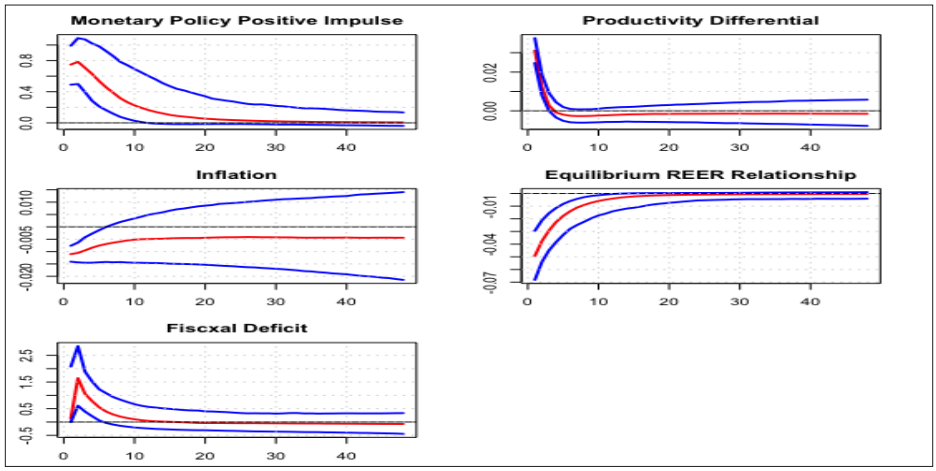
The GFC crisis caused some alignment in the Zambian REER mainly due to the depreciation of the nominal exchange rate by 21.6 percent in the first quarter of 2009, but this was followed by a 4.2 percent overvaluation in the second quarter of 2009. The overvaluation largely went on (with varying degrees) until the unwinding of the UMP which led to an undervaluation averaging 3.0 percent during the third and fourth quarter of 2020. The fall in commodity prices leading to the depreciation of the Kwacha largely explains this outcome. An undervaluation in the range of 2.0 to 3.2 percent was recorded during the COVID-19 period of 2020. The depreciation of the nominal exchange rate in the range of 3.1 to 20.6 percent over the four quarters primarily explains this development. The undervaluation was nonetheless followed by an overvaluation as the Kwacha due to an appreciation bias particularly in the last half of the year 2021.

Impact of Monetary Policy on the Equilibrium REER

To gain insights into how monetary policy is likely to impact the REER, a Bayesian technique employing sign restrictions was applied within a VAR Framework. This analysis incorporated the monetary policy rate, the REER and some of its determinants such as inflation, productivity differential and the fiscal deficit.

The overall results show that a positive (i.e. contractionary) monetary policy shock leads to a decline in inflation, an appreciation of the REER, and an initial rise in fiscal deficit. Additionally, there is an observed widening of the productivity differential in favor of Zambia's major trading partners (Figure 47).

Figure 47: Impulse Response Functions



The effect of a contractionary monetary policy persists for two quarters and then declines progressively to die out after 20 quarters within the system. Its effect on inflation takes long as inflation remains subdued. Fiscal deficit increases in the first two quarters of monetary tightening contrary to expectation. This could be a reflection of poor monetary – fiscal coordination. Ideally, when monetary policy tightens, fiscal should implement complementary measures in order to help the economy deal with an adverse shock hitting the system. In the decade 2011 – 2021, this was largely not the case as fiscal deficit continued to mount amidst economic shocks (such as ending of the UMP by the Federal Reserve Bank in 2015) that may have required tightening of both monetary and fiscal policy. However, after two quarters, fiscal deficits responds to tight monetary policy with a decline probably on account of tight liquidity that may have led to some slow down on expenditure as financing the deficit becomes relatively expensive. Productivity reverts to its equilibrium within five quarters after the initial policy impulse whilst the REER reverts to the equilibrium within 15 quarters after appreciating.

The result of the effect of monetary policy shock on REER is relatively long lived, lasting 15 quarters. This result is in line with findings in the literature showing persistence of the real exchange rate in response to monetary policy shocks (Carvalho, Nechio and Yao, 2018). Thus, in Zambia, there is a role for monetary policy to offset uncompetitive price pressures.

VI. Conclusion

The real effective exchange rate (REER) is an important macroeconomic variable, pivotal in the overall resource allocation within an economy. It also serves as a measure of competitiveness, significantly shaping a country's external sector performance. This study sought to examine the determinants of equilibrium exchange rate, compute the exchange rate misalignment and assess the impact of monetary policy on the equilibrium REER in Zambian based on data over the period 2006-2021.

The study used fractional cointegration VAR (FCVAR) model because which accommodates both integer order and fractionally integrated data. The results show that the Zambian REER is fractionally cointegrated with the real copper price, fiscal deficit and productivity differential. The equilibrium relationship is stable but a shock to it tends to have a slow speed of adjustment to its steady state. Further, the study employed a Bayesian VAR with sign restrictions to identify the impact of monetary policy on the REER. The results show that a positive monetary impulse leads to the REER appreciation and convergence to the equilibrium occurs after 15 quarters.

However, our findings do not support the Balassa-Samuelson effect as an increase in the productivity differential in favor of Zambia seems to be associated with a depreciation of the REER. In Zambia, external factors relevant for the REER are mainly those arising from shocks to the real copper price. Anecdotally, shocks to the copper prices largely arise from exogenous shocks in the global economy.

Given that the equilibrium process of the REER reverts to the mean, albeit slowly, the major policy implication is that there is some scope for policy intervention to hasten the return to equilibrium when the economy is hit by shocks that result in non-competitive prices. These would include among others, foreign exchange interventions that averts excessive appreciation of the Kwacha-Dollar nominal exchange rate.

Monetary policy shocks have a significant effect on the REER, for instance, contractionary shocks result in an appreciation of the REER on impact, an indication of the dampening effect of policy on inflation. Thus, policy makers should be conscious of the fact that their policy actions may have a direct impact on the external sector competitiveness. For example, loose monetary policy may result in unwanted depreciation of the real effective exchange rate which may occasion external imbalances. In addition, monetary policy tightening leads to a rise in the productivity differential against Zambia. The policy implication with this outcome is that monetary authorities should make a trade-off between high inflation and loss of productivity for about a two year-period.

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Annexes

Annex 1: Beta Convergence Estimations

The Beta convergence estimation procedure serves to gauge the long run average (steady state value) toward which a time series may revert in the event of deviations caused by various shocks. Furthermore, it provides insight into the speed of adjustment to this long run steady state value. This information can offer clues regarding whether the series of interest exhibit persistence or follows a mean reverting process (see Marques, 2004; and Dias and Marques, 2010). In our context, the estimation of the long run steady state value and the speed of adjustment for the equilibrium REER is derived from equations below.

These equations (1 and 2) are as presented by Hlivnjak (2009), Monfort (2008) and Mbao (2021).

$$\Delta x_t = \alpha + \beta(x_{t-1}) + \theta_t \qquad (1)$$

where,

Δ is the first differences of the variable of interest;
α is constant term representing autonomous growth in the variable of interest;
β is speed of convergence/adjustment to long run mean; and
θ_t is the error term such that $\theta_t \sim N(0, \sigma^2)$.

Equation (1) can be expanded as

$$x_t - x_{t-1} = \alpha + \beta(x_{t-1}) + \theta_t$$

or

$$x_t = \alpha + x_{t-1} + \beta(x_{t-1}) + \theta_t$$

or

$$x_t = \alpha + (1 + \beta)x_{t-1} + \theta_t,$$

conditioned on

$$-1 \leq \beta \leq 0.$$

The interpretation of equation (1) is that the speed of adjustment is supposed to be negative if convergence to the long run occurs. The closer its absolute figure is to one (1) (i.e. 100%), the greater the speed of adjustment is, and the opposite is true. Specifically, the null hypothesis guiding the tests is that the equilibrium REER does not converge to its steady state value, meaning $\beta \geq 0$, against the alternative hypothesis that equilibrium REER converges to a long run steady state. This is the case for $-1 \leq \beta < 0$.

That is,

$$H_0: \beta \geq 0$$

$$H_a: -1 \leq \beta < 0$$

For estimating the long run steady state value for the sample, the equation below is used.

$$Long\ run\ steady\ state = -\frac{\alpha}{\beta}, \qquad (2)$$

where,

α and β are as defined before.

Fitting the model above with the equilibrium REER data and estimated with an OLS procedure in EViews, the results are presented in the table below.

Annex 2: Results of the OLS Model

Dependent Variable: D(EREER)

Method: Least Squares

Date: 09/25/22 Time: 17:53

Sample (adjusted): 2006Q2 2021Q4

Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.465017	0.720928	3.419226	0.0011
EREER(-1)	-0.299635	0.087683	-3.417239	0.0011

R-squared	0.160676	Mean dependent var	0.001543
Adjusted R-squared	0.146916	S.D. dependent var	0.058602
S.E. of regression	0.054126	Akaike info criterion	-2.963777
Sum squared resid	0.178706	Schwarz criterion	-2.895741
Log likelihood	95.35898	Hannan-Quinn criter.	-2.937018
F-statistic	11.67752	Durbin-Watson stat	1.832802
Prob(F-statistic)	0.001132		

$$\alpha = 2.465017$$

$$\beta = -0.299635$$

$$-\frac{\alpha}{\beta} = -\left(\frac{2.465017}{-0.299635}\right) = 8.22673252$$

Annex 3: Literature Review on Fractional Integration

The issue of fractional integration and fractional cointegration being related to the subject of long memory process in the data presents a host of models/methods available for testing this phenomenon. A detailed review of such methods has been well documented by Baillie (1996) with the accompanied application of the methods to analyze economic and financial data.

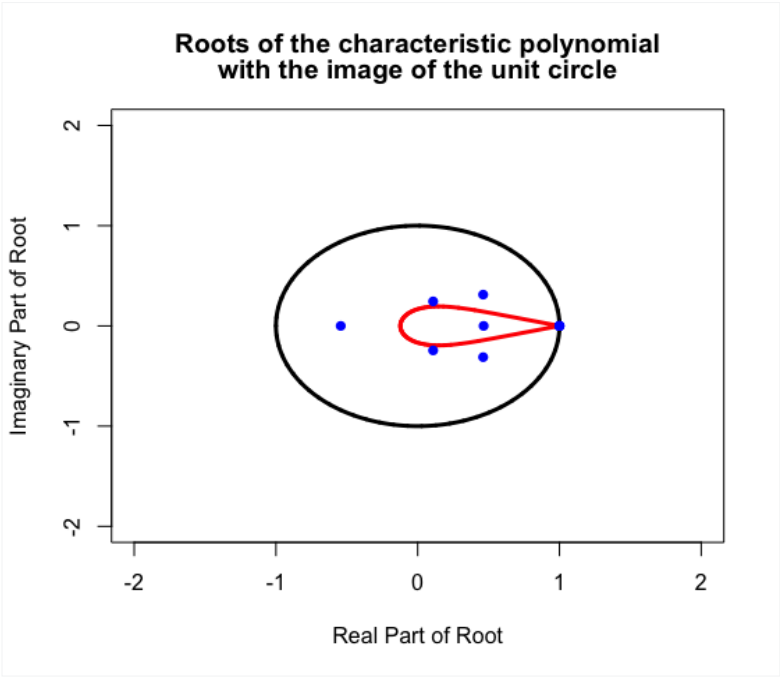
Early methods of determining fractional integration used fractal techniques for estimating the Hurst parameter, which is one of the measures of long memory in time series data. Since the pioneering work of the Rescaled Range (R/S) analysis by Hurst (1951) a lot more methods have been developed as pointed out by Cajueiro et al.(2009). Kirichenko, Radivilova and Deineko (2011) have all documented and assessed a range of techniques used for estimating the Hurst parameter with varying recommendations on their suitability based on whether the series under observation is stationary or otherwise. However, and more crucially, the use of the Hurst parameter to assess the fractional integration of the data should be done with a clear understanding of the true underlying behavior of the data under review.

Serinaldi (2010) and Eke et al. (2002) have guided on the need to establish whether the data is either fractional Brownian motion (*fBm*) or fractional Gaussian noise (*fGn*) when estimating long memory in the data based on the Hurst parameter. The *fGn* is the first difference of the *fBm*, which is a fractional differentiation of the Brownian motion or random walk Delignieres and Torre (2009). The *fBm* and the fGn have different statistical properties regarding stationarity or persistence and yet there can be the same Hurst parameter estimate of these two different data processes. This is the down side of the Hurst parameter estimate and therefore has the possibility of one making a spurious interpretation of the results if the signal classification of *fBm* and *fGn* properties are not established. Cannon et al. (1997) has empirically established that there is a unique Hurst exponent which characterises both the *fBm* and the *fGn* signals. In view of this, methods have been developed to estimate the fractal signal of time series data which can help to establish the nature of long memory and thus the type of fractional integration.

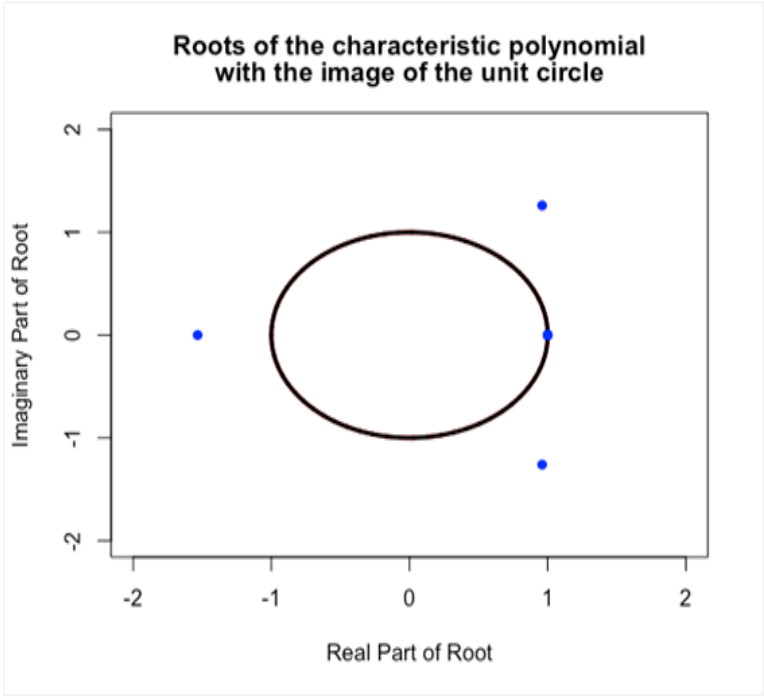
Data with long memory or fractionally integrated exhibit power law of the type $1/f^{\beta}$ (Chen et al., 1997; and Pilgram and Kaplan, 1998). According to Cannon et al.(1997), Eke et al.(2002) and Delignieres and Torre (2009) such processes can be either of the *fGn* or *fBm* classification such that $\beta \in (-1, 1)$ denotes the *fGn* series and $\beta \in (1, 3)$ implies the *fBm* type of signal (Serinaldi, 2010 and Cannon et al., 1997). White Gaussian noise is *fGn* type of the $1/f^{\beta}$ process with $\beta = 0$. The Brownian motion is the *fBm* process with $\beta = 2$ (Hausdorff *et al.*, 2000). Both the *fGn* series and the *fBm* signal with $\beta < 2$ are the anti-persistent processes. The *fBm* signals of $\beta > 2$ are regarded to be persistent over a relatively longer period. In this regard, estimates aimed at establishing whether time series data is of the *fBm* or *fGn* signal can be used to identify whether the series of interest is fractionally integrated since such methods help to identify series of long memory and classify them accordingly as described above.

Both the H and β parameters are not informative on the extent of fractional order of integration in a time series. However, autoregressive fractionally integrated moving average (ARFIMA) models of the type ARFIMA(p, d, q) have been estimated to determine the exact fractional order of integration for processes that are stationary. For example see Granger and Joyeux (1980) and Baillie (1996) for such estimations. The parameter p in the ARFIMA models is the number of autoregressive terms while d is the fractional difference operator and q is the number of lagged forecast errors in the prediction equation. Recently, models that considers fractional differencing parameter in a multivariate set up and also for non-stationary processes have been proposed by Johansen (2008), Johansen and Nielsen(2010) and Johansen and Nielsen(2018) and estimated by others as highlighted before in the earlier paragraphs. This approach informs the methodology in our current research.

Annex 3a: Characteristic Roots from the FCVAR Model



Annex 3b: Characteristic Roots from the CVAR Model



2. Real Effective Exchange Rate Misalignment and Monetary Policy in Uganda

Suleiman Nyanzi and Lorna Katusiime

I. Introduction

The subject of real effective exchange rate (REER) misalignment continues to generate wide interest and debate from policymakers, market participants and academicians alike due to the increase in real exchange rate distortions occasioned by globalization and openness, whereby the exchange rate deviates from its long run equilibrium level resulting in either an over or undervaluation of the domestic currency. There is a vast literature on the determination of the equilibrium level of exchange rates and its misalignment both in developed and developing country contexts that employ various exchange rate models, data sets, and estimation strategy with mixed results. In general, real exchange rate misalignment is considered costly and a key indicator of a country's economic vulnerability. However existing evidence on the impact of REER on macroeconomic performance is mixed. For instance, while the general consensus is that real exchange rate matters for economic growth, existing evidence on exchange rate misalignments in the form of undervaluation is linked to both positive and adverse growth effects, suggesting moderating region and country specific factors may be important (Ghura & Grennes, 1993; Haddad & Pancaro, 2010; Karadam & Özmen, 2021; Berg & Miao, 2010; Ribeiro et al., 2020).

In the era of increasing globalization, the close link between REER misalignment and economic crises makes the issue of optimal currency value a concern for academics and policymakers. Indeed, several studies are devoted to investigating the link between REER misalignment and crises (Heriqbaldi et al., 2020; Holtemöller & Mallick, 2013; Kemme & Roy, 2006; Stein & Paladino, 1999). For policymakers, exchange rate misalignments constitute a serious problem because they may highlight a country's economic vulnerability that signals domestic policy inconsistency or adverse macroeconomic shocks. As such, an understanding of equilibrium exchange rates and their misalignment is crucial information for the effective deployment of corrective action and contributes to central banks' objectives of maintaining price stability and a sound financial system.

The present study therefore estimates the equilibrium REER and examines its misalignment for Uganda in line with the popular Behavioral Equilibrium Exchange Rate (BEER) approach. In addition, the study investigates the potential relationship between real exchange rate misalignment and monetary policy. To the best of the authors' knowledge, this is the first study investigating the relationship between monetary policy and REER misalignment in Uganda.

The rest of the paper is structured as follows. The evolution of Uganda's exchange rate policy is described in section 2, section 3 presents a review of the literature on real equilibrium exchange rates while section 4 discusses the methodology applied in this

study. The empirical results and discussion of the findings are presented in section 5 while the conclusions are reported in section 6.

I. Evolution of Uganda's Exchange Rate Policy

The exchange rate and its evolution are essential macroeconomic indicators in a small open economy like Uganda. Uganda's foreign exchange market has undergone significant reform and transformation, moving from systems of controls in the early 70's to an open and liberalized market. The inception of the Ugandan foreign exchange market date back to the period following independence, when the Government of the newly created Republic of Uganda began establishing institutions through Acts of Parliament including the Bank of Uganda Act of 1966 as well as the Exchange Control Act (1969). The Uganda foreign exchange market was charged with the responsibility of among other things maintaining external reserves in order to safeguard the international value of the currency and manage the exchange rate. Exchange rate management during this period was guided by the Treaty for East African Co-operation, which came into force in December 1967 and required central bank governors to meet at least four times a year to consult and co-ordinate their monetary, balance of payments, and interest rate policies. However, in the 1970s, gross economic mismanagement and artificial shortages created by fixed exchange rate regimes led to deterioration of the economy and the emergence of a parallel market leading to overvaluation of the shilling. The resultant balance of payments deficit was caused by dwindling foreign exchange earnings as the shilling overvaluation imposed an implicit tax on the export sector while at the same time granting a subsidy on imports. By the 1980s, the parallel foreign exchange market premium had risen dramatically such that the official shilling rate in 1980 stood at 7.5 per US dollar while the black-market rate was 30 times higher.

In 1981, a financial program with the IMF partly aimed at correcting the exchange rate distortion was launched during which the shilling was un-pegged and substituted by a managed float that resulted in extensive devaluation of the shilling. The managed float was maintained up to August 1982 and replaced by a dual exchange rate regime characterized by a two-window system. The first window (Window I) handled priority transactions including exports of coffee, tea, tobacco and cotton; imports of petroleum; aid-financed projects; official loan and grant inflows; and the servicing of debts and arrears at the official exchange rate while other transactions were handled through the auction system under Window II. In June 1984, the two windows were merged just before the collapse of the adjustment program. The dual exchange rate regime was re-introduced briefly in May 1986 before a fixed rate system was re-established at the end of 1986 that further aggravated the external disequilibria in the economy. Thus, a currency reform was undertaken in May 1987 to address external imbalances which reduced the parallel market premium substantially. From October 1989 to July 1990, the government adopted a more active stance on the management of the official exchange rate. The aim was to assist in dampening the disruptive effects of discrete devaluations and the erosion of the exchange rate in real terms. As such the policy of maintaining the real effective exchange rate constant (a 'crawling peg' system) was introduced in October 1989

and the parallel market legalized in July 1991, leading to the establishment of foreign exchange bureaus which were licensed to engage in spot transactions at freely determined rates.

In a further move towards a market-based exchange rate regime, a foreign exchange auction system for import support funds was introduced in January 1992. Eligibility of imports was based on a short "negative" list of goods jointly set by the Government, the donor community and commercial banks, and later foreign exchange bureaus were permitted to bid in the auction, provided they were in a good financial footing with the Bank of Uganda. This marked the end of administered exchange rates although the foreign exchange market remained segmented until November 1993 when the current account was liberalized and inter-bank foreign exchange trading system was launched. Following the liberalization of the current account, Bank of Uganda adopted a flexible exchange rate policy regime and on fifth April 1994, the government accepted the obligations of Article VIII, Sections 2, 3 and 4 of the IMF's Articles of Agreement. Accordingly, since then, the Ugandan shilling's exchange rate is determined by market forces and BOU intervention in the foreign exchange market is limited to occasional purchase or sale of foreign currency aimed at dampening excessive volatility in the exchange rate and building foreign exchange reserves. Following on the reforms, the capital account was opened up in 1997, marking the last reform in the liberalization of the foreign exchange market.

II. Literature Review

The major challenge in investigating REER misalignment analysis is the construction of a suitable benchmark or yardstick against which to appraise a country's price-competitiveness performance in a theoretically defensible and empirically accurate manner. This section provides an overview of the theoretical and empirical literature, highlighting the differences in alternative approaches to measuring equilibrium exchange rates and misalignments. Much of the voluminous theoretical and empirical literature on the equilibrium exchange rates has been captured in detailed and extensive theoretical and empirical discussions found in (Demir & Razmi, 2022; MacDonald, 2007; Sarno & Taylor, 2002; Siregar, 2011) among others and thus this section only provides a brief overview.

The equilibrium REER is generally defined as the rate that is consistent with the internal and external balance of the economy and is characterized by high economic growth, low levels of inflation and current account sustainability. Thus, effective exchange rate misalignment is defined as the deviation of the real effective exchange rate from its equilibrium level. Any analysis of REER misalignment depends upon the measurement of the equilibrium REER and thus requires the derivation of a measure of the equilibrium REER, otherwise the notion of currency under or overvaluation is meaningless. Although there is still no consensus on the precise calculation of the equilibrium REER, several methodologies exist in the literature with varying strengths and weaknesses. Siregar, (2011) suggest that, when choosing between different equilibrium concepts and the models used to represent them, their relevance to the question at hand is important.

The Purchasing Power Parity (PPP) approach is the earliest theory and has

been subjected to numerous theoretical reviews and econometric tests (Frait et al., 2008; MacDonald, 2007; Sarno & Taylor, 2002; Stein & Paladino, 1999). The theory of PPP posits that the exchange rate between two countries will be determined by the ratio of their general price level. The theory assumes that monetary policy does not influence the real exchange rate in the long run, implying that countries with different inflation rates should expect their bilateral exchange rates to adjust to offset these differences over the long run. However, despite its simplicity and limited data requirements, there is a strong consensus in the literature that PPP is not an appropriate measure for the developing economies (Frait et al., 2008; Stein & Paladino, 1999).

In order to address the shortcomings of the PPP approach and contribute meaningfully to policy analysis, subsequent equilibrium real exchange rate theories and approaches determine the equilibrium REER based on economic fundamentals that have an impact on the value of the equilibrium exchange rate. Among these theoretical streams is the Fundamental Equilibrium Exchange Rate (FEER) developed by Williamson (1994). FEER defines the equilibrium exchange rate as the REER that satisfies internal and external balance simultaneously and was widely used by the IMF despite relying on normative judgement to determine the size of long-term capital flows. Moreover, determination of the equilibrium FEER is based on largescale macro econometric models or partial trade blocks of a given economy which the macroeconomic balance (MB) approach to equilibrium REER determination, also used widely used by the IMF, attempts to circumvent by directly estimating the sustainable level of current account deficits (surpluses) based on the saving and investment balance (Frait et al., 2008). The main limitation of the fundamental equilibrium exchange rate approach is that the equilibrium level of the exchange rate is highly influenced by the normative assumptions around the internal and external balance positions. The Natural Real Exchange Rate (NATREX) model developed by Stein & Allen (1997) and Stein & Clark (1995) is also based on the concept of internal and external balances, although unlike the FEER, it considers both the medium term and long run horizon when capital stock and foreign debt are assumed to converge to their long-run steady state. The NATREX is the rate that generates a current account balance that corresponds to the equilibrium between the optimal investment and savings while the unemployment rate is at its natural level and contrary to the FEER model, does not necessitate defining a sustainable external balance.

The Behavioural Equilibrium Exchange Rate (BEER) approach by MacDonald (1997) and MacDonald & Clark (1998) uses real interest parity to connect the real exchange rate to macroeconomic fundamentals and as such the choice of the fundamentals is more ad hoc than based on a theory according to Frait et al. (2008). The popularity of the BEER stems from its flexibility in allowing the equilibrium REER to vary and respond to the economy's fundamentals and macroeconomic conditions as well as its ability to explain REER movements even when estimated in a reduced form (Maeso–Fernandez et al., 2002). The BEER approach eschews internal and external equilibria perspective and directly estimates the structural or long-run relationship between relevant economic fundamentals and the real equilibrium exchange rate which is considered the equilibrium relationship. The BEER approach is considered more

suitable for developing economies and is widely used due to its attractive features including its applicability to country-specific circumstances, the rigorousness of statistical estimation and limited scope for normative elements. Understandably, the choice of long run macroeconomic determinants for the equilibrium REER vary in the empirical literature, although the most plausible choice of fundamentals can be gleaned from comprehensive literature reviews such as Égert (2004) and Fidora et al. (2021). Among the popular explanatory variables used to explain equilibrium REER are per-capita GDP or (GDP), net foreign assets (NFA), terms of trade (TOT), foreign real interest rate or real interest rate differential, foreign debt, foreign direct investment and trade openness.

The literature also has variants of the BEER approach such as the permanent equilibrium exchange rate (PEER) developed by Gonzalo & Granger (1995) that aims to decompose the long-term co-integration vector into a permanent and transitory component and the capital enhanced equilibrium exchange rate (CHEER) that focuses on the interaction between the real exchange rate and the capital account items to the exclusion of other real determinants such as relative output and captures the basic Casselian view of PPP based on the assumption that the exchange rate may be away from its PPP determined rate because of non-zero interest rate differentials (Frait et al., 2008; MacDonald, 1997; Maeso–Fernandez et al., 2002).

The past decades have seen many developing countries shift from fixed to flexible exchange rates as part of a cocktail of measures to deliver macroeconomic growth and stability. Notwithstanding, real exchange rate misalignment may occur under fixed, flexible or hybrid exchange rates regimes, although the intensity of REER misalignment across regimes remains contentious. For instance, according to Dubas, (2009), flexible exchange rates are prone to more misalignment which is even more pronounced in the case of developing countries while Coudert & Couharde (2009) and Holtemöller & Mallick (2013) show that fixed exchange rates induce more misalignment than the floating exchange rate regimes. Recently, Mahraddika (2020) examined the association between real exchange rate (RER) misalignments, exchange rate flexibility, and capital account openness using a panel dataset for 60 developing countries over the period 1980 to 2014. The study showed that the exchange rate regime and capital account policy are significantly related to the degree of persistence and the magnitude of RER misalignments, with a more flexible exchange rate and liberal capital account contributing significantly to limiting the persistence of RER misalignment.

However, the divergence in results may be due to differences in econometric methodology and data samples. There is a lot of empirical research on exchange rate modeling and REER misalignment across countries, however among the popular approaches is the BEER approach which has been widely used for developing countries. One of the early studies in the context of developing countries was Edwards (1988) who develops a BEER type dynamic model of real exchange rate (RER) behavior using data from 12 developing countries over the period 1962–84. Ghura & Grennes (1993) indicated that the Edwards model of REER determination performs well for the Sub-Saharan Africa (SSA) region and higher

levels of misalignment are accompanied by higher levels of macroeconomic instability. In addition, the study confirms the negative relationship between the real exchange rate (RER) misalignment and economic performance is robust for 33 countries in Sub-Saharan Africa (SSA).

Recent country specific studies within the African context include Iimi (2006) who investigates the behavior of Botswana's real exchange rate for the period 1985-2004 following concerns that the country's exchange rate might have been misaligned with its economic fundamentals due to successive devaluations of its currency and the move from a fixed to a crawling peg exchange rate regime. Using the BEER approach, the study found Botswana's pula to be undervalued in the late 1980s and overvalued by 5 to 10 percent in subsequent years, though the misalignment in the 1990s seems to have been very marginal. Masunda (2012) found that real exchange rate misalignment in Zimbabwe was attributed to pressures exerted by government consumption, openness, excess credit, technical progress, and capital flows. Using annual data from 1980 to 2006, the study also found evidence that real exchange rate misalignment in the form of an overvaluation contributed to the currency crisis. Ndhlela (2012) found that keeping the RER at levels close to, or below, equilibrium and avoiding protracted periods of RER overvaluation will promote economic growth in a study that analyzed the relationship between real gross domestic product growth and real exchange rate misalignment for Zimbabwe using the BEER approach and monthly data for the period 1985-2004.

For Morocco, Lebdaoui (2013) employed the BEER technique to estimate the equilibrium real exchange rate of the Moroccan Dirham using quarterly data that spanned from 1980Q1 to 2012Q4 and finds misalignment from the equilibrium level requires from five to six years to correct. In addition, the study identifies three periods of under or overvaluation ranging from 2.80 percent under to 2.16 percent over equilibrium level while the variables used to determine the behavior of the equilibrium real exchange rate in Morocco include the terms of trade, government spending, relative productivity, net capital flows in real terms, foreign reserves, trade openness and a monetary policy index. The results indicate that except for the statistically insignificant net capital flows variable, both government spending and trade openness have a depreciating effect on the Moroccan Dirham exchange rate, while the rest of variables have an appreciating effect on it.

In a study to examine the dynamics of Nigerian real exchange rate, Ibrahim (2014) used the BEER technique to estimate the equilibrium real exchange rate for Nigeria and a single equation cointegration approach to determine the effect of exchange rate misalignment on trade flows. The study found that between 1960 and 1985 Nigeria's real effective exchange rate appreciated relative to its long run level in most periods between 1960 and 1985 and depreciated relative to its long run level in most periods between 1986 and 2013. In addition, real exchange misalignment had no significant effect on volume of export, but it had a negative effect on import and trade balance in the country. In contrast, Essien et al. (2017) examined the dynamics of Nigerian real exchange rate and its misalignment over the period 2000Q1 to 2016Q1 and found that real exchange rate misalignment averaged 0.15 per cent during the sample period. Generally, the period

2001Q2 to 2016Q1 was characterized by 43 episodes of overvaluation and 21 episodes of undervaluation, suggesting a tolerance for real exchange rate overvaluation than undervaluation. The study which adopts the BEER approach, incorporating structural breaks and the Balassa Samuelson effect proxied by GNP per capita as well as other determinants including the nominal exchange rate, total government expenditure and the interest rate differential, also highlights the relationship between exchange rate misalignment and exchange rate policies.

Interestingly, Amoah (2017) also investigates the behavior of the Ghanaian cedi for the period 1980Q1 to 2013Q4 using the BEER approach and the Johansen cointegration and error correction modelling framework and find significant misalignment of the real effective exchange rate characterized by undervaluation before the redenomination in 2007 and overvaluation thereafter. In view of the significant overvaluation, the study recommends a one-off devaluation of a minimum of 20% to bring the exchange rate close to its equilibrium. This is consistent with Akosah et al. (2018) who examine the degree of real exchange rate misalignment and its macroeconomic implications in Ghana using quarterly data over the period 2000Q1-2015Q3 and found evidence of misalignment throughout the sample period although the REER was close to its equilibrium level at the end of 2012. In addition, overvaluation was observed to exert disinflationary pressures, while undervaluation tends to increase inflationary pressures in Ghana and concludes that the use of REER undervaluation as a deliberate industrial policy instrument for sustained economic growth may be counterproductive in the context of Ghana, potentially undermining the price stability objective of the central bank.

In a different country context, Gachoki et al. (2019) investigates real exchange rate misalignment in Kenya using quarterly data for the 2000 to 2016 and the BEER approach and found that the REER was on average undervalued. Although the magnitude of misalignment varies across the sample period, the exchange rate is overvalued to a maximum of 5.9 percent and undervalued up to 5.2 percent. In addition, the results show that Kenya's long-run real exchange rate is driven by economic fundamentals namely; net foreign assets, productivity, world oil prices, trade openness and terms of trade.

Recently, Hosni (2021) investigates the behavior of the real exchange rate in Egypt over the period 1965–2018 using a BEER approach and found that the Egyptian pound was misaligned from its equilibrium value during most of the examined period. The main determinants of real exchange rate misalignment in Egypt are terms of trade, degree of openness, investment ratio and government consumption variables. The domestic currency experienced a phase of overvaluation that started in 2009 until the free float of the local currency in November 2016, following which the Egyptian pound was found to have experienced a new phase of undervaluation till the end of the sample period. Moreover, the results support the importance of both economic fundamentals and short run shocks in impacting currency misalignment in Egypt.

Among the few studies that investigate the Ugandan context is Atingi-Ego and Sebudde (2004) whose study focused on determining the equilibrium exchange rate path, degree of misalignment and its impact

on the performance of nontraditional exports. The study found that the magnitude of misalignment greatly reduced during the period 1991 to1999 following the liberalization of the exchange and payments system. In addition, overvaluation of the exchange rate in excess of 15 percent hampers non-traditional export performance. Another study by Kihangire et al. (2005) investigated Uganda's equilibrium real exchange rate (EREER) during 1993M1 to 2004M12 and found that not only is Uganda's REER overvalued over the period 2003-2004 but also the macroeconomic and financial costs of this overvaluation were quite high for the economy. The analysis was based on ARDL approach to cointegration and the long-run relationship between Uganda's REER and its determinants, driven largely by trade balance, openness, fiscal deficits, and capacity utilization.

As demonstrated in the preceding empirical studies, there is significant variation in macroeconomic fundamentals that drive the exchange rate in the long run across countries suggesting that this may be dependent on domestic country conditions. Indeed Schröder (2013) finds that when homogeneity assumptions on cross-country long-run real exchange rate behavior are appropriately addressed by estimating the misalignment of the real exchange rate for each of the 63 developing countries over the period 1970–2007 individually, REER misalignment in the form of either an overvaluation or undervaluation reduces growth. In summary, the numerous empirical studies suggest real exchange behavior is somewhat heterogeneous across countries and over time albeit broadly consistent with macroeconomic fundamentals.

III. Methodology

The theoretical foundation of the BEER approach popularized by Clark & MacDonald, (1998) derives from the risk-adjusted uncovered interest parity (UIP) condition depicted below:

$$E_t[\Delta s_{t+k}] = -(i_t - i_t^*) + c_t \quad (1)$$

Where s_t denotes the price of a unit of foreign currency, i_t is the nominal interest rate, and c_t is the risk premium, Δ is the first difference operator, E_t is conditional expectations operator, t + k is the maturity horizon of the asset (bonds), * denotes foreign variables. Equation (1) can be converted from nominal to real by deducting the expected inflation differential from both sides of the equation, giving:

$$q_t = E_t[q_{t+k}] + (r_t - r_t^*) - c_t \quad (2)$$

where $r_t = i_t - E_t[\Delta p_{t+k}]$ and $r_t^* = i_t^* - E_t[\Delta p_{t+k}^*]$ which depict domestic and foreign real interest rates, respectively and q_t is the real exchange rate. Equation (2) expresses the real exchange rate as a function of the expected future real exchange rate, real interest rate differential and the risk premium, on the assumption that the unobservable expected future real exchange rate, $E_t[q_{t+k}]$ is determined by long run macroeconomic fundamentals, Z_t , such that the equilibrium real exchange rate is equal to $E_t[q_{t+k}] = E_t[\beta' Z_t]$.

In line with the theoretical underpinnings of the BEER model and the ARDL approach to cointegration, the specified empirical equilibrium REER model for the Ugandan

economy is as follows:

$$\Delta lREER_t = \beta_0 + \sum_{k=1}^{n1} \beta_{1k} \Delta lREER_{t-k} + \sum_{k=1}^{n2} \beta_{2k} \Delta lRGDP_{t-k} + \sum_{k=1}^{n3} \beta_{3k} \Delta lTOT_{t-k} + \sum_{k=1}^{n4} \beta_{4k} \Delta lOPEN_{t-k} + \sum_{k=1}^{n5} \beta_{5k} \Delta lNFA_{t-k} + COVID19_{t-k} + \gamma_0 lREER_{t-1} + \gamma_1 lRGDP_{t-1} + \gamma_2 lTOT_{t-1} + \gamma_3 lOPEN_{t-1} + \gamma_4 lNFA_{t-1} + \varepsilon_t \quad (3)$$

where Δ is a difference operator, l is natural logarithm, β_{ik} represents the short-run effect and γ_{ik} represents the long-run effect, which are normalized by β_0. In Equation 3, RGDP denotes productivity and is derived as real GDP per capita, while REER, TOT, OPEN and NFA denote the real effective exchange rate, terms of trade, trade openness and net foreign assets respectively. COVID19 denotes a Dummy for the Covid19 pandemic crisis which takes on the value of 1 during the COVID 19 pandemic crisis (2020 to 2021) and 0 otherwise. This study applies the ARDL estimation technique.

The a priori expected signs are indeterminate for TOT and OPEN because the effect of TOT on the REER occurs through the income and substitution effects, with the net impact depending on their relative strength since they work in opposite directions and as such while theoretically important as a determinant of the REER, the direction of its impact remains largely unclear. In addition, while trade restrictions negatively affect the REER, the direction of influence of trade openness on REER is inconclusive in the empirical literature and largely depends on the weight of imports versus exports in the domestic economy. Further, the expected sign for RGDP is theoretically positive but a negative sign may occur due to imperfect substitution between tradable and non-tradable sectors as well as imperfect competition while the expected positive theoretical sign for NFA sign could become negative due to sustained foreign direct investment which results in deterioration of a country's NFA position and appreciation of its currency.

The ARDL approach was proposed by Pesaran and Shin (1999) and Pesaran et al. (2001) and, has multiple advantages in contrast with other co-integration techniques. These include the fact that it does not require unit root pretesting for the incorporated variables in the model, allows for the inclusion of variables that are integrated of different orders such as (I(0), I(1) or a combination of both, accounts for endogeneity, providing unbiased estimates and valid t-statistics, irrespective of the endogeneity of some regressors, and is considered to be statistically robust in the case of small sample size modelling (Harris & Sollis, 2003; Narayan, 2005; Pesaran et al., 2001; Pesaran & Shin, 1998, 1999). The tests for the existence of a long run relationship among the variables of interest is carried out using the ARDL Bounds test for cointegration by Pesaran et al. (2001). The null hypothesis of no cointegration is tested using the joint F-statistic as follows:

$$H_0: \gamma_0 = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0 \quad (4a)$$

$$H_1: \gamma_0 \neq \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq 0 \quad (4a)$$

If the calculated F-statistics exceeds the upper level of the bound, the null hypothesis is rejected, implying that there is cointegration. However, the null hypothesis cannot be rejected, indicating lack of cointegration, if the computed F-statistic is below the lower bound and the test result is inconclusive if the calculated F-statistics falls within the upper and lower bounds.

The data used for analysis are compiled from the World Bank and the Bank of Uganda (BOU), while the variables that enter the model were selected based on economic theory, the empirical literature, and data availability. The analysis is based on annual data for the period 1990–2021, and details of the data and a summary of descriptive statistics are summarized in Table 56.

Table 56: Descriptive Statistics

Variable	Description	Mean	Maximum	Minimum	Std. Dev.	Obs
REER	Real effective exchange rate	81.56	103.86	52.53	15.70	32
TOT	Terms of trade	-115.73	1229.10	-3166.52	969.39	32
OPEN	Natural log of Trade Openness	3.60	4.03	3.28	0.16	32
NFA	Net Foreign Assets (Shs billion)	-13.65	16.99	-270.70	64.57	32
RGDP	Natural Log of GDP per capita (constant 2015 US$)	6.43	6.80	5.93	0.30	32

Notes: RGDP, TOT and OPEN data was compiled from the World Bank database on World development indicators while data on REER, and NFA were compiled from Bank of Uganda Database.

IV. Empirical Results and Discussion

The unit root test in Annex 1 indicate that all the variables are either I(0) or I(1) validating the appropriateness of using ARDL technique. Consistent with previous studies that used annual data and for the sake of parsimony, a maximum lag length of 2 lags is adopted for each variable of the ARDL model, (Narayan, 2005; Pesaran and Shin, 1999)[61]. After determining the optimal number of lags, we apply ARDL bounds test approach to test for the presence of long-run relationship among the variables of interest. The result of the bounds test given in Table 57 is above the upper bound critical value suggested by Narayan (2005) using a small sample size between 30 and 80 at the 5 percent level of significance. Thus, the null hypothesis of no cointegration between the REER and the explanatory variables is rejected.

[61] The lags must be long enough to render εt serially uncorrelated and not too long as to lead to an over parameterization (Narayan, 2005; Pesaran, 2001). The conducted tests indicated that the optimal lag length is one and the selected ARDL representation for the model is ARDL (1, 0, 0). Additionally, as a precaution we apply the Heteroscedasticity and Autocorrelation Consistent Covariance (HAC) estimators in the ARDL model estimation to ensure that our results are robust in the presence of heteroscedasticity and serial correlation. Note that the HAC approach alters the estimates of the coefficient standard errors of an equation but not the point estimates themselves.

Table 57: ARDL Bounds Cointegration Test Results

Dependent variable a	F-Statistic for Case III Intercept no Trend b	Conclusion
	MODEL 1	
REER	6.070	Cointegration
LRGDP	3.257	No cointegration
LOPEN	4.510	No cointegration

NOTES: a The cointegrating vector includes the Real effective exchange rate (REER), Natural log of Trade Openness (LOPEN), and Natural Log of GDP per capita (LRGDP), while Terms of trade adjustment (TOT), Net Foreign Assets (NFA), and the Covid-19 pandemic crisis (COVID19) are excluded from the cointegrating vector but included in the short run dynamics. The F-test indicates which variable should be normalized when a long-run relationship exists between the lagged level variables in the cointegrating vector. If the F-statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no cointegration is rejected. If it is below the lower bound, the null hypothesis of no cointegration can't be rejected. b The relevant critical values are obtained from Case III: Intercept no Trend when k = 2. For small sample sizes ranging from 30 to 80 observations, Narayan (2005) provides a set of critical values, which are 4.27 and 5.47 for the lower and upper bound respectively at 95 percent significance level.

Given the conclusive evidence of cointegration, we proceed to estimate the long run and short run models. The long run and short run results are presented in Table 58. In the long run the significant variables which appear to affect the REER are LRGDP, NFA, TOT and COVID19 while in the short run only NFA and TOT were found to statistically significantly affect the REER. Importantly, the study also finds the COVID19 pandemic statistically significantly affects the REER, resulting in a 10.8-unit appreciation. Strikingly an increase in the productivity proxy LRGDP resulting in a 51.8-unit depreciation of the REER in the long run, which implies that in the long run, REER was largely determined by LRGDP in Uganda. An increase in TOT and NFA appreciate the real effective exchange rate. Interestingly, despite the negative coefficient, the study finds that OPEN does not significantly affect the REER at both the short and long run horizons.

The coefficient of the error correction term (ECT) is significant at the 1 percent level with the expected sign giving further support of a long run level relationship between the REER and the long run variables in the ARDL model. The coefficient estimates of -0.60 implies that the speed of adjustment to equilibrium after a shock is high with approximately 60 percent of disequilibria from the previous year's shock converging back to the long-run equilibrium in the current year. The results satisfy all the diagnostic tests reported in Annex 2.

Table 58: ARDL Model Results

Regressors	ARDL (1,0,0)	LONG RUN	SHORT RUN
Intercept	-132.084		-139.879
	(-4.06) ***		-4.09***
LREER1(-1)	0.432		
	(3.53) ***		
LRGDP	29.420	51.827	
	(4.61) ***	(6.16) ***	
Δ LRGDP			53.373
			(1.25)
LOPEN	-2.957	-5.209	
	(-0.68)	(-0.72)	
Δ LOPEN			-2.374
			(-0.29)
NFA	-0.057	-0.100	
	(-4.51) ***	(-3.17) ***	
Δ NFA			-0.049**
			(-2.75)
TOT	-0.003	-0.005	
	(-2.38) **	(-2.56) **	
Δ TOT			-0.003
			(-3.62) ***
COVID19	-6.119	-10.780	
	(-3.32) ***	(-2.65) ***	
Δ COVID19			-6.950
			(-1.41)
ECT(-1)			-0.598
			(-4.13) ***

Notes: The values in parentheses are t-ratios. The asterisks *, ** and *** denote statistical significance at 10 percent, 5 percent and 1 percent significance levels.

Since the principal concern of the study is to assess the extent of REER misalignment, we apply the estimated ARDL based error correction model to obtain the equilibrium REER and thereafter compute the extent of misalignment associated with the real effective exchange rate. The difference between the estimated equilibrium real effective exchange rate and the actual real effective exchange rate was computed as follows to arrive at the degree of (short-run) misalignment:

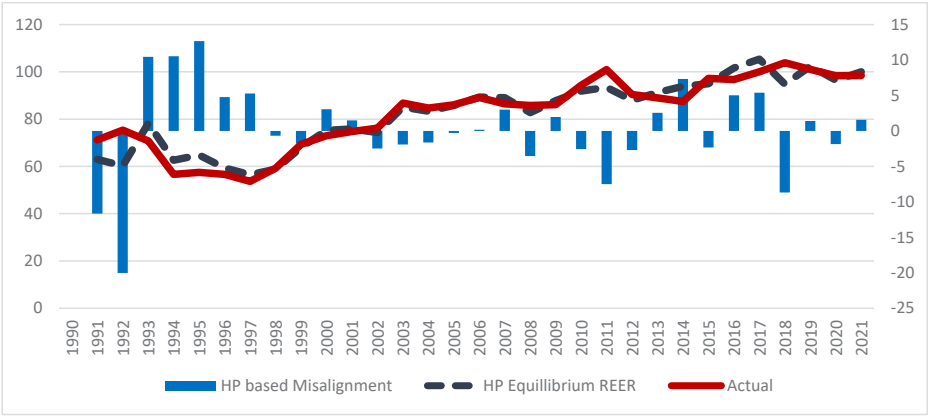
$$misalignment = \frac{\widehat{REER} - REER}{REER} * 100 \quad (5)$$

where $\widehat{REER}$ is the estimated equilibrium REER from the ARDL model. The evolution of the misalignment indicator is compared to the zero value such that when the curve is

above zero, it is overvaluation and if not, it is undervaluation. The degree of misalignment is measured first by estimating the equilibrium REER based on the ARDL model which is then subtracted from the actual REER to obtain the misalignment series. However, since the macroeconomic variables that enter the long-run ARDL model are not themselves at their equilibrium levels, we use the Hodrick-Prescott (HP) filter to obtain the permanent value of the fundamental variables which are then included in the ARDL long run model in line with practice in the empirical literature (see Gan et al., 2013) so as to derive the equilibrium values of the REER from which a REER misalignment measure is derived.

A depiction of actual REER versus the equilibrium measure of the REER (EREER) over the period 1990 to 2021, and the extent of misalignment (expressed as the percentage deviation of the actual REER from the estimated EREER) is presented in Figure 48, which confirms that the exchange rate deviates from its equilibrium level over time. The plot also shows the presence of abrupt changes or shifts in the direction of misalignment and long swings in the deviation of the REER from its equilibrium level. For example, following a 20 percent undervaluation in 1992, the exchange rate moved quickly into a 10 percent overvaluation in 1993. Similarly, from an overvaluation of 3.0 percent in 2007, the global financial crisis caused a 3.5 percent undervaluation in the currency in 2008 which was followed by a 2.0 percent overvaluation in 2009. An analysis of the misalignment series indicates that the exchange rate has been on average close to equilibrium by an average overvaluation of 0.2 percent during the study period, with 15 cases of undervaluation and 16 cases of overvaluation. In addition, periods of significant misalignment appear to be linked with policy shifts and macroeconomic shocks. For instance, the largest degree of over and under valuation during the period of estimation was recorded in the early 1990s a period characterized by policy transition from a system of market controls to market based policies including the adoption of a flexible exchange rate regime in 1993.

Figure 48: Actual Versus Equilibrium REER and Misalignment



The estimates of the computed REER misalignment as summarised in Table 59 show that during 2001-2005 and 2006–2010, the REER was largely in line with the levels implied by fundamentals, with the REER being slightly undervalued by an average of 0.96 percent and 0.19 percent respectively over these periods. The periods 2011-2015

and 2016-2020 while indicating low levels of REER misalignment on average, also have higher levels of uncertainty associated with them.

Table 59: Average Real Effective Exchange Rate Misalignment

	HP based Misalignment			
Period	Average	minimum	Maximum	std. dev.
1991-1995	0.401	-20.019	12.683	15.138
1996-2000	2.137	-1.774	5.272	3.197
2001-2005	-0.961	-2.478	1.479	1.586
2006-2010	-0.191	-3.548	3.009	2.819
2011-2015	-0.526	-7.499	7.320	5.650
2016-2020	0.257	-8.685	5.396	5.807

V. Conclusions

This study investigated the determinants of the real effective exchange rates (REER) in Uganda using the ARDL cointegration technique and annual data for the period 1990 to 2021. In addition, we computed the deviations of the REER from its equilibrium levels with a view to gaining insight into the extent of REER misalignment during the sample period. The long-run model showed that real GDP, net foreign assets, terms of trade and COVID19 were statistically significant determinants of the REER while only net foreign assets and terms of trade were found to statistically significantly affect the REER in the short run. The results showed that approximately 60 percent of disequilibria from the previous year's shock is corrected in the current year. On the average, the Uganda shilling REER was overvalued by about 0.2 percent over the period 1990-2021. The results also show that most REER misalignment episodes appear to be linked with policy shifts and macroeconomic shocks. Further, REER misalignments during the period under study were characterized by both abrupt and at times extreme movements with a quick correction as well as long swings.

The study also assessed the implications of REER misalignment for monetary policy implementation. Consistent with the existing literature, we find that tight monetary policy appears to increase REER misalignment which may be explained by the fragility of the economy and vulnerability of the banking sector particularly during the early 1990s which evidenced the greatest magnitudes of REER misalignment.

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Annexes

Annex 1: Unit Root Tests Results

	Augmented Dicky Fuller (ADF) test		Phillips-Peron(PP) test		Kwiatkowski-Phillips-Schmidt-Shin	
Variables	**Level**	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**
Real effective exchange rate	-1.683	-5.487***	-1.688	-5.566***	0.675	0.304***
Terms of trade adjustment	-3.059**		-3.233**		0.513	0.105***
Natural log of Trade Openness	-2.536	-6.364***	-2.454	-9.693***	0.429**	
Net Foreign Assets (Shs billion)	-45.578***		-2.508	-6.750***	0.448**	
Natural Log of GDP per capita (constant 2015 US$)	-2.081	-3.852***	-1.901	-3.898***	0.733	0.354**
Asymptotic critical values						
Significance level	ADF		PP		KPSS	
1%	-3.66		-3.66		0.739	
5%	-2.96		-2.96		0.463	
10%	-2.62		-2.62		0.347	

Notes: The figures in this table are unit-root test statistics. The asterisks ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Annex 2: ARDL Model Diagnostic Tests

Model Diagnostics	ARDL (1,0,0)
Adjusted R-squared	0.90
S.E. of regression	4.69
Schwarz Bayesian Criterion	6.45
DW-statistic	1.63
Residual Diagnostics	
Serial Correlation[1]	1.70 [0.207]
F-statistic[2]	47.30 [0.000]
Heteroscedasticity[3]	0.95 [0.339]
Functional Form[4]	3.59 [0.002]
Normality[5]	0.41 [0.815]

Notes:

[1] Breusch-Godfrey Lagrange multiplier test of residual serial correlation
[2]F-statistic
[3] ARCH test for Heteroskedasticity based on the regression of squared residuals on squared fitted values
[4] Ramsey's RESET test for omitted Variables/Functional form
[5] Jarque-Bera Normality test based on a test of skewness and kurtosis of residuals
The values in brackets are probabilities.
The asterisks *, ** and *** denote statistical significance at 10 percent, 5 percent and 1 percent significance levels, respectively.

Annex 3: Bivariate Tests between Monetary Policy and REER Misalignment

This study tested the null hypothesis that monetary policy has no effect on REER misalignment against the alternative that it does by estimating the following equation:

$$misalignment_t = \alpha_0 + \propto_1 91day_t + \propto_2 91day_{t-1} + \propto_3 91day_{t-2} + \propto_4 IT + \varepsilon_t \quad (6)$$

where denotes the measure of REER misalignment generated under section 5.4. When the actual RER is more appreciated than the estimated equilibrium rate, the actual REER is considered to be overvalued and , otherwise the REER is undervalued and . In addition, represents the 91 day Treasury bill interest rate, a proxy for monetary policy implementation and denotes inflation targeting a dummy variable to capture the effect of monetary policy regime that assumes the value of unity during the inflation targeting regime and zero otherwise. The 91-day Treasury bill interest rate was used as a proxy for monetary policy because it played a pivotal role in interest rate transmission in Uganda prior to the introduction of inflation targeting in 2011 and represents the best measure of the monetary policy stance in view of data availability limitations. The expectation is that . The theoretical and empirical work on the impact of tight monetary policy on exchange rates misalignment remains inconclusive and as such remains an empirical issue, particularly in post-crisis situations (Montiel, 2003). The study also investigates the effect of REER misalignment on monetary policy implementation by estimating the following equations:

$$91day_t = \propto_0 + \propto_1 misalignment_t + \varepsilon_t \quad (7)$$

$$\text{inflation}_t = \propto_0 + \propto_1 misalignment_t + \varepsilon_t \quad (8)$$

Annex 3a: Unit Root Tests

	Augmented Dicky Fuller (ADF) test		Phillips-Peron(PP) test		Kwiatkowski-Phillips-Schmidt-Shin (KPSS)	
Variables	**Level**	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**
Misalignment	-3.762		-3.705		0.348	
91 Day interest rate	-5.423		-5.423		0.091	
Inflation	-5.330		-5.330		0.112	
Asymptotic critical values						
Significance level	ADF		PP		KPSS	
1%	-3.66		-3.66		0.739	
5%	-2.96		-2.96		0.463	
10%	-2.62		-2.62		0.347	

Notes: The figures in this table are unit-root test statistics. The asterisks ***, ** and * denote significance at the 1%,

where *misalignment* denotes the measure of REER misalignment computed in section 5, 91*day* represents the 91-day Treasury bill interest rate, a proxy for monetary

policy implementation and *inflation* denotes the domestic inflation rate. We expect $\propto > 0$ *and* $\propto > 0$. Equations 6, 7 and 8 was estimated with annual data for the period 1993-2021 due to limitation of data availability. The results for unit root tests for variables in equations 6-7 are reported in annex 3a.

The results from the estimations of equations 6, 7 and 8 are reported as Model 2, model 3 and model 4, respectively in annex 3b. In annex 3b, the study finds that monetary policy implementation does affect REER misalignment. While the impact is correctly signed for the Inflation targeting regime, suggesting that adoption of inflation targeting regime contribute to reduction in misalignment, and an appreciation of the REER and correction of the REER undervaluation, this effect is not statistically significant. In contrast, the monetary policy tightening in the form of an increase in the 91 day interest rate results in an increase in misalignment in the form of a depreciation of the REER and undervaluation of the exchange rate. However, this effect is statistically significant only for lags one and two. This result is consistent with Montiel (2003) who in a review of the theoretical and empirical literature concludes that a positive effect of tight monetary policy on REER misalignment is plausible particularly during crisis periods and periods where the economy and banking system are vulnerable.

Annex 3b: REER Misalignment and Monetary Policy

Regressors	MODEL 2	MODEL 3	MODEL 4
Intercept	-11.637	9.762	10.599
	(-2.41) **	(10.72) ***	(2.65) ***
Misalignment		0.189	0.340
		(1.35)	(0.55)
91day	0.206		
	(0.73)		
91day(-1)	0.472		
	(1.78) *		
91day(-2)	0.545		
	(2.41) **		
IT	-2.459	1.865	-6.136
	(-1.36)	(1.31)	(-0.98)
Inflation	0.037		
	(0.71)		
Model and Residual Diagnostics			
Serial Correlation[1]	0.118[0.943]	3.737 [0.154]	0.189 [0.909]
Heteroscedasticity[2]	0.607 [0.436]	0.158 [0.691]	0.061 [0.805]
Normality[3]	1.772[0.412]	5.644 [0.060]	413.699[0.000]
Adjusted R squared	0.176	0.032	-0.016

Notes:

[1] Breusch-Godfrey Lagrange multiplier test of residual serial correlation
[2] ARCH test for Heteroskedasticity based on the regression of squared residuals on squared fitted values
[3] Jarque-Bera Normality test based on a test of skewness and kurtosis of residuals
The values in parentheses are t-ratios while probabilities are brackets.
The asterisks *, ** and *** denote statistical significance at 10 percent, 5 percent and 1 percent significance levels.

This views is also supported by Baig & Goldfajn (2002) who found that in some countries, there was need to reverse overly depreciated currencies through firmer monetary policy. In addition, this study highlights the limitations of cost associated with high interest rates to stabilize the currency which can be overwhelming if the banking sector is fragile. Further support is provided by Goldfajn & Gupta (2002) who found that for undervaluation in many countries in the aftermath of currency crises, tight monetary policy substantially increased the probability of reversing the exchange rate trend while opposite was true when the country was facing a banking crisis and tight monetary policy decreased the probability of a reversal. Thus, in the case of Uganda, the fragility of the economy and vulnerability of the banking sector during the early 1990s characterized by the greatest magnitudes of REER misalignment may account for our result.

3. Real Effective Exchange Rate Misalignment and Monetary Policy in Rwanda

Emmanuel Ngarambe Bahati and Wilberforce Nuwagira

I. Introduction

The stability of the exchange rate is important in a country's monetary policy mechanism. (Edwards, 2018) suggested that central banks need to know whether the real exchange rate (RER) is (approximately) close to its long-term equilibrium value to make efficient monetary policy decisions. Significant and persistent real exchange rates misalignments, i.e. deviation of actual RER from its benchmark or equilibrium level, have implications on the country's potential economy, hence, increases its vulnerability (Jongwanich, 2009). For instance, an RER overvaluation may cause a decrease in economic growth, put pressures on exporter industries, particularly manufactures, which reduce export volumes and encourage imports and constrain export diversification, foster currency crises and political instability and conflict (Ambaw, et al., 2023). Therefore, policy makers and markets need to have knowledge on these currency misalignments, overvaluation or undervaluation, and what policy actions are in place to address these volatilities (Borowski & Couharde, 2003).

This paper deals with the relationship between exchange rates and monetary policy in Rwanda. The main purpose of this paper is to estimate the equilibrium real exchange rate, determine the level of real exchange rate misalignment, if any, and assess its implications on monetary policy implementation in Rwanda. The number of studies that examined this topic in Rwanda remains limited and have focused on measuring the level of exchange rate misalignments without attempting to relate it to monetary policy implementation while other have focused on exchange rate pass through to inflation in Rwanda.

For instance, Hitayezu & Nyalihama, (2019) examined the real exchange rate pass through to domestic prices in Rwanda while Nuwagira and Kigabo, (2014) estimated the exchange rate misalignment using quarterly data from 2000Q1 to 2012Q1 and derived a long-run Behavioral Equilibrium Exchange Rate (BEER). Similarly, Nuwagira and Muvunyi, (2016), using quarterly data spanning the period 2000Q1 to 2015Q4, analyzed the impact of the real exchange rate on the Rwandan external competitiveness, using the BEER method to determine the level of the exchange rate misalignment and tested the Marshall-Lerner condition. Both studies found evidence of exchange rates misalignments. This paper revisits the analysis but using the most recent data in order to inform policy makers and researchers on the extent of exchange rate misalignments in the light of the latest global multiple shocks that had implication on currencies of many countries including Rwanda.

This study used the reduced form equilibrium exchange rate approach, particularly the behavioral equilibrium exchange rate (BEER) model to estimate the real exchange rate misalignment,

(MacDonald, 1997; Clark and MacDonald, 1998). The results from the study are as follows. First, we run a reduced-form model in which a long-run or cointegrating relationship between RERs and a set of key macroeconomic fundamentals was estimated. The results from the model indicate a significant relationship between the RERs and the selected variables, implying that the real exchange rate is in line with economic fundamentals. Second, the reduce-form model allowed us to derive RER and REER equilibrium values, as well as to compute the corresponding level of misalignments. Our study found evidence of REER misalignments-altering episodes of overvaluation and undervaluation. However, the level of misalignment is not prolonged and is not very high to induce a negative effect on macroeconomic stability.

The structure of the rest of paper is as follows. Section 2 describes the exchange rate transmission mechanism while section 3 provides the literature review. Section 4 describes the empirical model and discusses variable measurement. Section 5 provides discussion of estimation results of equilibrium RER and RER misalignments while section 6 concludes the study.

II. Stylized Facts on Monetary Policy and Exchange Rate

Rwanda operates under a flexible exchange rate and inflation targeting monetary policy framework where the transmission of monetary policy is expected to impact the economy through various channels including interest rates and the exchange rate. Under this framework, the central bank of a country alters its policy rate with the expectations that the move will be transmitted along the yield curve, and affect the long-term interests, which ultimately impact consumption decisions by households and firms' investment decisions (Edwards, 2018). However, in recent times some studies have shown concerns that monetary policy in some countries has lost power and effectiveness as evidenced by less responsiveness of long-term interests to changes in central banks' policy rates.

These studies suggest that this weak transmission mechanism is due to the global financial markets interconnectedness, where interest rates are determined by the global interaction between savings and investment and not the decision of the local monetary policy, (Edwards, 2018; Guinigundo, 2005). The significance of exchange rate transmission mechanism may also depend on the share of domestic value added, compared with imported goods and services, in tradables. If this share is very high, changes in exchange rate have high effect on output and inflation (Mohanty & Turner, 2005). The traditional interest rate transmission mechanism may therefore be even much weaker since in such small open economies, output and inflation are sensitive to changes in the exchange rate. Consequently, the major transmission mechanism might be the exchange rate rather than the yield curve, (Edwards, 2018; Mohanty & Turner; Chow, 2005).

The exchange rate transmission mechanism suggests that an increase in a central bank policy rate appreciates the local currency through the which in turn yields downward pressures through the law of one price for tradable goods, making imported goods and services relatively cheap, resulting into a decrease in inflationary pressures in the domestic economy. On the other hand,

a currency depreciation will generate upward pressures as imports become more expensive and less competitive against goods produced by domestic producers. Therefore, if monetary policy is evidenced to be transmitted through exchange rate changes, central banks worldwide will need to take into account the exchange rate when formulating their monetary policy. Particularly, central banks should be concerned whether the real exchange rate is close to equilibrium, or if it is misaligned. (Edwards, 2018) argues that if a country currency is misaligned, monetary policy actions triggered by inflation considerations may exacerbate this disequilibrium. In light of this view, understanding the extent of exchange rate in Rwanda is crucial for policy makers.

III. Literature Review

Several empirical studies have been undertaken to estimate the long-run equilibrium and the associated RER misalignment. These studies have mostly followed techniques related to reduced form real exchange rate equilibrium (ERER) models such as fundamental equilibrium exchange rate (FEER) and Behavioral equilibrium exchange rate (BEER). Some have used single equation approach, while others employed the cross-section and panel frameworks.

Chin & Prasad, (2003) employed the macroeconomic balance (MB) approach to determine the factors that directly and indirectly affect the current account fluctuations. They used cross-section and panel data models of 18 industrial and 71 developing countries, and the results show that the current account deficit is positively related to fiscal balance and international investment position deficit. The results showed a positive relationship between foreign financial flows and current account deficit for developing countries dependent on these inflows. On the other hand, the countries' level of openness tends to negatively affect the current account balance.

Borowski & Couharde, (2003) examined the macroeconomic balances between major countries vis-à-vis their exchanges rate to establish the extent of fluctuations in the medium term since large fluctuations can cause world macroeconomic instability. The study applied the fundamental equilibrium exchange rate approach, using 1995 as the baseline, with the medium-projection up to 2000 to establish equilibrium exchange rate in selected industrial countries, and the results showed, that adjustment of the Dollars, Yen and Euro is aligned with the fundamentals.

As articulated in previous studies, a country's exchange rate should remain competitive to continue supporting its exports and ultimately its growth while ensuring that it remains consistent with macroeconomic objectives in the medium term (Williamson, 2008). In light of this view, in a given country there exists an equilibrium real exchange rate (ERER) that satisfies its macroeconomic balance. Hence, any deviation of the RER from its equilibrium hampers internal balance and sustainability of the external balance (Rodrik, 2008).

Other studies, however, have provided theoretical and empirical evidence indicating that, not all deviations from the ERER could negatively affect growth and exports. Indeed, (Rodrik, 2008) showed that while RER overvaluation harms growth and current account balance, the RER undervaluation improves these variables, mostly in developing countries.

Notably, Nouira et al., (2011) found evidence supporting the view of (Rodrik, 2008) and based on a sample of 52 developing countries and the REER model, the authors showed that such countries deliberately choose the policy of keeping their exchange rate undervalued in order to strengthen the price competitiveness in their manufacturing exports sector.

Zhang, (2002) estimated the behavioural equilibrium exchange rate (BEER) in Hong Kong and China for the period 1984-1988 and included four economic fundamentals, namely terms of trade (TOT), net exports/ GDP, private investment and trade openness in their specification. They found that RER was overvalued during the period 1983Q3-1985Q2, and in 1984Q1, at around 20 percent. After the second half of 1985, the currency tended to adjust back towards the equilibrium. Leung & Ng, (2007) also estimated the equilibrium RER for Hong Kong and China, covering the period 1987-2006. Using key economic fundamentals such as productivity, terms of trade, and government consumption as share of GDP, they found a modest undervaluation of the real exchange rate in the late 1990s.

Frankel, (2005) employed fundamental equilibrium exchange rate (FEER) approach to compute the equilibrium exchange rate and the exchange rate misalignment in China and found that in 2000, the RER was undervalued by 35 percent. Cheng and Orden, (2005) used the BEER framework to estimate RER misalignment in India during the period 1975-2002. The RER was overvalued during the 1980-1990 and in 1990 and the overvaluation was more than 10 percent, however, in the aftermath of 1991 crisis, the RER adjusted towards the equilibrium.

Bénassy-Quéré, et al., (2008) used panel data methodology to estimate the misalignments of bilateral and multilateral real effective exchange rates of G20 currencies. The results showed that the currencies of five Asian countries were overly undervalued at the beginning of 2006. These results also indicated that lack of exchange rate adjustment in Asian countries amplified this impact. In addition, the bilateral misalignments between the United States and the other countries depend mainly on misalignments of the exchange rate of all countries.

Baffers, et al., (1999) estimated the RER and the degree of misalignment of countries such as Cote d'Ivoire and Burkina Faso using the single-equation model consistent with previous work, (Edwards, 1989; Devarajan, et al., 1993; Elbadawi & Soto, 1994). The study adopted a three-pronged methodology. An estimate of the long-term relationship, an estimation of the model parameters and the computation of degree of misalignment and concluded that devaluing the currency depends on the fundamentals and that the degree of misalignment of the RER and the speed of the internal and external adjustment mechanisms seem to restore the macroeconomic balance.

Lossifov & Loukoianova, (2007) examined the factors that influence the equilibrium exchange rate in Ghana. They followed a vector error correction model (VECM). The results indicated that the long-term variations in the real exchange rate are explained by the real GDP growth rate, the interest rate differential as well as the world prices of the exported raw materials. These results also showed that when the RER deviates from its equilibrium trajectory, it reverts back to it after 2 and 3 years.

Couharde, et al., (2011) estimated the currency misalignment of the CFA zone countries and assessed how their real effective exchange rates converged to their equilibrium level between 1985 and 2007. To attain this, they estimated the long-run relationship between actual effective exchange rates and their economic fundamentals through panel cointegration techniques, particularly, the ordinary dynamic-least-squares based on previous studies (Kao & Chiang; Mark & Sul, 2003). The results from their study found that the real appreciation of CFA zone countries in 2000s didn't translate into a real overvaluation, with exceptions of some countries. They also found that the adjustment of the REER towards the equilibrium levels differ among the CAF zone countries.

With regard to country specific studies, Nuwagira and Muvunyi, (2016) studied the impact of the real exchange rate on the Rwandan external competitiveness, using the Behavioral Equilibrium Exchange Rate (BEER) method to determine the level of the exchange rate misalignment and the Marshall-Lerner condition. The long-run BEER drew a relationship between the REER with the economic fundamentals highlighting some of the factors that influence RER under-valuation. These factors include the increase in government expenditure and the decrease of terms of trade while other factors, mainly the increase in foreign financial inflows and the supply side of output explain RER over-valuation. In addition, the study found that the Marshall-Lerner condition for Rwanda does not hold given that the improvement in trade balance relies so much on foreign demand than exchange rate depreciation.

In addition, Nuwagira & Kigabo, (2014) examined the RER misalignment using quarterly data spanning the period 2000Q1 to 2012Q4 using the BEER approach. Their results indicate the existence of episodes of overvaluation and undervaluation with the level of misalignment ranging between 0.04% and 2.3%. Therefore, the issue could have become more important in recent years as many economies' vulnerabilities rose due to the coronavirus pandemic and prolonged low international commodity prices, which weighed on the external sector performance.

Muvunyi, et al., (2019) used the external sustainability approach to evaluate the Rwandan current account deficit vulnerability to the level of net foreign assets, on a sample covering up to 2017 (the benchmark), and considering 2018 – 2021 as medium-term projections. The results showed that the current account gap at the benchmark was higher, but it would go lower based on the medium-term projections, suggesting a small RER adjustment in order to close the gap.

IV. Methodology

This subsection presents the key theoretical approaches in determining the equilibrium exchange rate and its misalignment. The equilibrium real exchange rate is based on three major theories, namely the purchasing power parity (PPP), the uncovered interest rate parity (UIP) and the reduced form equilibrium real exchange rate, (Jongwanich, 2009).

Purchasing Power Parity Model

The first theoretical approach is premised on the purchasing power parity, which conjectures that exchange rate variation between two currencies over a given period of time is influenced by the change in the two countries' relative price levels. The application of the PPP involves 2

steps: i) a RER index of the base year also referred to as equilibrium year and subsequent years is calculated and then ii) a comparison is made between the RER of the current period and that of the base period or equilibrium year. If the two RER deviate, then the currency is said to be misaligned. Under this approach, when the cost of a basket of goods in a common currency is equalized across countries and the same basket enters each country's market with the weights, then the equilibrium RER is determined as:

$$RER^{*} = e * \frac{p^{*}}{p} = 1 \quad \text{..... (1),}$$

where RER^{*} is equilibrium RER, e is the nominal exchange rate, p^{*} is the price, and p is the domestic price. The equation specified in (1) is known as the absolute PPP, which relies on the assumption of the law of one price. However, the law of one price is challenged on several grounds. Firstly, the spot price of a given good will not necessarily be equal in different locations given the time it takes to move commodities from one location to another. The basket of commodities across countries tend to be different and the price measures are not likely to be constructed in terms of absolute prices, these shortcomings led to the introduction of relative PPP, given by:

$$RER^{*} = e * \frac{p^{*}}{p} = \theta \quad \text{..... (2),}$$

where θ is a constant, reflecting the barriers to trade and the differences in basket compositions.

While both the absolute and relative measures suggest that equilibrium RER is constant over time, a host of empirical studies dispute the validity of these theories. On the empirical front, the mean reversion to PPP is not observed in data. Theoretically, the critique of PPP emerge from two major causes. Firstly, the increased importance of manufactured tradable goods, which are differentiated has led to finite elasticities of demand under imperfect competition. In addition, transport costs, trade restrictions and taxes may alter the price of tradable goods across countries. Secondly, differences in production, consumer tastes and preferences and factor endowments across countries dispels the law of one price, suggested by the PPP theory. The deficiency of the PPP approach has led to the emergence of theoretical alternative approaches to assessing factors influencing movements in equilibrium RER including uncovered interest rate parity and equilibrium exchange rate models.

Uncovered Interest Rate Parity

The second strand of theoretical model to the determination of equilibrium real exchange rate is the uncovered interest parity (UIP), which suggests that the difference in interest rates between two countries equals the relative change in exchange rates over the same period to equilibrate international financial market. The UIP also involves 2 steps: i) a reduced form for the real exchange rate with economic "fundamentals" is derived and estimated and ii) then the estimated coefficients together with the economic fundamentals is used in calculating the equilibrium RER.

The UIP condition is given by:

$$\mathrm{E}_t\left(e_{t+1}\right)-e_t=i_t-i_i^* \quad \text{..... (3),}$$

where $\mathrm{E}_t\left(e_{t+1}\right)$ denotes the nominal value of exchange rate in period t for t+1, $_i$ and i^* are domestic and foreign nominal interest rates, respectively.

To convert nominal interest rate to real interest parity, we subtract the expected inflation differential on both sides of equation 3 and obtain:

$$E_t\left(rer_{t+1}\right)-\left(rer_t\right)=r_t-r_t^* \quad \text{..... (4)}$$

By rearranging equation (4), the observed exchange rate is represented as a function of the expected value of real exchange rate $E_t\ (rer_{t+1})$ and the current real interest rate differential $rer_t=E_t\left(rer_{t+1}\right)=(r_t-r_t^*)$. Following Clark & MacDonald, (1998), the unobservable expectations of the real exchange rate is influenced by a vector of economic fundamentals. These include terms of trade, productivity differential (PROD), net foreign assets (NFA), and government expenditure, thus the equilibrium real exchange rate is expressed as a function of economic fundamentals and the interest rate differential

$$erer=f\left(tot,prod,nfa,gov,r-r^*\right) \quad \text{..... (5)}$$

Equilibrium Exchange Rate Model

The third strand of theoretical approach to the determination of RER is based on the notion of equilibrium, particularly the consistence in internal and external balance over the medium to long term, a phenomenon known in literature as fundamental equilibrium exchange rate (FEER) proposed by (Williamson, 1994). The internal balance is attained when the economy is operating at fully capacity/employment, with low inflationary pressures. The external balance is characterized as sustainable balance of payments position over the medium term. It calculates the difference between the actual current account and the balance that would stabilize the net foreign assets. This approach involves estimating a sustainable current account balance and then computing the level of RER that is consistent with that particular current account deficit.

The determination of FEER model builds on the current account position *(CA)* as a function of rer^* as well as domestic and foreign output at full employment (y^{d*}, y^{f*}). The is then equal to the level of equilibrium capital account over the medium term (CAP^*). This equation can be expressed as depicted in equation (6)

$$CA=f(rer^*, yd^*, y^{f*})=CAP^* \quad \text{..... (6).}$$

Given the level of domestic and foreign output at full employment (y^{d*}, y^{f*}) and the equilibrium capital account (CAP^*), then the fundamental RER is derived as follows:

$$rer^*=f\left(CAP^*, yd^*, y^{f*}\right) \quad \text{.....(7)}$$

However, this approach is influenced by normative assumptions about the notion of ideal economic conditions of internal and external balance, which in actual sense are not attainable. Secondly, its calculation requires the estimation of trade elasticities with respect to exchange rate, which in most cases are less accurate given that different functional forms of current account equations could lead to different trade elasticities. To overcome this, we adopt the behavioural equilibrium exchange rate (BEER) due to the fact that, it is not a normative measure as it does not necessitate making assumptions on the sustainable internal and external balance over the long-run. The equilibrium real exchange rate under BEER approach is thus in line with economic fundamentals.

Empirical Model

To estimate the real exchange rate misalignment, we follow the reduced form equilibrium exchange rate approach, particularly the behavioural equilibrium exchange rate (BEER) model consistent with previous work, (MacDonald, 1997; Clark and MacDonald, 1998). This is an empirical approach that is based on economic fundamentals that influence real exchange rate behaviour. To obtain the measures of real exchange rate misalignment, we compute the deviation of actual real exchange rate from its equilibrium value and this deviation is known in literature as exchange rate misalignment. Its empirical assessment is challenging given that the equilibrium real exchange rate is unobservable, thus the starting point in addressing this is to define the concepts of real exchange rate and equilibrium real exchange rate.

The RER is the domestic relative price of traded to non-traded goods, expressed as $rer = E * \frac{p_t^*}{p_n}$, where E is the nominal exchange rate, P_t and P_n are prices of tradables and non-tradables, respectively. Nurkse, (1945), defined ERER as the value of RER that induces both the internal and external equilibrium, given sustainable values of relevant variables for achieving this objective.

Despite the fact that BEER approach is part of the complementary approaches proposed by the IMF's consultative group on exchange rate issues (CGER), it is chosen over other approaches such as Macroeconomic balance (MB) and external sustainability (ES) due to the fact that it is more pragmatic given that it directly computes an equilibrium exchange rate for each country as a function of medium to long term fundamentals of the real exchange rate. It therefore does not require to make assumptions on the long-run values of economic fundamentals, while the other two approaches are highly influenced by normative assumptions. Indeed, Thorstensen et al., (2014) contend that the BEER approach minimizes the subjectivity in the estimation of equilibrium RER and its misalignment by using a set of economic fundamentals that explain real exchange rate behaviour. Secondly, the macroeconomic balance approach does not take into account long-run stock effects via the net foreign position and the stock of capital. This paper uses takes into account economic fundamentals consistent with previous studies (Berg & Miao, 2010; Vieira & MacDonald, 2012). Our empirical model is thus specified as:

$$reer_t = \alpha + \alpha_1 tot_t + \alpha_2 open_t + \alpha_3 nfa_t + \alpha_4 prod_t + \alpha_5 gov_t + \varepsilon_t \quad \ldots\ldots (8)$$

Where $t = 1.....,T$ denote time period, $reer_t$ is the real effective exchange rate, tot_t are

the terms of trade, $open_t$ is the degree of trade openness, nfa_t is net foreign assets, $prod_t$ is productivity proxied by real per capita gross domestic product, gov_t is government consumption as percentage of GDP, $\alpha = (1,....,5)$ are parameters to be estimated and ε_t is the error term.

The procedure to estimate the equilibrium real exchange rate is implemented in five steps. Firstly, in line with conventional practice in econometrics, we test for unit root to determine the order of integration of used variables. Secondly, we estimate single equation cointegration based on reduced rank regression approach due confirm the presence of cointegrating relations (Johansen, 1988). Thirdly, we estimate the long run parameters of equilibrium RER using single equation cointegration based estimators such as dynamic ordinary least squares (DOLS) model. Fourthly, derive sustainable values of economic fundamentals of RER by decomposing RER into their permanent and cyclical components, implemented via Hodrik-Prescott (HP) filter and compute the misalignment measure, given by $Mis_t = reer_t - ereer_t$, where $ereer_t$ is the equilibrium real exchange rate and where positive (negative) values of Mis_t indicate undervaluation (overvaluation). Finally, we incorporate the RER misalignment indicator in the monetary reaction function to check for the impact of RER misalignment on monetary policy implementation.

Estimation Strategy

To estimate the relationship specified in equation (1), we apply single equation dynamic ordinary least squares estimator, (Stock & Watson, 1993; Kao and Chiang, 2000; Mark and Sul, 2003). This approach improves OLS by addressing the problem of small sample bias and dynamic sources of bias owing to the fact that it corrects for endogeneity by adding leads and lags. Indeed, Kao and Chiang, (2000) argue that DOLS is robust in small samples, a result that is confirmed by Rahman, (2017) using Monte Carlo simulations. This estimation technique is used, along with complementary estimators such as fully modified ordinary least squares (FMOLS) and canonical cointegration regression (CCR).

Definition of Variables and Data Sources

The series in equation (1) are constructed as follows. The real exchange rate is the inflation adjusted and trade weighted nominal exchange rate, computed by multiplying the nominal effective exchange rate by the ratio of foreign price to domestic price, given by $reer_t = \sum_{t=1}^{k} neer_{it} * \frac{p^*}{p}$.[62] The real exchange rate misalignment indicator is the exchange rate deviation from the equilibrium level based on Hodrick-Prescott (HP) filter, constructed as . Net foreign assets is calculated as difference between assets and liabilities , (Lane & Gian Milesi-Ferretti, 2007). Relative productivity proxied by real per capita GDP is calculated as nominal GDP divided by the total population and its growth rate is given by $ngdppc\_gr = ngdppc - ngdppc_{t-1} - 1$. .

Terms of trade is the ratio between a country's export prices and its import prices, computed as $tot = \frac{\exp ort\ prices}{import\ prices} * 100$

[62] The estimated models used real effective exchange rate as the indicator of exchange rate. Evolution of bilateral and weighted exchange rates for Rwanda is presented in Annex 2a and 2b.

Government expenditure is the total government expenditure, including recurrent and capital spending divided by GDP. Openness is measured as the sum of exports and imports divided by GDP, calculated as $open = \frac{x+m}{gdp}$. All the series are expressed in natural logarithms. We use quarterly data, covering the period 2006Q1-2021Q4 and data is sourced from World Bank's world economic outlook database (WEO), National Institute of Statistic of Rwanda and National Bank of Rwanda database.

V. Discussion of Results

Prior to estimating the reduced form real exchange rate equilibrium model, we checked for the stochastic properties of data and found that except for the terms of trade, all other variables are integrated of order one (see Annex 1).

Table 60 presents the results of the reduced form model based on various single equation cointegration estimators. It this study, the main focus is on DOLS. We estimated the long-run relationship between real effective exchange rate and a set of economic fundamentals. The estimated coefficients are presented in columns (2) -(4). All variables included in our empirical specification are statistically significant, with correct signs, implying that the real exchange rate is in line with economic fundamentals.

The coefficient of openness is positive and statistically significant, this implies that trade-liberalizing reforms tend to depreciate the equilibrium RER. From the results in Table 60, a 10 percent rise in openness brings about 1.5 percent depreciation in REER. In addition, the coefficient of terms of trade is positive and statistically significant, supporting the hypothesis that the substitution effect overwhelms the income effect in Rwanda. Similar results on the domination of substitution effect over income effect was found by Bahati and Sebera, (2020). The coefficient of NFA is positive and statistically significant, implying that higher net foreign assets induce real exchange rate depreciation given that a depreciated currency is required to restore the external balance for countries like Rwanda that experience current account deficits. As a matter of fact, Rwanda continues to run current account deficits despite the fact it has received substantial amounts of capital inflows, which would have otherwise rendered Rwanda to afford a more appreciated REER, while retaining the ability to restore the external balance through financing the associated current account deficits. However, these financial flows have not been enough to offset the current account deficit. In their analysis on the response of real exchange rate on different types of capital flows, (Bahati & Sebera, 2020) found total capital flows is associated with a currency depreciation as FDI and other private flows have a higher tradable bias compared to public inflows and remittances. The coefficient on government expenditure was also positive and statistically significant, suggesting that government consumption is biased towards tradables. From the results, the RER would depreciate by 0.7 percent following a 1 percent increase in government consumption.

By contrast, the coefficient of productivity is correctly signed but not significant in the first specification and correctly signed and statistically significant in the second and third specifications, suggesting that productivity increase relative to trading partners induces real exchange rate appreciation, a phenomenon well known in literature as "Balassa- Samuelson effect". These results are consistent with the theory and the results

of empirical studies for different countries, (Nuwagira and Muvunyi, 2016; Bukovšak, et al., 2020).

Table 60: BEER Estimation Result

Variables	DOLS	FMOLS	CCR
Openness	0.15*	0.27***	0.30***
	(0.08)	(0.08)	(0.09)
Terms of trade	0.30**	0.19	0.41***
	(0.12)	(0.13)	(0.05)
Net Foreign Assets	0.14**	0.19**	0.20**
	(0.06)	(0.07)	(0.08)
Government Expenditure	0.72***	0.81***	0.73**
	(0.07)	(0.08)	(0.07)
Productivity	-0.09	-0.13**	-0.17**
	(0.07)	(0.07)	(0.07)
Constant	0.52	0.41	(0.33)
	(0.56)	(0.67)	(0.64)
Observations	64	64	64
R-squared	0.87	0.68	0.72

Note: Standard errors in parentheses. *, ** and *** denote significant at 0.1%, 0.05% and 0.01%, respectively. The lag interval is set to 1 as suggested by Schwarz and Hann-Quinn information criteria.

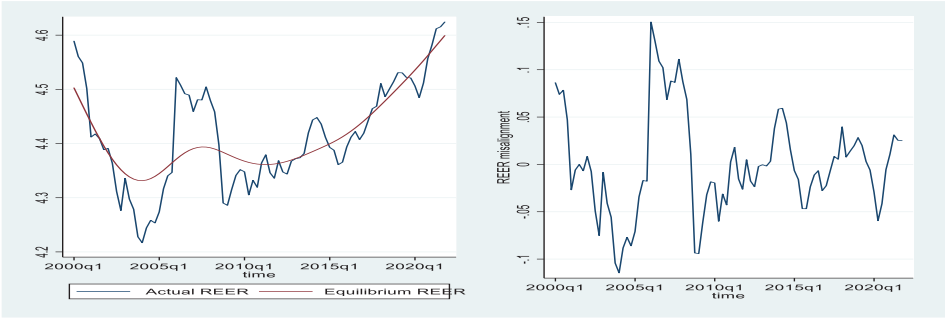
Source: Authors' estimations

Exchange Rate Misalignment in Rwanda

The estimated results of the main model, coupled with the Hodrick & Prescott, (1997), HP filter is used to derive the equilibrium values of economic fundamentals, whereby HP filter decomposes REER into their permanent and cyclical components and thus the level of misalignment is calculated as the difference between the actual real effective exchange rate and the equilibrium real effective exchange rate, which is the permanent component. Figure 49 below depicts the level of misalignment over the entire sample period. From the figure, different but alternating episodes of overvaluation and undervaluation are observable. It can further be observed that the level of misalignment is not prolonged and not very high. Considering the last episode, Rwanda's real effective exchange rate is undervalued by 2.3 percent, suggesting that Rwandan franc should appreciate by 2.3 percent in real effective terms to restore REER to its sustainable levels. Broadly speaking, this level of misalignment is not too high and the associated real exchange

rate misalignment episodes are not persistent to induce a negative effect on external sector competitiveness. The low levels of misalignment would be explained by the fact that inflation and exchange rate depreciation remained small in the last one decade. Specifically, during this period inflation averaged 3.8 percent while REER misalignment averaged 2.2 percent, thus monetary policy was largely accommodative.

Figure 49: Evolution in REER Misalignment in Rwanda



Source: Authors' estimations

Note: An increase (decrease) in RER is referred to as depreciation (appreciation). When the actual RER exceeds the equilibrium level, this refers to undervaluation.

REER Misalignment and Monetary Policy Implementation

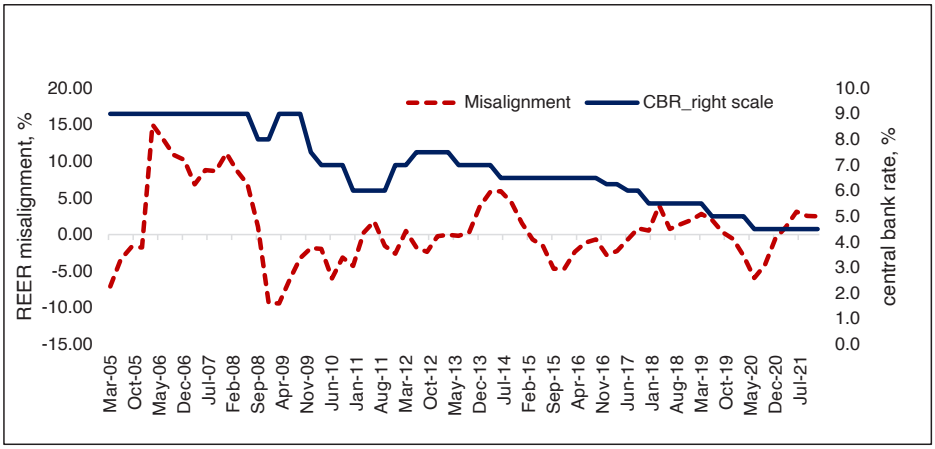
After obtaining the equilibrium level of real exchange rate and its associated real exchange rate misalignment as well as identifying the alternating episodes of overvaluation and undervaluation, we proceed with the assessment of the implication of REER misalignment on monetary policy implementation in Rwanda. This is informed by the fact that the REER and its deviation from sustainable levels plays a cardinal role in the transmission of external shocks to the domestic economy and in the propagation of monetary policy actions. The key channel that is well documented in literature is the direct effect of real exchange rate on inflation. Households consume not only domestically produced goods, but also imported goods, which are part of the consumer price index basket and as such the depreciation in exchange rate affect the domestic currency price of imported goods. REER depreciation erodes the value of domestic currency, thereby leading to an increase in inflation, thus if the resultant inflation expectations are not adequately anchored, the increase in imported goods prices feeds through to other domestic prices in the economy, inducing rampant increase in general price levels. Indeed, evidence from the empirical literature indicate that persistent REER misalignment have been associated with many of the crises that have been experienced in the emerging and developing economies, suggesting that monetary authorities should closely track its evolution.

From the Figure 49, taking the entire sample period, the episodes of real exchange rate misalignment point to a not too high level of REER misalignment, implying that exchange rate has evolved close to the equilibrium, which has prevented Rwanda from currency and banking crises and the associated high costs to the real economy coming

from balance sheet effect. This has been due to the fact that the central bank has from time to time intervened in foreign exchange market to smoothen exchange rate volatility.

To show the implication of REER misalignment on monetary policy implementation in Rwanda, we follow two approaches. First, we link the evolution of Rwandan REER misalignment and Rwanda's central bank policy rate between Jan-2005 and December 2021 (Figure 50). As can be observed, there might be a link between exchange rate and central bankers' decisions with respect to policy, particularly during episodes of high REER undervaluation. For instance, the figure shows that following a REER undervaluation in 2006Q1-2008Q3 at around 10 percent which peaked at around 15 percent in 2006Q1 combined with episodes of high inflation, the central bank increased its policy rate by 1 percentage point in early 2009. The currency then adjusted back towards the equilibrium and has remained relatively close to its equilibrium level, except for some years, 2009, 2014-2015 and 2020 buoyed by terms of trade shocks. Figure 50 shows that the REER undervaluation preceded or was associated with rising domestic prices.

Figure 50: Evolution of Rwanda's Monetary Policy Rate and REER Misalignment



Source: National Bank of Rwanda and Authors' calculation

The second approach consisted of estimating the effect of real exchange rate misalignment on the implementation of monetary policy in Rwanda using both linear autoregressive distributed lag (ARDL) and non-ARDL (NARDL), akin to Bahmani-Oskooee et al., (2019). The linear model assumes a linear effect of real exchange rate misalignment on central bank rate and is specified below, (Pesaran et al., 2001):

$$\Delta ir_t = \theta + \sum_{j=1}^{n} \varphi_j \Delta ir_{t-j} + \sum_{j=1}^{n} \gamma_j \Delta mis_{t-1} + \sum_{j=1}^{n} \rho_0 ir_{t-1} + \sum_{j=1}^{n} \rho_1 mis_{t-1} + \varepsilon_t \quad (1)$$

Where; *ir* is the central bank policy rate proxied by the 3-months Treasury bill interest rate, *mis* is the real exchange rate misalignment and ε is the error term.

In the above model specification, the short-run effects are derived from the first-difference variables, whereas the long-run estimates are provided by the ρ_1 normalized on ρ_0

To capture the asymmetric effect of real exchange rate misalignment on monetary implementation in Rwanda, the model is modified and disaggregate the real exchange rate misalignment into over-valuation and undervaluation in order to estimate their effects separately. Specifically, the study takes the positive variable for the partial sum of positive changes in the exchange rates and a thereafter a negative variable for the partial sum of negative changes in the real exchange rates is created. The positive and negative changes in the real exchange rates signify under-valuation and overvaluation of the real exchange rate respectively. The two variables are defined as:

$$undervaluation_t = \sum_j^t \Delta mis_t^+ = \sum_{j=1}^t \max(\Delta mis_j, 0) \quad \text{and}$$
$$overvaluation_t = \sum_j^t \Delta mis_t^- = \sum_{j=1}^t \min(\Delta mis_j, 0) \quad (2)$$

Therefore, the non-linear ARDL model can be expressed as follows:

$$ir_t = \theta^+ mis_t^+ + \theta^- mis_t^- + \mu_t \quad (3)$$

where θ^+ and θ^- are the asymmetric long-run equilibrium parameters associated with positive and negative changes in the real exchange rate. We then re-specify equation (1) by incorporating the two partial sum variables of the exchange rate misalignment in equation (2) and obtain the following equation:

$$\Delta ir_t = \propto + \varphi_j' \Delta ir_{t-j} + \gamma_j' \Delta mis^-{}_{t-j} + \delta_j' \Delta mis^+{}_{t-j} + \pi_0 ir_{t-1} + \pi_1 mis^-{}_{t-1} + \pi_2 mis^+{}_{t-1} + \in_t \quad (5)$$

Where $\theta^+ = \frac{\delta}{\varphi'}$ and $\theta^- = \frac{\gamma}{\varphi'}$

If the two partial sums carry the same coefficient in terms of sign and size, the effects are symmetric. Otherwise, they are asymmetric.

The results of the linear ARDL and non-linear ARDL are reported in Table 61. Both models indicate that exchange rate misalignment doesn't affect monetary policy implementation in Rwanda. In the linear ARDL model, although the coefficient is not significant it is correctly signed, suggesting that an increase or undervaluation (decrease or overvaluation) in exchange rate would push the central bank to tighten (loose) its monetary policy. Similarly, in the non-linear ARDL model, the results suggest that undervaluation of the exchange rate is insignificantly associated with tight monetary policy while real exchange rate overvaluation is insignificantly linked with ease of monetary policy. In addition, both models have revealed significant effects of past monetary policy shocks on the current monetary implementation policy.

Table 61: Results from ARDL and NARDL model

Dependent variable: monetary policy variable: ir			
Variable		**ARDL**	**NARDL**
Constant		1.15**	1.20*
		(0.45)	(1.04)
ir_{-1}		0.84***	0.80***
		(0.06)	(0.07)
mis		0.02	-
		(0.04)	-
mis_{-1}			
mis^{+}			0.01
			(0.08)
mis^{+}_{-1}			0.01
			(0.08)
mis^{-}			-0.03
			(0.09)
mis^{-}_{-1}			-0.05
			(0.13)
Diagnostics tests	$Adjusted\ R^2$	0.798	0.783
	$F-statistics$	65.53[0.00]	38.200[0.00]
	X^2_{LM}	4.69[0.0958]	5.992[0.0500]
	$;\ \chi^2_{HET}$	11.225[0.0241]	12.735[0.07889]
	$Jarque-Bera(p-value)$	46.038[0.00]	52.843[0.000]
	CUSUM	stable	stable

Notes: The values in parentheses are standard errors while values in brackets are p-values. *, **, *** denote 10%, 5% and 1% significance level. χ^2_{LM} is the Lagrange Multiplier test of residual serial correlation distributed as χ^2 with n degrees of freedom; χ^2_{HET} is the Breusch-Pagan-Godfrey test of residual homoskedacity distributed as χ^2 with n degrees of freedom. RESET is Ramsey's test for misspecification.

Source: Authors' calculation

VI. Conclusions

The main objective of this paper was to estimate the equilibrium real exchange rate and misalignment and assess its implication on monetary policy implementation in Rwanda. The study used quarterly data, spanning the period 2000Q1-2021Q4. Building on the behavioral equilibrium exchange rate framework, the study estimated the relationship between the real effective exchange rate and economic fundamentals using single equation cointegration based techniques, particularly DOLS. To check for the robustness of the econometric results, complementary estimators such as FMOLS and CCR were also utilized. To derive the level of REER misalignment, the estimated equilibrium real exchange rate results were used along with Hodrick-prescott filter to obtain sustainable levels of REER and decompose REER into their permanent and cyclical components. Thus, the level of REER misalignment was calculated as the difference between the actual real effective exchange rate and the equilibrium real effective exchange rate.

The main results indicate that the real effective exchange rate is in line with the economic fundamentals. Rwanda has experienced alternating episodes of undervaluation and

overvaluation over the period under review. The obtained level of REER is not too high and the identified episodes of undervaluation and overvaluation are not persistent to cause loss of competitiveness of the external sector. However, the study found that real exchange rate misalignments may not have important implications on monetary policy implementation despite Rwanda being a small open economy. Nevertheless, the study recommends that monetary authorities should continuously monitor the evolution of exchange rate misalignment due to its potential effects on macroeconomic stability.

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Annexes

Annex 1: Unit Root Test for the Variables under the BEER Model

Table 3: Unit roots test for non-stationarity (Sample: 2000Q1–2021Q4)

	Level		First Difference		Order of Integration
	Intercept	Trend	Intercept	trend	
Lrgdp	-1.21	-0.60	-8.65***	-8.70***	I(1)
Lreer	-1.60	-2.92	-7.72***	-7.92**	I(1)
Ltot	-2.47	-2.48	-3.44*	-3.53*	I(1)
Lgov	-0.74	-1.99	-3.93***	-4.45***	I(1)
Lopen	-1.67	-2.32	-11.59***	-8.05***	I(1)
Lnfa	-2.43	-2.04	-9.44***	-9.70***	I(1)

Note: *, **, ***: denote rejection of null hypothesis at 10%, 5%and 1% significance level respectively.
Source: Authors' estimations

Annex 2a: Bilateral Nominal Exchange Rate

Figure 2b: Rwanda's Real Effective Exchange Rate

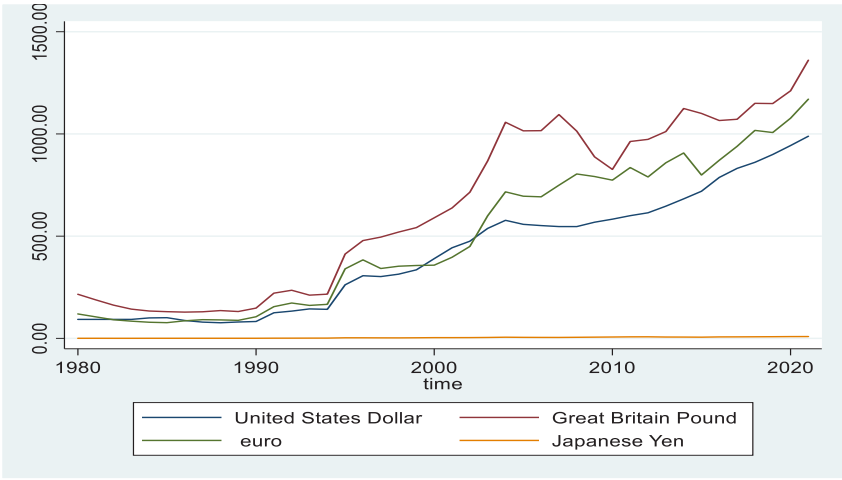
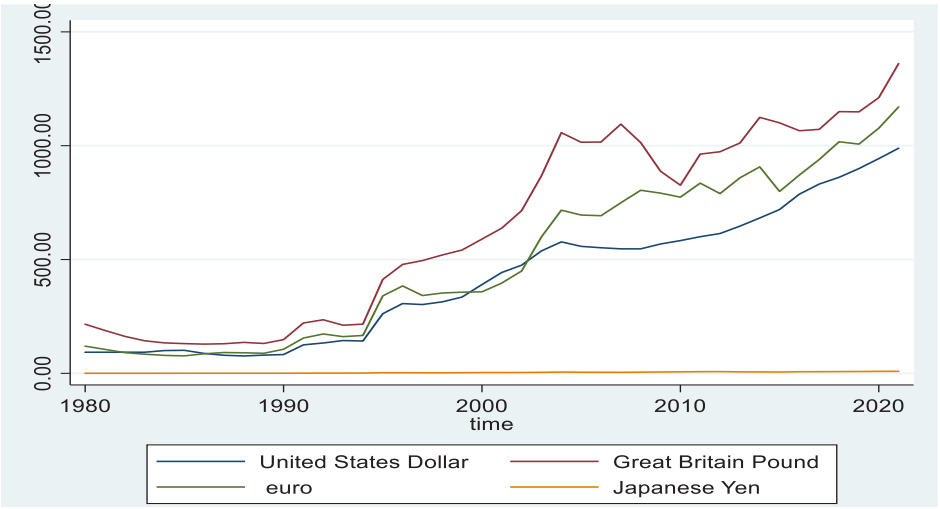


Figure 2b: Rwanda's Real Effective Exchange Rate



4. Taux de change effectif réel d'équilibre et mise en œuvre de la politique monétaire en RD Congo

Nsunda Ngindu Jules

I. Introduction

Dans une économie globalisée, avec des marchés financiers intégrés, la valeur d'une monnaie (nationale et transnationale) au regard des autres devises étrangères, a des conséquences importantes sur l'économie du pays. À la fin de la Seconde Guerre mondiale, afin d'éviter la volatilité excessive des taux de change et de prévenir les dépréciations concurrentielles dans les économies, le régime de change fixe avait été adopté par les nations. Pendant longtemps, la valeur des monnaies ne fluctuait que très peu car leurs taux de change étaient fixés par les autorités nationales selon des accords internationaux. À cette époque, il était impossible de spéculer sur la valeur des différentes monnaies.

Au fil du temps, le régime de change fixe montre ses limites, puisqu'il est supposé être la principale raison déclenchant les crises financières internationales. Afin de stabiliser la monnaie au mécanisme de rééquilibrage de l'offre et de la demande sur le marché des changes, plusieurs pays adoptent le régime de change flottant [63].

Compte tenu du rôle que le taux de change joue dans l'activité économique, le choix et la gestion d'un régime de change sont devenus un des principaux défis macroéconomiques auxquels font face les banques centrales en Afrique. En effet, les choix d'un régime influencent inéluctablement la stabilité du taux de change et sa valeur d'équilibre (Elfathaoui, 2019). Quel que soit le régime choisi, les autorités monétaires doivent ajuster leurs politiques macroéconomiques pour qu'elles correspondent à la politique de change choisie.

La littérature économique met souvent en évidence la notion de taux de change nominal bilatéral (TCN). En dépit de son importance économique, cet agrégat n'indique pas le prix relatif (en termes réels) de biens, et ne renseigne rien sur la compétitivité-prix entre les pays. Compte tenu des interdépendances existant entre les économies, il semble pertinent de chercher à définir le taux de change effectif réel (TCER) et son niveau d'équilibre. Considéré comme étant un indicateur de compétitivité, le taux de change effectif réel est un instrument central d'ajustement de la balance des paiements et reste sans doute l'un des agrégats les plus surveillés par les banques centrales.

Lorsque les autorités monétaires constatent des écarts importants et persistants entre le taux de change effectif réel observé et sa valeur tendancielle, c'est-à-dire le désalignement, elles doivent opérer des choix afin de le ramener proche de zéro. Qu'il prenne la forme d'une surévaluation ou d'une sous-évaluation, le désalignement du TCER, reflète une mauvaise politique de change, puisqu'il crée l'incertitude sur les décisions d'investissements, l'instabilité des déficits de la balance courante, les crises

[63] http. www.imf.org/external/np/exr/ib/2000

monétaires et de change, et finalement l'atonie de la croissance, (Berg et Miao, 2010 ; Béreau, et al., 2009 ; Couharde et al., 2011).

En effet, une monnaie est surévaluée dès lors que le niveau général des prix du pays concerné est supérieur à celui de ses pays partenaires (Dornbusch, 1988). Ce qui engendre non seulement le dérapage inflationniste dans le pays concerné mais également la dépréciation du taux de change, le déficit structurel du compte courant et perte de recettes d'exportations liée à une baisse des prix à l'exportation de matières premières. Cette situation aggrave inexorablement le pessimisme du développement, peut drainer les réserves de change et déséquilibrer la balance des paiements.

En revanche, les périodes longues d'une monnaie sous-évaluée entraînent une vulnérabilité excessive de l'économie aux chocs externes, au risque de crise sur le marché financier intérieur et manque d'incitations pour les entreprises nationales à accroître leur efficacité, car la compétitivité des prix est déjà élevée, ce qui engendrerait des tensions inflationnistes (les cas de Yougoslavie, du Brésil dans les années 80.

Ainsi, la question du désalignement est cruciale pour les pays en développement, particulièrement en République Démocratique du Congo (RDC), étant donné que la gestion de la politique de change a toujours été au centre des débats de politique économique dans le pays.

En effet, l'adoption, d'un régime de change, lequel oriente fondamentalement la nature de la politique de change, demeure l'une des pièces maitresses des stratégies de stabilisation macroéconomique des pays avancés comme ceux en développement.

Depuis plusieurs années, le taux de change flottant a été adopté en tant que régime de change de la RD Congo. Le choix de ce régime en 2001 a été justifié par la nécessité de réduire les distorsions qui affectaient le fonctionnement du marché de change, accentuaient les déséquilibres macroéconomiques et alimentaient la spéculation sur le taux de change.

Pour préserver la stabilité du taux de change et réduire les écarts entre le taux de change effectif et son niveau d'équilibre, la Banque Centrale du Congo (BCC) devrait se préoccuper de l'évolution du désalignement du TCER. A cet effet, il revient à la politique macroéconomique de résorber les écarts observés.

En se basant sur le modèle du taux de change d'équilibre comportemental (BEER), à l'aide d'une relation de long terme entre le taux de change effectif réel et un ensemble de déterminants fondamentaux, l'objectif poursuivi dans cette étude est d'évaluer le comportement de l'Autorité Monétaire face au désalignement du TCER au cours de la période 1980-2021. Elle cherche à vérifier, si au cours de cette période, le désalignement du TCER a été impacté par la politique monétaire en RD Congo ou c'est l'inverse.

Partant de ce constat, la suite de ce papier est organisée comme suit. Outre l'introduction et la conclusion, le premier chapitre présente la revue théorique et empirique relative du TCER et de son niveau d'équilibre. La méthodologie de l'étude et les données utilisées sont décrites dans le deuxième chapitre. Enfin, les résultats des estimations économétriques et leurs interprétations, ainsi que les implications de politiques sont abordés dans le troisième chapitre.

I. Revue de littérature

La littérature économique offre plusieurs types de taux de change ainsi que les multiples manières de calculer le taux de change effectif d'équilibre et le désalignement du taux de change effectif réel. Edwards (1989) ; Wrenlewis (1992) et Williamson (1994) ont mis en œuvre la théorie du calcul de taux de change d'équilibre fondamental (FEER) correspondant à un horizon de long terme.

Les différents types de taux de change et leurs calculs

La littérature économique présente plusieurs types de taux de change, parmi lesquels le taux de change nominal et le taux de change réel. Le taux de change nominal représente la valeur d'une devise par rapport à une autre, tandis que le taux de change réel tient compte des différences de prix entre les pays. Pour une petite économie ouverte comme la République Démocratique du Congo (RDC), le taux de change effectif réel (TCER) est un indicateur clé puisqu'il reflète la compétitivité extérieure de l'économie en tenant compte de l'évolution des prix relatifs des biens domestiques par rapport aux partenaires commerciaux.

Dans le cadre de la mesure du TCER d'équilibre, plusieurs théories ont été proposées, chacune apportant une perspective spécifique sur l'équilibre à long terme du taux de change.

Taux de change d'équilibre fondamental (FEER)

Edwards (1989), Wren-Lewis (1992), et Williamson (1994) ont introduit la théorie du taux de change d'équilibre fondamental (FEER), qui vise à maintenir simultanément l'équilibre interne (c'est-à-dire le plein emploi sans inflation) et l'équilibre externe (balance courante soutenable à long terme). Le FEER repose sur des déterminants macroéconomiques fondamentaux comme la balance courante, les termes de l'échange et la politique budgétaire. Cette approche est particulièrement pertinente pour évaluer le désalignement du TCER, car elle permet d'estimer un taux de change cohérent avec les équilibres macroéconomiques fondamentaux d'un pays.

Taux de change naturel (NATREX)

Stein (1994) et Stein et Allen (1997) ont proposé le concept de taux de change naturel (NATREX), une approche dynamique qui postule que le taux de change d'équilibre résulte de l'évolution des fondamentaux économiques à long terme, comme la productivité, l'épargne et l'investissement. Le NATREX se différencie du FEER en ce sens qu'il prend en compte la tendance naturelle des comptes extérieurs sans tenir compte des flux de capitaux spéculatifs ou des interventions en matière de réserves de change. Cette approche est utile dans le cadre de la RDC, où les chocs extérieurs et les mouvements spéculatifs peuvent influencer les flux de capitaux et les réserves de change.

Taux de change d'équilibre désiré (DEER)

Artis et Taylor (1993) ont introduit le concept de taux de change d'équilibre désiré (DEER), qui se base sur l'équilibre entre les niveaux désirés d'emploi et de compte courant. Cette approche est davantage normative, car elle se fonde sur des niveaux "optimaux" des fondamentaux économiques pour évaluer si le taux de change est en adéquation avec les objectifs de politique économique, tels que le plein emploi et l'équilibre extérieur. Dans un contexte comme celui de la RDC, où la

stabilisation du marché du travail et la réduction des déficits extérieurs sont des objectifs prioritaires, l'approche DEER pourrait permettre de concevoir des stratégies de politique économique visant à corriger les désalignements.

Taux de change d'équilibre comportemental (BEER)

Clark et MacDonald (1998) ont développé l'approche du taux de change d'équilibre comportemental (BEER), qui est fondée sur l'idée qu'il existe une relation de long terme (cointégration) entre le taux de change et des variables économiques fondamentales, telles que les termes de l'échange, les différentiels de taux d'intérêt, et la productivité relative. Cette approche utilise le modèle à correction d'erreur (VECM) pour estimer le désalignement du taux de change, en se basant sur la dynamique à court et à long terme. Dans le cas de la RDC, où les fluctuations du taux de change sont souvent influencées par les chocs externes et les pressions inflationnistes, l'approche BEER permettrait d'identifier les écarts à court terme et de les corriger.

Edwards (1989) a développé un modèle de panel de 12 pays en développement et trouve que les variables les plus importantes qui affectent le niveau du taux de change réel sont : les termes de l'échange, le niveau et la composition des dépenses publiques, les mouvements de capitaux, le contrôle de change, le progrès technique, et l'accumulation de capital. Les résultats ont montré que : i) le TCR dépend lui-même des fondamentaux économiques; iii) le TCR peut s'écarter du taux de change d'équilibre réel qui est censé garantir l'équilibre interne et des niveaux soutenables de déséquilibre de la balance courante et d'endettement extérieur ; iv) le degré de désalignement du taux de change réel de son niveau d'équilibre est supposé refléter les situations de court et moyen termes traduirait la sur ou la sous-évaluation du taux de change réel et donc, les pertes ou les gains de compétitivité.

Clark et Macdonald (2000), utilise l'approche BEER du taux de change d'équilibre pour le dollar néo-zélandais est fonction de différentiel de productivité (effet Balassa-Samuelson), du taux d'intérêt et des termes de l'échange. Il trouve que: i) tous les coefficients estimés sont statistiquement significatifs; ii) les variables retenues dans le modèle ont montré des effets compatibles avec la théorie; iii) le dollar néo-zélandais a connu des phases fortes de sous-évaluation dans la période post 1999.

En adoptant l'approche BEER du taux de change comportemental, Kibritcioglu et Kibritcioglu (2004) utilisent quatre variables explicatives du taux de change effectif réel, à savoir : le rapport entre la consommation gouvernementale et le PIB, les termes de l'échange et le ratio d'ouverture. Les résultats indiquent que tous les coefficients sont significativement différents de zéro et trouve un degré de désalignement de grande ampleur.

MacDonald et Ricci (2003) utilisent la méthode BEER dans le cadre d'un modèle vectoriel de correction des erreurs (VECM) pour estimer une relation de cointégration à long terme entre le TCER et les variables économiques sur la période de 1970 à 2002. Ils constatent que les mouvements du taux de change réel à long terme en Afrique du Sud peuvent être expliqués par les mouvements des prix des produits de base, la productivité, les différentiels de taux d'intérêt réels par rapport aux partenaires commerciaux, la balance fiscale, la position nette des actifs étrangers et l'ouverture commerciale.

Plusieurs manifestations de désalignement du taux de change ont été identifiées dans l'étude, confirmant que le rand était sous-évalué de plus de 25% au début de 2002, après la forte dépréciation du taux de change nominal en 2001.

MacDonald et Ricci (2003) affirment que les déviations du taux de change d'équilibre devraient normalement être éliminées dans par un laps de temps court s'il n'y a pas d'autres chocs dans le système (vitesse d'ajustement de 8% dans l'équation de cointégration). Du Plessis (2005) soulève la question importante de l'endogénéité dans la modélisation économétrique et remet en question la validité des résultats de MacDonald et Ricci (2003) puisque le taux de change était faiblement exogène dans leur modèle. Outre l'existence d'une relation d'équilibre entre le taux de change réel et les fondamentaux économiques, Du Plessis (2005) affirme que l'autre condition nécessaire pour un modèle de taux de change d'équilibre est que le taux de change soit endogène dans le modèle de sorte que les déséquilibres doivent avoir un effet de rétroaction sur le taux de change réel.

Le modèle de MacDonald et Ricci violant la condition d'endogénéité, Du Plessis (2005) conclut que leur modèle ne peut être qualifié de modèle de taux de change d'équilibre.

En réponse à Du Plessis (2005), MacDonald et Ricci (2003) prolongent leurs données de six trimestres pour résoudre le problème et soutiennent que les degrés de liberté limités expliquent la faible exogénéité. Les auteurs soutiennent également que l'absence d'endogénéité faible n'affecte pas significativement leur modèle d'équilibre.

Quant Égert et al. (2004), qui examinent les taux de change d'équilibre de la monnaie tchèque (CZK), afin de mesurer le degré de désalignement via l'utilisation du modèle BEER et les techniques de coïntégration (ARDL). Ils trouvent une relation positive entre les avoirs extérieurs nets et le taux de change est un phénomène de moyen terme confirmant l'idée que la République Tchèque est encore dans un régime de moyen terme.

Gulde, A. et al. (2005) ont analysé les fluctuations du taux de change réel effectif par rapport à sa valeur d'équilibre de long terme, appliquant l'approche fondamentale (BEER) et la méthodologie de cointégration de Johansen. Leurs analyses révèlent que (i) les termes de l'échange, les dépenses publiques et les flux de capitaux impactent positivement le TCER. (ii) le degré de désalignement indique que le taux de change est surévalué avant 1994, ensuite sous-évalué entre 1994 et 2001; pour enfin s'apprécier continuellement à partir de 2001. (iii) le désalignement du taux de change effectif réel est essentiellement due aux facteurs temporaires et on s'attend à ce qu'il revienne à l'équilibre en l'absence de chocs futurs.

El Bouhadi et al (2006), analysent l'impact de la politique de change sur l'économie réelle au Maroc par un modèle économétrique BEER. Les résultats montrent que la dynamique du taux de change au Maroc est déterminée par les termes de l'échange, les réserves de change, les créances à l'étranger et la dette extérieure. De même, en termes de fluctuations à court terme du taux de change et d'analyse des chocs, la dynamique de l'offre et de la demande du dirham sont déterminantes.

Paiva et Moita(2006) étudient « les facteurs explicatifs » de l'amélioration des comptes extérieurs du Brésil et les larges fluctuations du TCR depuis le flottement du TCR en 1999. Ils ont utilisé le modèle

BEER de Clark et MacDonald (1999) pour analyser le TCR du Brésil. Ainsi, ils ont considéré que la dynamique de ce taux est conduite par des fondamentaux suivants : (i) le prix relatif des biens non échangeables par rapport aux biens échangeables, les termes de l'échange, (ii) le différentiel du taux d'intérêt réel, (iii) la position extérieure nette et (iv) le stock relatif de la dette publique intérieure. En utilisant les données annuelles de la période 1970-2004, par le test de cointégration de Johansen (1995).

La conclusion du travail est que la forte appréciation du TCR sur la période 2003-2005 est causée par l'amélioration des fondamentaux économiques notamment la position extérieure nette et les termes de l'échange.

Coudert et Coharde (2009), procèdent aux tests de comparaison des moyennes du désalignement entre régimes de change de facto dans un échantillon de pays émergents et en développement de 1974 à 2004. Les tests révèlent que le taux de change réel est plus surévalué dans les systèmes de change fixes et une forte sous-évaluation dans les régimes de change flexibles.

Hadj Amor et Elaraj (2009) développent un simple modèle macroéconomique (FEER) pour les pays en développement, et en particulier aux Pays Sud-Est Méditerranéens (PSEM) (l'Algérie, l'Egypte, le Liban, le Maroc, la Tunisie et la Turquie). A travers ce modèle, ils examinent le taux de change de ces six pays pour identifier ses déterminants et ses effets.

Les fondamentaux utilisés sont les termes de l'échange, le différentiel de productivité, les dépenses publiques, le taux de croissance de la monnaie et la quasi-monnaie, l'ouverture commerciale, l'intégration financière internationale, les réserves de change et la dette. Les résultats indiquent qu'un comportement du TCR à long terme dépend essentiellement de la spécificité économique de chaque pays et en particulier de leur degré d'intégration financière et d'ouverture commerciale.

LEZAR A., (2011) a testé l'évolution du taux de change réel du dirham par rapport à celui d'équilibre, s'inspirant des travaux d'Edwards pour les pays en développement. Il utilise la technique de filtre HP « Hodrick-Prescott (HP) filter », afin d'estimer les variables soutenables des variables fondamentales. Les résultats de la modélisation du taux de change réel du dirham ont montré que: i) le taux de change s'apprécie avec l'amélioration des termes de l'échange, l'augmentation des flux de capitaux et la hausse des avoirs extérieurs nets, ii) et se déprécie avec l'accroissement du degré d'ouverture de l'économie nationale, iii) les déséquilibres se compensent à long terme (10 à 11 ans) entre le taux de change réel et les variables fondamentales.

Gnimassoun (2012), utilisant les techniques de cointégration en panel pour estimer le taux de change d'équilibre du franc CFA selon l'approche BEER, par rapport à plusieurs fondamentaux économiques : les termes de l'échange, les dépenses de consommation publique, les transferts internationaux, le degré d'ouverture. L'examen des désalignements révèle que la marge de manœuvre de la zone CFA en termes de compétitivité prix s'est beaucoup réduite depuis 2002 avec l'appréciation de l'euro, jusqu'à devenir quasi nulle en 2009. Ainsi, si certains pays présentent une sous-évaluation de leur taux de change en 2009, la Côte d'Ivoire quant à elle a atteint un niveau de surévaluation

comparable à celui observé en 1993.

En définitive, la littérature empirique indique une large gamme de travaux et de méthodes appliquées à l'étude de l'interaction entre le TCER et les fondamentaux économiques. A l'exception du Rapport du FMI, n°10/88, qui aborde très brièvement les aspects du TCR en RDC, l'auteur n'a pas connaissance d'une autre étude similaire axée sur le taux de change effectif réel et le désalignement du taux de change en RDC.

II. Méthodologie Économétrique

Bien qu'il soit complexe de déterminer le taux de change d'équilibre, particulièrement dans un pays présentant d'importantes ruptures structurelles des données, la technique de cointégration de Clark et MacDonald adoptée dans cette étude, permet d'estimer la valeur d'équilibre d'une monnaie en cohérence avec les fondamentaux économiques.

Spécification du Modèle et Choix des Variables

Dans sa forme fonctionnelle, le modèle à estimer s'écrit comme suit :

$$TCER_t = f(TEC_t, M2_t, LRES_t, CC_t, INFL_t) \quad (1)$$

Où TCER représente l'indice du taux de change effectif réel, TEC, M2, LRES et CC sont respectivement les termes de l'échange, la masse monétaire, les réserves de change en mois d'importations, le solde de la balance courante et de l'inflation. Toutes les variables sont prises en logarithmes, à l'exception du solde de la balance courante « CC » qui contient des valeurs négatives. Le choix de ces variables repose sur des fondements théoriques et empiriques développés dans la littérature économique. Plusieurs auteurs ont exploré les déterminants du taux de change effectif réel (TCER) et la politique monétaire, contribuant à la pertinence des variables choisies.

Le termes de l'échange (TEC) influencent directement la valeur de la monnaie locale par rapport aux devises étrangères, affectant ainsi le TCER. Cote et al. (2011) ont montré que des termes de l'échange favorables sont généralement associés à une appréciation du TCER, particulièrement dans les économies dépendantes des exportations de matières premières comme la RDC.

Masse Monétaire (M2) est un indicateur de la liquidité dans l'économie. Une augmentation de M2, sans une augmentation proportionnelle de la production, peut entraîner une dépréciation de la monnaie. Mishkin (2007) souligne que la gestion de la masse monétaire est cruciale pour la stabilité des prix et que son interaction avec le TCER est significative.

Réserves de Change en mois d'importations (LRES) fournissent une mesure de la capacité d'un pays à financer ses importations et à faire face aux chocs externes. Elles sont un facteur clé de la confiance des investisseurs et de la stabilité monétaire. Khan et al. (2007) ont montré que des niveaux adéquats de réserves de change sont essentiels pour maintenir un taux de change stable, surtout dans des économies vulnérables comme celle de la RDC.

Solde de la Balance Courante (CC) mesure les transactions internationales d'un pays et

un solde déficitaire peut signaler une pression à la baisse sur le TCER. Frenkel et Razin (1996) affirment que le solde de la balance courante est un indicateur critique de la santé économique d'un pays et de sa capacité à maintenir un TCER compétitif.

Inflation (INFL) affecte le pouvoir d'achat et peut induire des ajustements dans le TCER si elle n'est pas contrôlée. Fischer (1993) démontre que des taux d'inflation élevés peuvent conduire à une dépréciation du taux de change effectif réel, soulignant ainsi l'importance de la maîtrise de l'inflation dans le cadre des politiques monétaires.

Technique D'estimation

Pour estimer l'équation (1), la technique de cointégration de Johansen (1995) est privilégiée dans cette étude, au regard des avantages qu'elle offre. En effet, si les variables considérées dans la relation (1) sont cointégrées et intégrées du même ordre, il est possible d'estimer un vecteur à correction d'erreurs de la forme ci-dessous :

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-1} + \mu + \psi D_t + \varepsilon_t \quad (2)$$

Où X_t est le vecteur des variables de court terme, et les matrices Γ et Π contiennent respectivement les coefficients de court terme et ceux de relations de long terme. Ces derniers intéressent particulièrement cette étude, mais également la dynamique de court terme qui sert à spécifier correctement l'équilibre de long terme.

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-1} + \mu + \psi t + \varepsilon_t \quad (3)$$

Le modèle (3) indique que derrière les fluctuations les plus apparentes, il existe au moins une relation stable à long terme qui détermine la trajectoire de l'ensemble des variables considérées.

Données et Sources

Les données considérées dans cette étude concernent la RD Congo et portent sur la période 1980-2021. Nos principales sources de données sont la Banque Centrale du Congo et les statistiques financières internationales du FMI.

Le choix de ces variables repose sur des fondements théoriques et empiriques développés dans la littérature économique. Plusieurs auteurs ont exploré les déterminants du taux de change effectif réel (TCER) et la politique monétaire, contribuant à la pertinence des variables choisies.

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Solde de la Balance Courante (CC) mesure les transactions internationales d'un pays et un solde déficitaire peut signaler une pression à la baisse sur le TCER. Frenkel et Razin (1996) affirment que le solde de la balance courante est un indicateur critique de la santé économique d'un pays et de sa capacité à maintenir un TCER compétitif.

Inflation (INFL) affecte le pouvoir d'achat et peut induire des ajustements dans le TCER si elle n'est pas contrôlée. Fischer (1993) démontre que des taux d'inflation élevés peuvent conduire à une dépréciation du taux de change effectif réel, soulignant ainsi l'importance de la maîtrise de l'inflation dans le cadre des politiques monétaires.

Dans le cadre de cette étude, il est crucial d'évaluer la multicolinéarité afin de garantir des estimations fiables. En effet, les travaux des auteurs précédemment cités, fournissent un cadre théorique solide sur lequel on peut s'appuyer pour examiner les relations entre le TCER et ses déterminants, et ils peuvent orienter nos analyses et interprétations des résultats

III. Résultats Empiriques et Implications de Politiques

Test de Racine Unitaire

Les résultats du test de stationnarité sont repris dans le tableau n°62 ci-dessous :

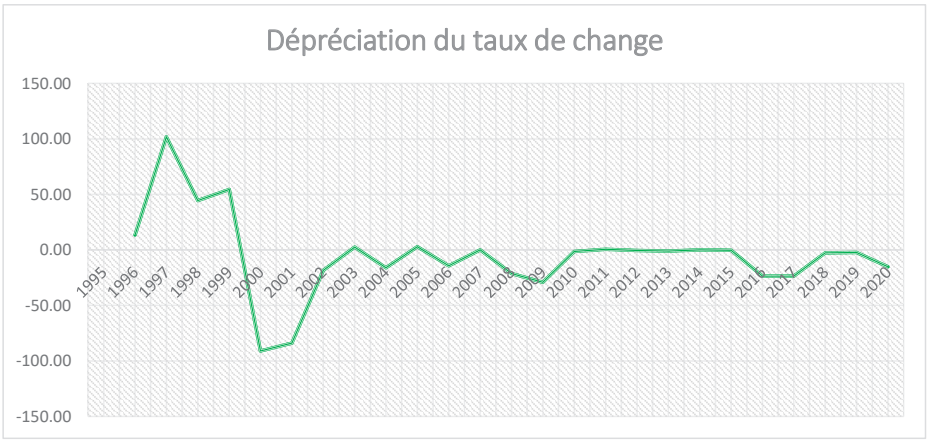
Table 62: Résultats du Test de Racine Unitaire

Test de Dickey-Fuller Augmenté (ADF)					
Variable	En niveau		Stationnaire	Différence première	Stationnaire
	Intercept	Intercept & trend		Intercept & trend	
LTCER	-2,00	-3,00	Non	-4,82***	I(1)
LTCE	-1,78	-3,38	Non	-9,02***	I(1)
LCM2	-2,08	-2,60	Non	-7,64***	I(1)
CC	-2,57	-2,87	Non	-6,27***	I(1)
LREC	-1,20	-2,53	Non	-7,39***	I(1)
Test de racine unitaire de point de rupture					

*, **, *** indiquent une signification à 10%, 5% et 1%, respectivement.

On note que toutes les variables son non-stationnaires de type (DS) et intégrées de même ordre I(1).

Figure 51: Evolution de la Dépréciation du Taux de Change



L'évolution de la dépréciation du taux de change du franc congolais représente la baisse de la valeur de la monnaie nationale par rapport à une autre, ce qui a pour conséquence directe d'augmenter le coût des importations et de renchérir les biens et services importés. Cela peut également entraîner une inflation domestique, car les produits importés deviennent plus chers, tout en améliorant potentiellement la compétitivité des exportations, à condition que la hausse des prix à l'exportation ne soit pas compensée par une augmentation des coûts de production internes.

Au cours de la période étudiée de 1999 à 2000, la monnaie nationale s'est fortement affaiblie, notamment en raison de la baisse des recettes d'exportation. Elle a évolué de manière irrégulière entre 2002 et 2009, avant de se stabiliser durant la période allant de 2010 à 2016. Cette stabilisation relative a été favorisée par une gestion plus rigoureuse de la politique monétaire et une meilleure maîtrise de l'inflation. Toutefois, des facteurs externes, comme les fluctuations des prix des matières premières sur le marché international, ont continué à influencer la volatilité du taux de change. Malgré cette stabilité apparente, l'économie congolaise est restée vulnérable aux chocs externes, notamment en raison de sa dépendance aux exportations de matières premières. Ainsi, toute baisse significative des prix des produits comme le cuivre ou le pétrole a eu des répercussions directes sur les recettes d'exportation et, par conséquent, sur le taux de change. Cette situation a mis en évidence l'importance d'une diversification économique et d'une réduction de la dépendance vis-à-vis des produits de base pour renforcer la résilience de la monnaie nationale face aux fluctuations externes.

Test de Causalité de Granger

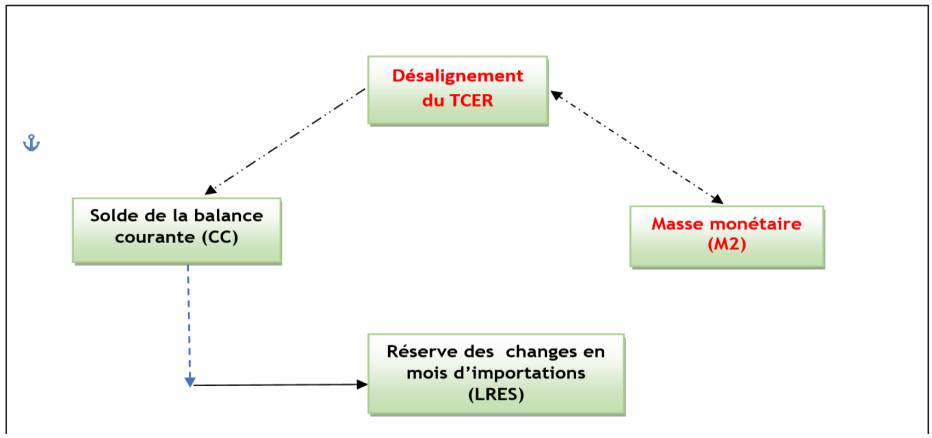
Table 63: Résultats du Test de Causalité de Granger, 1980- 2021

Hypothèse nulle :	Obs	F-Statistic	P-value
LCM2 does not Granger Cause DESAL	41	4.21970	0.0469
DESAL does not Granger Cause LCM2		5.83578	0.0206

Source : calcul de l'auteur sur Eviews

Le résultat du test de causalité de Granger indique une relation bidirectionnelle entre l'agrégat monétaire (M2) et le désalignement du TCER (DESAL), au seuil de significativité de 5%. En effet, le désalignement négatif du TCER conduit l'Autorité Monétaire à prendre des mesures idoines pour lisser les fluctuations du cours de change.

Figure 52: Mécanismes Globaux de Transmission du Désalignement du TCER sur L'agrégat Monétaire



L'analyse de ce schéma identifie clairement le lien bidirectionnel entre la politique monétaire et le désalignement du taux de change effectif réel. En effet, l'orientation de la politique monétaire au cours de la période 1980-2021, a significativement influencé le TCER à s'éloigner de sa valeur d'équilibre. En outre, le schéma du mécanisme de transmission du désalignement du TCER démontre également son effet indirect sur les réserves de change en mois d'importations à travers le déficit du solde de la balance courante.

Test de Cointégration de Johansen

La procédure de Johansen (1995) est utilisée pour tester l'existence de la cointégration entre les variables intégrées de même ordre. L'objectif est d'identifier les variables qui ont une relation d'équilibre à long terme avec le taux de change effectif réel.

Table 64: Relation de Cointégration de Johansen (Test de Trace)

Hypothèse nulle	Statistique de la Trace	Valeur critique au seuil de 5%	Probabilité
0	115.6274	95.75366	0.0011
1	65.34781	69.81889	0.1079
3	43.14801	47.85613	0.1290
4	24.58951	29.79707	0.1767
5	11.31502	15.49471	0.1928

Faisant référence au tableau n°65 ci-dessous, le test de trace montre l'existence d'une relation de cointégration parmi les variables au seuil de 5%.

Estimation de la Relation de Long Terme Entre le TCER et les Fondamentaux

Table 65: Relation de Long Terme Entre le TCER et les Fondamentaux

TCER	CM2(-1)	CC(-1)	LRES(-1)	LTEC(-1)
1	0,30	-0,0004	-0,33	0,44
t-stat	12,97	-10,29	-4,89	1,60

Le taux de change à long terme est fixé par les facteurs « fondamentaux « que sont, la masse monétaire (M2), le solde de la balance courante (CC) et les réserves de change en mois d'importations (LRES). En effet, l'accroissement de la masse monétaire de 1%, augmente le niveau général des prix, qui se traduit par une dépréciation du TCER de 0,30%. En clair, les chocs des politiques monétaires a une incidence importante sur la fluctuation du taux de change effectif réel en RD Congo.

En revanche, l'impact du solde de la balance courante sur le taux de change est relativement faible mais significatif. En effet, tout déficit du solde courant de la balance des paiements de 1 point de pourcentage génère une dépréciation du TCER de 0,0002 de point de pourcentage. De même, les variations des réserves de change ont un effet significatif sur le TCER. La diminution des réserves de change impacte négativement la compétitivité de l'économie congolaise et donc détériore le TCER.

Cependant, il peut arriver que le taux de change s'éloigne momentanément de son niveau d'équilibre sous l'effet d'une bulle spéculative sur le marché de change ou d'un phénomène de sur réaction.

Estimation de la relation de Court Terme

Table 66: Relation de court terme

Variable Dépendante: Δ(LTCER)

VARIABLES	coefficients	P-value
ECT_{T-1} **t-stat**	-0,71 -3, 16	0,0000
$\Delta(LTCER)_{t-1}$ **t-stat**	0,58 2,64	0,0000
$\Delta(LTCER)_{t-2}$ **t-stat**	-0,32 -1,85	0,1000
$\Delta(LRES)_{t-1}$ **t-stat**	0,130 1,92	0,1000
$\Delta(LCM2)_{t-1}$ **t-stat**	-0,126 -1,825	0,1000
$\Delta(CC)_{t-1}$ **t-stat**	0,0001 1,95	0,0000 0,0000

Il ressort du tableau n°4, une forte significativité du coefficient d'ajustement dans l'équation du taux de change effectif réel. En effet, le facteur d'ajustement de l'équation de cointégration (vitesse d'ajustement) s'est révélé négatif (-0,71%) et statistiquement significatif au seul de 5%. [64]

[64] Le nombre de périodes T nécessaires pour éliminer α% de l'écart par rapport à l'équilibre est donné par la formule : (1-α%) = (1 – 0,80), (El Badawi 1994, pp 110)

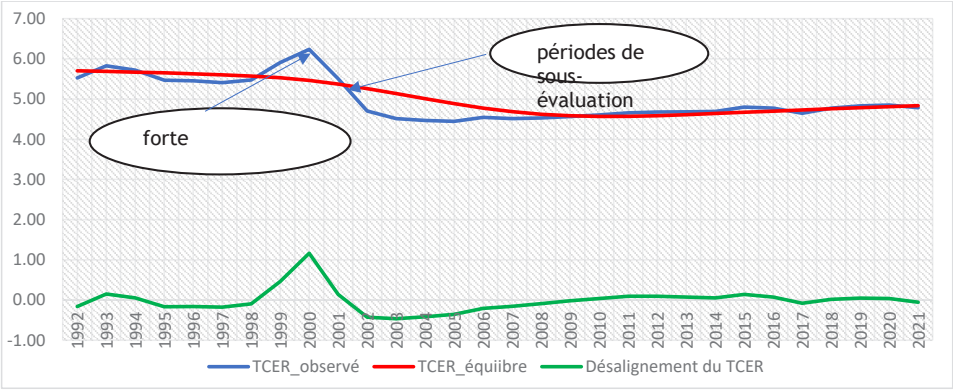
Cela signifie que si le système résorbe annuellement 71% de son écart par rapport à l'équilibre de l'année précédente, il résorbera de lui-même tout déséquilibre occasionné par un choc au bout de 1 an et 4 mois, toutes choses égales par ailleurs. Ces résultats révèlent que la croissance de la masse monétaire, la variation des réserves de change et le taux de change effectif réel décalé ont été les principaux déterminants du taux de change effectif réel en RD Congo.

Tests de Diagnostic Résiduels

Les différents tests économétriques post-estimation comprennent les tests de normalité des erreurs, de corrélation sérielle, de multicolinéarité et d'hétéroscédasticité. Tous les tests ont donné des résultats satisfaisants, à l'exception du test de normalité, voir en annexe.

Evolution du Taux de Change Effectif Réel (TCER) et de son Niveau D'équilibre (TCERE)

Figure 53: Evolution du TCER et TCERE



Le TCER global a augmenté (déprécié) de 27,6%, respectivement entre 1996-1997. Il convient de noter que du fait d'une forte hausse des prix des matières premières, notamment le baril du pétrole, la Banque Centrale du Congo a adopté une politique monétaire restrictive, afin de contenir l'inflation importée suite à la dépréciation du taux de change effectif réel, occasionnant une hausse du niveau général des prix. Ctte situation a eu comme effet la détérioration de la compétitivité.

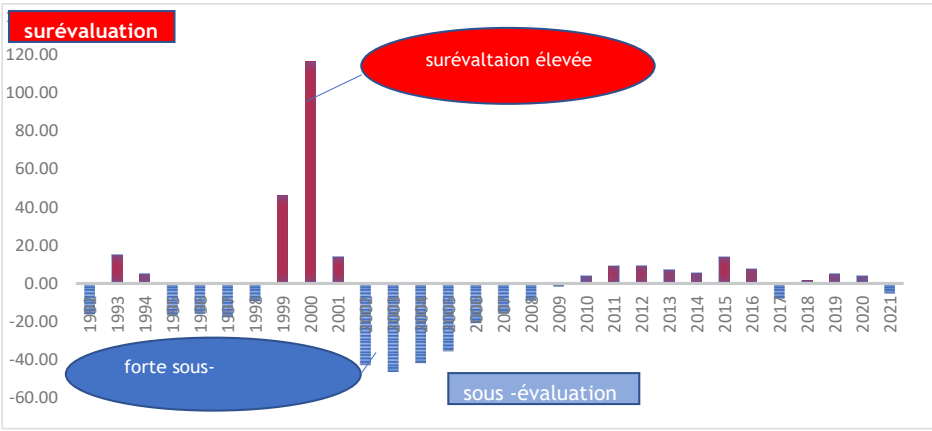
Evolution du Désalignement du Taux de Change Effectif Réel

Le graphique n°3, ci-dessous montre l'évolution du désalignement du TCER au cours de la période 1980-2021, et décèle aisément une sur/ou sous-évaluation du TCER au tour de la valeur d'équilibre. En effet, une année après son lancement officiel, au cours de la période (1999-2001), le franc congolais a connu une le dérapage inflationniste, le déficit du compte courant et une perte de recettes d'exportations liée à une baisse des prix à l'exportation de matières premières. Cette situation a fait naître chez les investisseurs, un comportement pessimisme du développement et a drainé significativement les réserves de change officielles. Pour y remédier, le gouvernement congolais a engagé une série

des réformes monétaire et économique de grande envergure.

Il est intéressant de noter qu'après les périodes de surévaluation du TCER, la politique monétaire restrictive a considérablement diminué la volatilité et le désalignement du TCER, à partir de 2002–2008 (graphique 3)Ce qui a permis une meilleure prévisibilité du taux de change, favorisant un climat économique plus stable pour les investisseurs et les entreprises. En effet, un TCER aligné sur ses fondamentaux économiques contribue à soutenir la compétitivité des exportations et à limiter les pressions inflationnistes importées. Cependant, cette période de stabilité relative a également mis en lumière la nécessité de poursuivre les réformes structurelles pour renforcer la résilience de l'économie congolaise face aux chocs externes, notamment en matière de diversification des exportations et de renforcement des réserves de change.

Figure 54: Evolution du Désalignement du TCER (1980-2021)



Source : Auteur, sur base des données d'estimation

En effet, au cours de l'année la sous période 1999-2001, on note une surévaluation monétaire réelle de 59% et une longue période de sous-évaluation monétaire de -27%, nationale par rapport aux monnaies des principaux partenaires. Cette situation explique l'économie congolaise a connu des courtes périodes de surévaluation très prononcées et de des longues périodes de sous-évaluation moins prononcées, comme indique le graphique n°3.

Cette dynamique reflète les déséquilibres structurels de l'économie congolaise, notamment en termes de productivité et de compétitivité externe. Les courtes périodes de surévaluation monétaire, souvent liées à des afflux de capitaux ou à des chocs positifs sur les prix des matières premières, ont eu un effet négatif sur les exportations, rendant les produits congolais moins compétitifs sur les marchés internationaux. En revanche, les longues périodes de sous-évaluation, bien que favorisant les exportations, n'ont pas permis de stimuler durablement la croissance économique en raison de la dépendance excessive de l'économie aux exportations de matières premières et du manque de diversification productive. Ces fluctuations du TCER illustrent également l'importance de la mise en place de réformes économiques structurelles visant à renforcer la résilience de l'économie face aux chocs externes et à stabiliser la monnaie nationale.

Désalignement du TCER et Orientation de la Politique Monétaire

Au cours de la période d'étude, a montré que les fluctuations du taux de change effectif réel du franc congolais s'expliquent notamment par les fondamentaux économiques, à savoir : la masse monétaire, le solde de la balance courante et la variation des réserves de change. Après la période de crise financière internationale (2008-2009), le taux d'inflation a été maîtrisé et il s'est dégagé un consensus parmi les économistes qu'il y a moyen d'en réduire davantage à long terme le niveau de taux d'inflation, sans éventuellement réduire le taux de croissance de la masse monétaire.

Pour y arriver, la stratégie consisterait à mener une flexibilité dans la conduite de la politique monétaire afin de maintenir une stabilité externe et contenir le taux de change effectif réel proche de son niveau d'équilibre. Pour cela, l'Autorité Monétaire devrait suivre l'évolution du TCER et de son niveau d'équilibre.

Cela impliquerait d'ajuster les instruments de politique monétaire en fonction des écarts observés entre le taux de change effectif réel et son niveau d'équilibre. Une telle approche permettrait de réagir rapidement aux chocs externes, tels que les variations des prix des matières premières ou les fluctuations des flux de capitaux. De plus, la Banque Centrale du Congo devrait renforcer ses réserves de change afin de disposer de marges de manœuvre suffisantes pour intervenir sur le marché des changes en cas de pressions excessives sur la monnaie nationale. Une coordination accrue entre la politique budgétaire et la politique monétaire serait également nécessaire pour éviter des désalignements prolongés du TCER et préserver la compétitivité de l'économie congolaise sur le long terme.

Evaluation du Désalignement

Table 67: Evaluation du Désalignement

Périodes		Logarithme du TCER_ OBSERVE	Logarithme du TCER D'EQUILIBRE	Désalignement	Décisions
1	1991 -1995	5,53	5,28	0,25	sur-évaluation
2	1996 -1997	5,43	5,48	-0,05	sous-évaluation
3	1998 -2001	5,78	5,30	0,48	sur-évaluation
4	2002 -2009	4,53	4,77	-0,24	sous-évaluation
5	2010 -2016	4,70	4,64	0,06	sur-évaluation
6	2017	4,65	4,74	-0,09	sous-évaluation
7	2018 -2020	4,82	4,79	0,03	sur-évaluation
8	2021	4,78	4,83	-0,05	sous-évaluation

Source : calcul de l'auteur

Il ressort de ce tableau que, l'appréciation réelle de la monnaie nationale observée au cours de la période sous étude, particulièrement entre 2010-2016, a contribué de manière substantielle à un niveau faible d'inflation par rapport aux périodes précédentes (1999-2001). De plus, cette appréciation a été largement déterminée par la conduite d'une

politique monétaire restrictive, qui a eu un avantage comparatif dans la maitrise de l'inflation, mais n'a significativement pas contribué à la réduction du déficit de la balance courante.

IV. Conclusion

Cette étude, basée sur l'approche BEER, a démontré l'existence d'une relation d'équilibre de long terme entre le TCER du franc congolais et les fondamentaux économiques, à savoir : (i) la masse monétaire, (ii) les termes de l'échange, (iii) le solde de la balance courante, et (iv) les réserves de change en mois d'importions. L'étude révèle que le recours à la politique de change comme outil de régulation monétaire, devrait être orienté par les fondamentaux influençant le taux de change effectif réel d'équilibre. L'un des résultats-clés de cette étude, est que la plupart d'épisodes de sous-évaluation du taux de change ont été en réponse à des chocs idiosyncratiques découlant à la fois de défis économiques internes et des facteurs systémiques mondiaux, notamment les mesures prises pendant le Covid-19 et celles liées à la guerre Russo-ukrainienne.

Afin de soutenir sa balance de transactions courantes, le Fonds Monétaire International, a accordé un montant de 261, 5 millions de dollars a a la RDC sous formes de Facilité Elargie de Crédit (FEC),Très récemment en 2020. L'observation des sous-évaluations a eu tendance à être abruptes et parfois extrêmes, avec une correction rapide et un passage brutal à la surévaluation, de sorte qu'il n'est pas possible pour les agents économiques de prendre des décisions éclairées sur base de l'évolution du taux de change effectif réel.

En définitive, l'analyse du désalignement permet non seulement de comprendre les causes de ces déviations, mais également d'éviter des fortes fluctuations et d'importants écarts du TCER en RDC. Dans le même ordre d'idées, les épisodes de surévaluation du taux de change ont coïncidé avec de bonnes performances économiques. Le choix du taux de change réel d'équilibre est très important pour l'Autorité Monétaire, parce que s'il n'est pas respecté ou connu, il peut avoir des retombées négatives tant sur l'équilibre interne ou qu'externe de l'économie.

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Annex

Test d'autocorrélation
VEC Residual Serial Correlation LM Tests
Date: 09/30/22 Time: 13:28
Sample: 1980 2021
Included observations: 39

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	Df	Prob.	Rao F-stat	df	Prob.
1	18.75079	25	0.8089	0.723664	(25, 68.4)	0.8149
2	16.97528	25	0.8827	0.647631	(25, 68.4)	0.8867

*Edgeworth expansion corrected likelihood ratio statistic.

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 09/30/22 Time: 13:30
Sample: 1980 2021
Included observations: 39

Component	Skewness	Chi-sq	df	Prob.*
1	0.949784	5.863578	1	0.0155
2	0.351553	0.803331	1	0.3701
3	3.226873	67.68262	1	0.0000
4	-0.612592	2.439247	1	0.1183
5	0.710264	3.279091	1	0.0702
Joint		80.06787	5	0.0000
Component	Kurtosis	Chi-sq	df	Prob.
1	4.812754	5.339874	1	0.0208
2	3.554090	0.498901	1	0.4800
3	16.77947	308.5448	1	0.0000
4	4.731683	4.872932	1	0.0273
5	4.115373	2.021593	1	0.1551
Joint		321.2781	5	0.0000

VEC Residual Heteroskedasticity Tests (Levels and Squares)
Date: 09/30/22 Time: 13:32
Sample: 1980 2021
Included observations: 39

Joint test:

Chi-sq	df	Prob.
307.2732	330	0.8105

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	Title of the Paper	Name of Author
1	Impact of Financial Systems Development on Macroeconomic Stability in Zimbabwe	*Dishoni Limbikani, Kennedy Munyaradzi Kupeta and Tawedzerwa Ngundu*
2	Impact of Financial Systems Development on Macroeconomic Stability in Sudan	*Aida Awad Mohamed, Gibreel Mohamed Siddig and Njem Eldin Mohamed Babiker*
3	Impact of Financial Systems Development on Macroeconomic Stability in Rwanda	*Christian Nyalihama and Callixte Kamanzi*
4	Impact of Financial System Development on Macroeconomic Stability in Kenya	*Irene Rugiri, Camilla Chebet Talam and Samuel Kiemo*
5	Impact of Financial Sector Development on Macroeconomic Stability in Mauritius	*Ashwin Moheeput*
6	Impact of Financial Systems Development on Macroeconomic Stability in Eswatini	*Zana S Mabuza*
8	Marché interbancaire et efficacité de la politique monétaire en RDC	*Kandolo L. Christian*
9	Implications of Fintech on Financial Stability: Evidence from Zambia	*Nason Kapako, Maureen M. Mulenga, Abraham Alutul, Wise Banda and Mulenga Chonzi Mulenga*
10	Equilibrium Real Effective Exchange Rate and Monetary Policy Implementation in Zambia	*Francis Z. Mbao, Kafula W. Longa, Liuwa Liuwa and Patrick B. Mulenga*
11	Real Effective Exchange Rate Misalignment and Monetary Policy in Developing Countries: The Case of Uganda	*Suleiman Nyanzi and Lorna Katusiime*
12	Equilibrium Real Effective Exchange Rate and Monetary Policy Implementation in Rwanda	*Emmanuel Ngarambe Bahati and Wilberforce Nuwagira*
13	Taux de change effectif réel d'équilibre et mise en œuvre de la politique monétaire en RD Congo	*Nsunda Ngindu Jules*

General Index

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