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Impact of Financial Systems Development on Macroeconomic Stability in Rwanda

Bу

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Abstract

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 are 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 of financial system development on inflation and the exchange rate.

Key words: Macroeconomic stability, financial systems development, Rwanda, JEL Classification: E30, G00, O40

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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 developmentmacroeconomic 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 preious work in atleast 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 the 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

2.1 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 1). 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 subsectors; 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.

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).

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	

Table 1: The Structure of the Financial System

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 2).

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

 Table 2: Distribution of NAL by Economic Sector in % Share

Source: National Bank of Rwanda, 2019

2.2 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 constituted 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 3).

	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

Table 3: Evolution of Total Assets, Loans and Deposits of Banks (in FRW billion)

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 1: 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. 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 2: 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 3 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 3: Evolution of the Lerner Index



Source: 'Authors' computation using data from NBR

2.3 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 of 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 4). 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.

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

Table 4: MFIs Performance Indicators

Source: National Bank of Rwanda, 2019

2.4 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 5).

Table 5: 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

2.5 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 4 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 4: Indicators of the Financial System Development and GDP

Source: National Bank of Rwanda, and IMF, 2019



Figure 5: Indicators of the Financial System Development and Consumption and Investment

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.

Source: National Bank of Rwanda, and IMF, 2019



Figure 6: 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. The 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 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

4.1 Justification

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:

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

Where $\theta_{i,h}$ is the estimate of the impulse response of Y_i at horizon h to a shock ε_{1t} . X is the vector of control variables, which include lags of Y_i 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.

4.2 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.

The figures 7 and 8 below depict the two main indicators of financial development, . In figure 8, 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 7: Evolution of credit to GDP ratio

Source: National Bank of Rwanda, 2019



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, DabraNorris 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 9 and 10 below, volatility in real GDP has not changed much over time, despite sustained 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 9: Evolution of volatility (standard deviation) in key macroeconomic variables

Source: National Bank of Rwanda, 2019



Figure 10: Evolution of volatility (coefficient of variation) in key macroeconomic variables

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 quarterly. It is included as another indicator of business cycles, used to identify the shock to our variable of

Source: National Bank of Rwanda, 2019

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.

4.3 Identification Strategy

Local projection 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.

5.1 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 11 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 12, as financial development is associated with lower volatility in per capita GDP.





Source: 'Authors' estimation

5.2 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.





5.3 Effect on Investment Growth Stability

Consitent with the literature, the impulse responses in figure 14 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 14: Effect on investment growth volatility (measured by standard deviation)

Source: 'Authors' estimation

5.4 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.





5.5 **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 16.

Figure 16: 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.

Source: 'Authors' estimation

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 development. 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 further indicate 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 also point out to stabilizing effect from financial system development. This results is critical considering the importance of investment in promoting sustainable economic growth and also considering how stability in macroeconomic indicators are crucial to investment climate and sustainable economic growth.

As policy implications, 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 a room for development. In addition, it is also important that the central bank continue to ensure the stability and soundness of financial system as well as macroeconomic stability in order to foster a favorable environment for financial systems development.

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Source: National Bank of Rwanda, 2019, authors calculation¹

¹ 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.

Annex 2:	Unit	Root	Test	Results
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		ADF test	
	ADF test level	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