BNR Economic Review 19(1): 18-39, 2022.

Impact of financial systems development on macroeconomic stability in Rwanda

Christian Nyalihama* Callixte Kamanzi†

May, 2022

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 examines this issue in Rwanda to contribute to policymaking in devising appropriate policies for sustaining macroeconomic stability and promoting financial systems development. 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. Results from local projection methods generally suggest that financial system development has contributed to macroeconomic stability, notably on real GDP growth via investment, while the effect on consumption is quasi absent.

JEL Classification Numbers:E30, G00, O40

Keywords: Macroeconomic stability, financial systems development, Rwanda.

*Senior Principal Economist, Research Department, National Bank of Rwanda
†Senior Economist, Research Department, National Bank of Rwanda

1 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; Demirguc-Kunt & Levine, 2011; 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 on 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 to 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 to macroeconomic stability (Aghion et al., 2005; Arcand et al., 2015; Dabla-Norris & Srivisal, 2013).

Against this backdrop, there are reasons that justify the need for sufficient studies on this matter globally for at least three reasons. First, the issue of macroeconomic stability is profoundly important for policymakers 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 development reforms geared towards financial systems, typically 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. Alongside, Rwanda's economic performance has 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 financial depth, 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 give enough reasons to investigate this matter for each economy like Rwanda, which enjoys significant positive changes in both aspects.

Previous studies (Kigabo et al., 2015; Karangwa & Gichondo, 2016; Nyalihama & Kamanzi, 2019) assessed the relationship between Rwanda's financial development and economic performance. Their findings suggest a positive effect of credit to the private sector on economic growth and suggest bi-directional causal-

ity 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 is still lacking in Rwanda. Thus, our main contribution is to address the link between financial system development and macroeconomic stability in Rwanda. Another contribution of this study is using a new financial development index developed by the International Monetary Fund (IMF) that captures this aspect in various dimensions: depth, access, and efficiency of the financial system (i.e., both financial institutions and financial markets).

Moreover, the study captures not only economic growth volatility as a measure of macroeconomic (in)stability but also 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.

This study sheds light on the impact of financial systems development on macroeconomic stability in Rwanda and aims to contribute to policymaking going forward in devising appropriate policies to sustain strong macroeconomic stability and promote financial systems development. It aims to assess whether financial system development contributed to Rwanda's macroeconomic stability and identify potential channels through which this may have happened.

Empirical results are largely in line with the literature. For the case of Rwanda, evidence from the local projection method suggests 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.

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

2 Financial system development in Rwanda

The Rwandan financial system has tremendously grown over the past two decades, thanks 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 regulates 603 institutions, including 16 banks, 14 insurance companies; 459 microfinance institutions; 13 pension schemes, 97 foreign currency dealers and remittance companies, and four registered lending-only institutions. 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 (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 financial sector is becoming 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, 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) were 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 1: 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 level of financial sector development and deepening has also 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, rising 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 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: 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

2.1 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, a 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 has been increasing over time, reaching 16 as of June 2020, of which 11 commercial banks, three microfinance banks, one development bank, and one cooperative bank, from one commercial bank in 1964. 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 in the same period.

Table 3: Evolution of total assets, loans, and deposits of banks (in FRW billion)

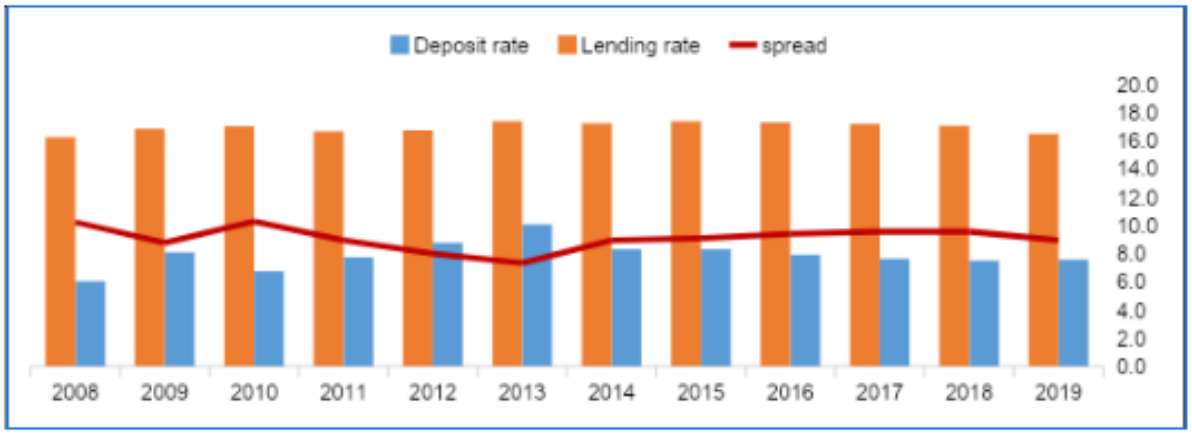
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Assets	879	1,084	1,248	1,511	1,803	2,133	2,380	2,685	3,091	3,476
Total loans	456	583	775	881	1,051	1,269	1,457	1,646	1,871	2,084
Total Deposits	536	651	741	866	1,042	1,418	1,530	1,723	1,965	2,184

Source:National Bank of Rwanda, 2019

Financial intermediation remains the core business of banks, with 56.7 percent of their assets being 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), due 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.

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 regard to banks' efficiency. The main reason attributed to lending rates that have been rigid and quite high over the past compared to the fluctuating and less elevated deposit rates. However, the most recent developments indicate the 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.

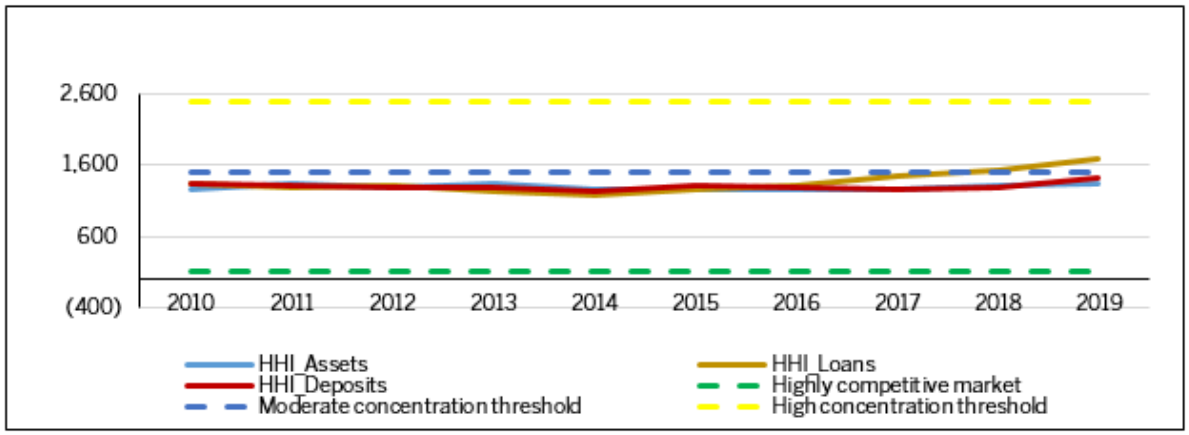
Figure 1: Annual average interest rate spread in Rwanda (2008-2019)



Source:National Bank of Rwanda, 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 loan market has become concentrated since 2018, indicating the increase in the loan market power of some banks.

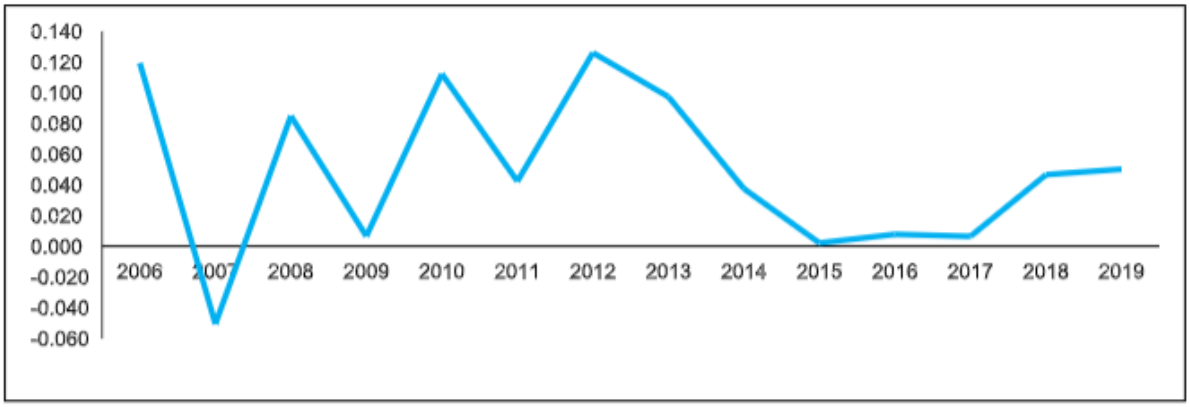
Figure 2: Evolution of HHI on banks assets, loans, and deposits



Source:Authors' computation using data from NBR

The most used indicator of competition is the Lerner index (or price-cost margin). The figure below 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 Lerner index



Source:Authors' computation using data from NBR

2.2 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 consists 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 SACCOs accounts for saving or borrowing from 2.0 million in 2016.

Because the microfinance sector largely serves the rural population, more than 70 percent of which 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 by 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 320,7billion. 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 4: 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

2.3 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 was established before establishing the Capital Market Authority (henceforth, CMA). The council's mission was to develop the capital market in Rwanda, facilitate the trading of debt and equity securities, enable securities transactions, and perform regulatory functions over the Rwanda Stock Exchange (henceforth, RSE). From then to now, 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 Rwanda's Gross Domestic Product. Despite the good performance, RSE is still nascent with limited transactions, which favors the banking sector to remain 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. The terms on which a Government can sell bonds depend on how creditworthy is rated by the market. In Rwanda, bonds are issued on a quarterly basis for the maturity periods of 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: 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

3 Literature review

Literature on the relationship between financial systems development and macroeconomic stability has been growing, though empirical studies are scanty in developing markets. The theoretical literature outlines various ways for financial development to affect macroeconomic stability.

On the 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 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 be important in transmitting real sector shocks via the credit channel. Particularly, 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 pieces of evidence s that financial development leads to macroeconomic stability in most cases. Using 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 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 panel data from 22 OECD countries from 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 is associated with lower volatility. Besides, they suggest that this relationship is nonlinear. Their point estimates indicate that output volatility starts rising when credit to the private sector reaches 100 percent of GDP. With a similar methodology but different controls and aggregation periods, Denizer et al. (2000) 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 as a significant determinant of macroeconomic volatility. A study by Ibrahim & Alagidede (2018) on 29 sub-Saharan African countries from 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 excess 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 the growth and reduced its volatility by facilitating other economic policies to enhance and stabilize 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 to effectively manage the risks in financial development.

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 (Dabla-Norris & Srivisal, 2013; Ibrahim & Alagidede, 2017; Easterly et al., 2000; Denizer et al., 2000; Fidrmuc & Scharler, 2013) used different methods and different measures of financial development and different sample period can be one of the reasons behind the diverging conclusion. Our study aims at contributing to the assessment of this issue using different methods and a set of variables.

4 Methodology

4.1 Justification

Empirical analysis with macroeconomic variables always faces 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. One of the most used is the structural VAR (SVAR) framework.

While the SVAR has proven to be a valuable tool, especially in the analysis of dynamics of macroeconomic variables after a shock, some concerns were raised with regards to the reliability of impulse response functions at distant time horizons when the estimated VAR does not necessarily represent the true data generating process (Ramey, 2016), and when the sample period is relatively short.

One of the alternative methods, especially in recent studies on credit cycles, has been the local projection methods pioneered by (Jorda, 2005). The advantages 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 mostly two reasons. First, it addresses the recurrent issue of a short sample period, which may limit degrees of freedom, especially in a multivariate model. Second, our empirical strategy gives us other advantages if the VAR would not fully capture the data generating process and offers the flexibility to identify shocks within the VAR framework and compare impulse response functions from local projection and VAR.

Even though Plagborg-Møller & Wolf (2020) argued that the local projection method and VARs are not conceptually different, and their impulse responses are similar at short term horizons. They also highlighted that at finite lag lengths, the two approaches could yield different dynamics in impulse response at long horizons. Besides, the local projection method offers the advantage due to its flexibility and possibility of comparison with VAR impulse responses.

Several studies on macro-financial linkages, especially on credit and housing cycles, and their macroeconomic implications, have also used the local projection methods with additional features. (e.g. Mian, Sufi, & Verner, 2017; Jorda, Schularick, & Taylor, 2013) According to Ramey (2016), the impulse response from Jorda's local projection methods can be estimated from the following regression:

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

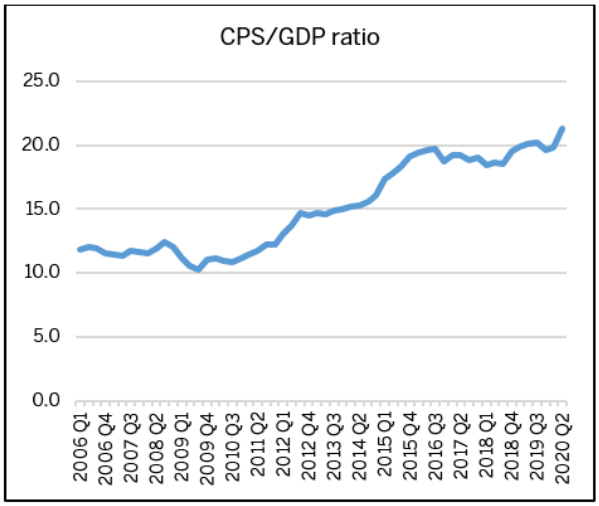
Where $\theta_{i,h}$ is the estimate of the impulse response of Yi at horizon h to a shock ε_{1t} . X is the vector of control variables, which include lags of Yi and lags of other variables. As in this method, a separate regression for each horizon is estimated; the control variables do not necessarily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

4.2 Data justification and description

This section describes the variables used for the Rwanda case. The main variables of interest are indicators of financial system development and macroeconomic stability. Starting with financial system development, this is a broad concept involving many aspects, including how the financial system channels funds to the economy, mobilizes resources, manages risks, and issues of efficient and inclusive intermediation. 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.

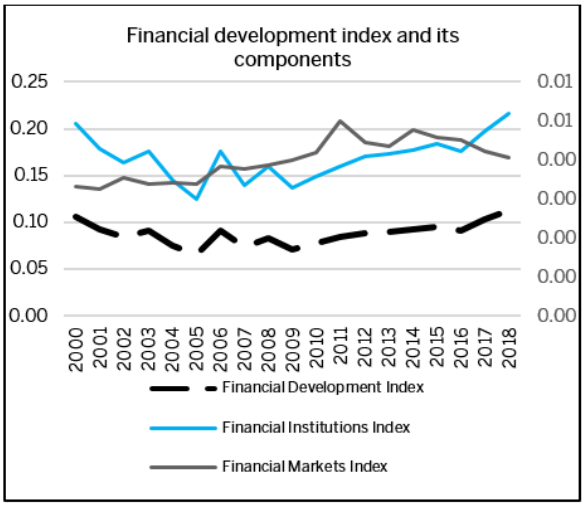
Alternatively, we use the financial development index recently developed by the IMF. This index considers various aspects of financial development, including financial institutions' access, depth, and efficiency, and financial market access, depth, and efficiency. The country index is derived using the principal component analysis. This indicator provides more insights into Rwanda'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 4 and 5 below depict the two main indicators of financial development, especially 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 4: Evolution of credit to GDP ratio



Source: National Bank of Rwanda, 2019

Figure 5: Financial development index



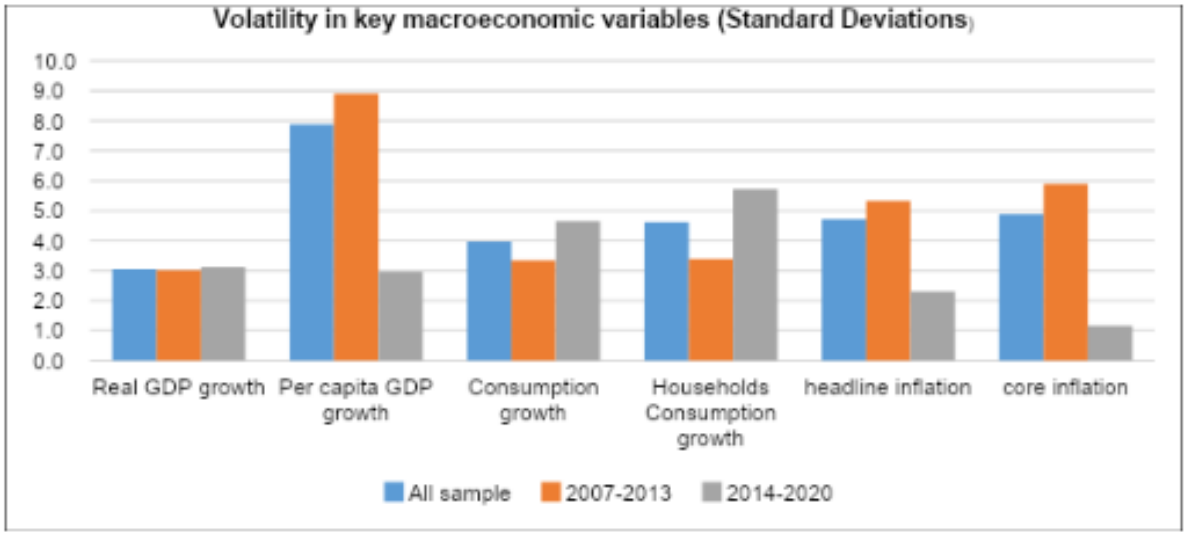
Source: Authors, using IMF data

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 and exchange rates, indicating the external balance. A number of studies reviewed considered only GDP or GDP per capita (Dabra-Norris and Srivisal, 2013). Nevertheless, in Rwanda, 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, especially 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.

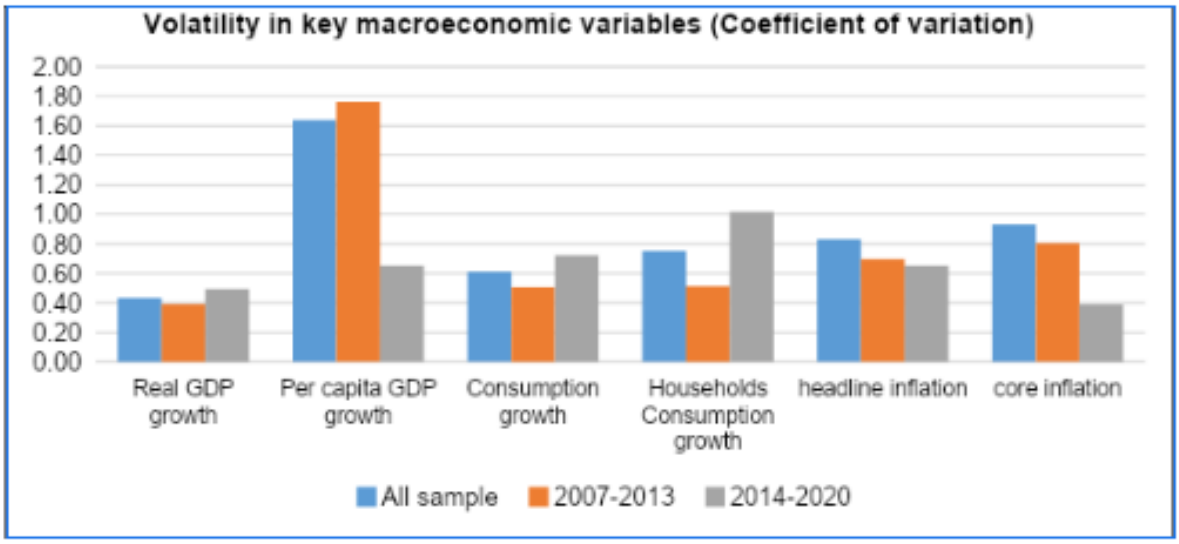
As illustrated in figure 6 and 7 below, volatility in real GDP has not changed much over time, despite sustained good economic performance. This is primarily due to recurrent episodes of adverse shocks in the agriculture sector, notably from weather conditions. On inflation, noticeable improvements are evident in line with the modernization of monetary policy, which contributed to inflation stabilization over time.

Figure 6: Evolution of volatility (standard deviation) in key macroeconomic variables



Source:National Bank of Rwanda, 2019

Figure 7: 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 and helped 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 usually can affect macroeconomic stability. It is the weighted average of the real effective exchange rate and real interest rate.

4.3 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 a monetary policy where output and inflation are ordered ahead of the monetary policy indicator.

5 Empirical results

5.1 Unit root test

Table 5 below summarizes results from stationarity tests; for variables integrated of order one, we used their difference to ensure the stability of the systems.

Table 6: Stationarity tests

	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

5.2 Estimation 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 the 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 projections are in green, while the ones of VAR are in blue. The confidence bands are for VAR impulse responses.

5.2.1 Effect on output stability

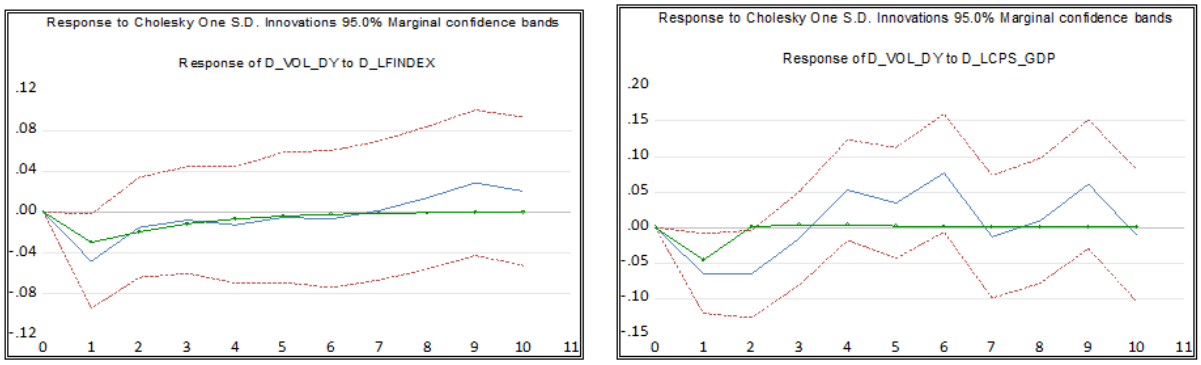
As explained in the methodology, we use standard deviation in selected macroeconomic variables as a proxy of macroeconomic stability. However, it is well known that these instead capture variables volatility. Nevertheless, consistent with other studies, the decline in standard deviation would subsequently indicate an

improvement in stability.

Regarding output, evidence suggests that financial development has contributed to dampening the output volatility in Rwanda when we use the financial development index as an indicator. Impulse responses in figure 8 are on the negative side, indicating that financial development leads to lower output growth volatility. However, using the credit to the private sector to GDP, evidence rather suggests that dampening effects are only short-lived and do not last beyond the first quarter.

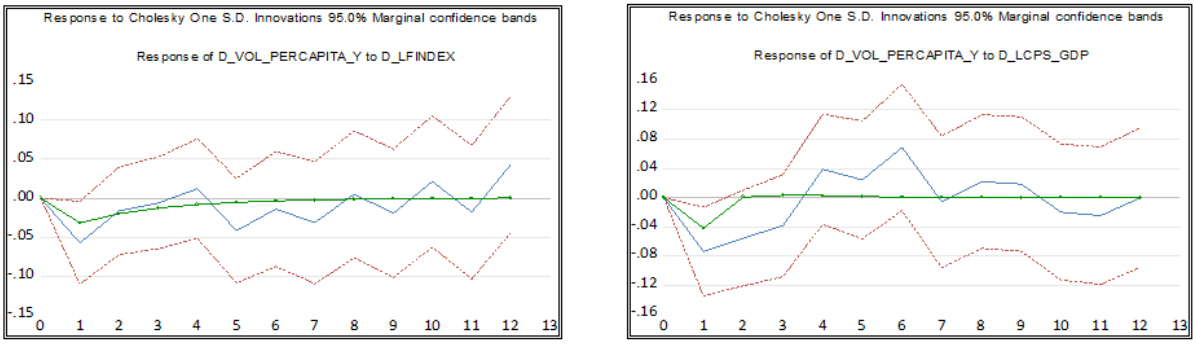
Considering per capita GDP as an alternative indicator of macro stability, the results are almost similar, as shown in figure 9, as financial development is associated with lower volatility in per capita GDP.

Figure 8: Effect on growth volatility (measured by standard deviation)



Source:Authors' estimation

Figure 9: Effect on per capita GDP volatility (measured by standard deviation)



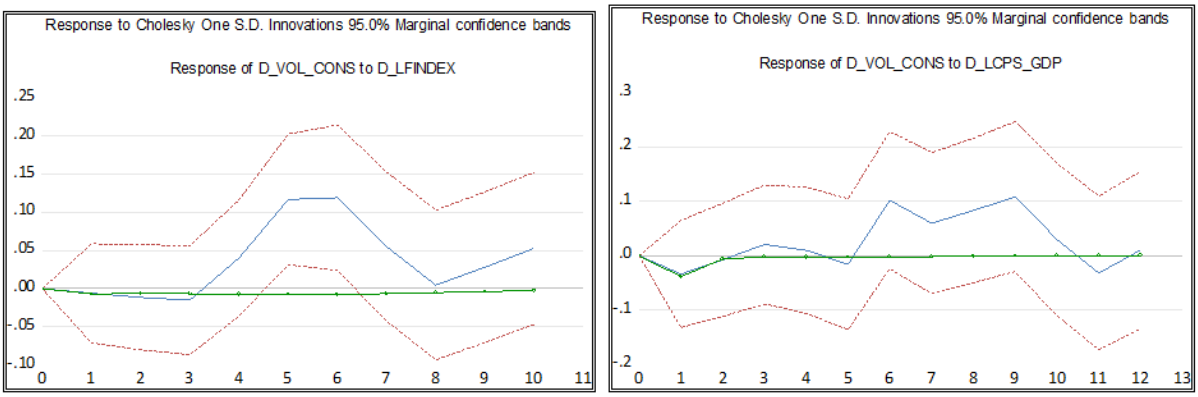
Source:Authors' estimation

5.2.2 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. Actually, consumption is measured as residual after subtracting Government expenditures and net exports from total GDP compiled from the production side.

Figure 10: Effect on consumption growth volatility (measured by standard deviation)

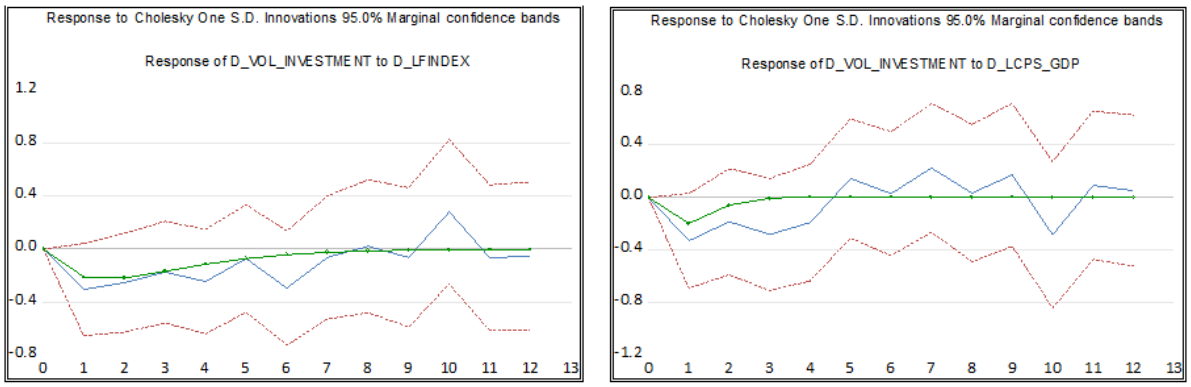


Source:Authors' estimation

5.2.3 Effect on investment growth stability

Regarding investment, the impulse responses in figure 11 suggest that financial development has contributed to stability in investment, which is in line with the literature. The effect is more significant when financial development is proxied by the financial development index. Obviously, investment is the main channel via which financial development has contributed to output stability in Rwanda.

Figure 11: Effect on investment growth volatility (measured by standard deviation)

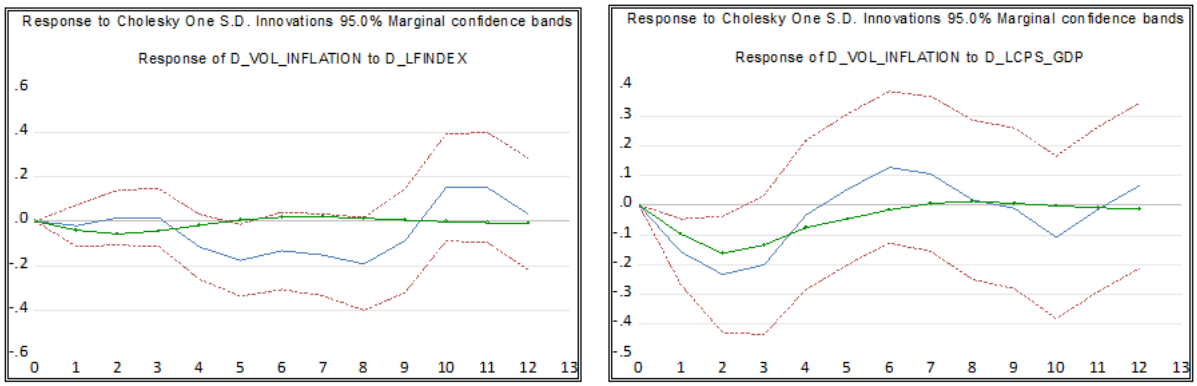


Source:Authors' estimation

5.2.4 Effect on inflation stability

About inflation. Evidence is rather mixed. On one side, using the index, the effect of financial development is quasi absent. Nevertheless, using the credit to GDP ratio, Impulse responses indicate that financial system development has had a stabilizing effect on inflation.

Figure 12: Effect on inflation volatility (measured by standard deviation)

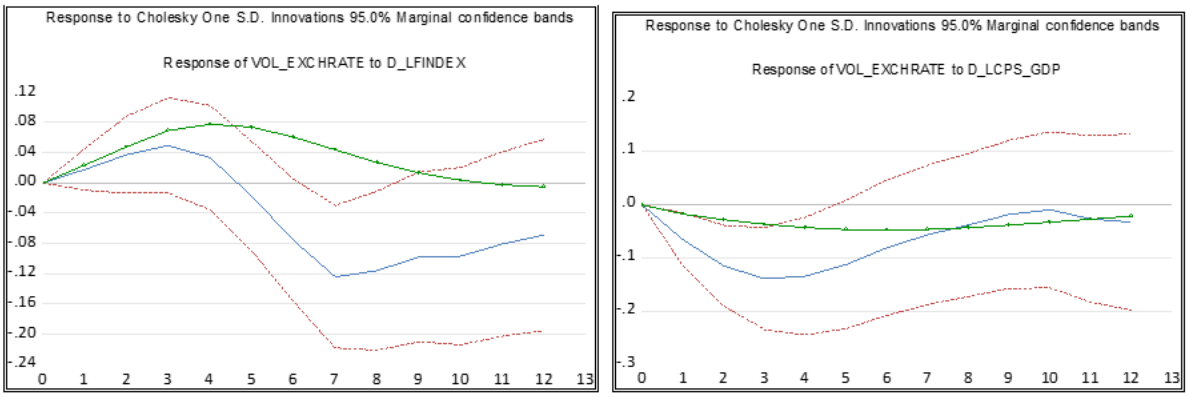


Source:Authors' estimation

5.2.5 Effect on exchange rate stability

We use the standard deviation in the year-on-year percentage change in the FRW exchange rate against the US dollar. Contrary to the case of GDP growth and inflation, evidence suggests that financial system development has led to more exchange rate volatility, notably when financial development is proxied by the index. Nevertheless, when the credit measures financial development to GDP ratio, impulse responses rather depict some stabilizing effect, as shown in figure 13. Thus, similar to inflation, the evidences are also mixed.

Figure 13: Effect on the volatility of exchange rate depreciation (measured by standard deviation)



Source:Authors' estimation

In summary, despite some contradictions due to different measures used to proxy on one side, financial development and on the other side macroeconomic stability, we can conclude that the positive effect of financial development is obvious on macroeconomic stability via its dampening effect on volatility in economic growth, especially via its effect on smoothing out investment volatility. This is noteworthy evidence considering the importance of investment in promoting sustainable economic growth.

The positive effect is not that evident for the remaining macroeconomic variables considered in this study. 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. Lastly, as explained in previous sections, the issue with consumption is mostly with its measurement in national account compilation.

6 Conclusion and policy implications

This study aims 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 due to financial sector development, 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 give enough reasons to investigate this matter for each economy like Rwanda, which enjoys significant positive changes in both aspects.

Our analysis purposefully uses the local projection method with quarterly data. We opt for the ratio of credit to the private sector from the banking system to GDP as the dominant and best proxy available for financial development and alternatively use the recent financial development index developed by the IMF. As generally recognized as indicators for macroeconomic stability, we use the real GDP growth, real GDP per capita growth, and inflation rate, which depict the internal balance, and exchange rate, which indicates the external balance. The stability of macroeconomic variables was proxied by the standard deviation in those variables listed above.

The results generally indicate that financial development had contributed to stabilizing output in Rwanda using the financial development index as a proxy, but the stabilizing effect is short-lived and mild when the financial development is captured by the ratio of credit to the private sector to GDP. The same analysis reveals no evidence that financial development has a stabilizing effect on consumption. The results on consumption may result from some imperfections in how consumption is measured as residual in Rwanda's national account compilation. The evidence on investment is somehow encouraging as they 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 financial development index.

Regarding inflation and exchange rate depreciation, evidences are rather mixed. There are some insights of stabilizing effects from financial development on inflation contrary to exchange rate. As previously explained, this may be due to the fact that inflation and exchange rate are prone to exogenous shocks such as food supply and foreign inflows shocks.

In summary, despite some mixed results due to different measures used to proxy financial development and macroeconomic stability, we can conclude that the positive effect of financial development is evident in dampening instability in economic growth, especially via its effect on smoothing out investment volatility in Rwanda. This is noteworthy evidence considering the importance of investment in promoting sustainable economic growth.

References

Acemoglu, D. & Zilibotti, F., 1997. Was Prometheus Unbound by Chance? Risk, Diversification, and Growth. Journal of Political Economy, 105(4), pp. 709-751.

AFR, 2020. Finscope survey 2020 report, Kigali: Access to Finance Rwanda.

Aghion, P., Banerjee, A. & Piketty, T., 1999. Dualism and Macroeconomic Volatility. Quarterly Journal of Economics, 114(4), pp. 1359-1397.

Aghion, P., Howitt, P. & Mayer-Foulkes, D., 2005. The Effect of Financial Development on Convergence: Theory and Evidence. Quarterly Journal of Economics, 120(1), pp. 173-222.

Arcand, J., Berkes, E. & Panizza, U., 2015. Too Much Finance?, Washington DC: International Monetary Fund.

Beck, T., 2013. Finance for development: A research agenda, London: Economic and Social Research Council.

Bernanke, B. S., Gertler, M. & Gilchrist, S., 1999. The financial accelerator in a quantitative business cycle framework. In: J. B. a. W. M. Taylor, ed. Handbook of Macroeconomics. Amsterdam: Elsevier, p. 1341–93.

Caballero, R. J. & Krishnamurty, A., 2001. International and Domestic Collateral Constraints in a Model of Emerging Markets Crisis. Journal of Monetary Economics, 48(3), p. 513–48.

Cecchetti, S.& Kharroubi, E., 2012. Reassessing the impact of finance on growth, Basel: BIS Working Papers 381, Bank for International Settlements.

Dabla-Norris, E. & Srivisal, N., 2013. Revisiting the Link between Finance and Macroeconomic Volatility, Washington DC: IMF Working Paper /13/ 29.

Demirguc-Kunt, A., 2006. Finance and Economic Development: Policy Choices for Developing Countries, Washington DC: World Bank Policy Research Working Paper No. 3955.

Demirguc-Kunt, A. & Levine, R., 2008. Finance, financial sector policies, and long-run growth, Washington DC: World Bank Policy Research working paper series.

Denizer, C. A., Iyigun, M. F. & Owen, A. L., 2000. Finance and macroeconomic volatility, Washington DC: Policy Research Working Paper Series 2487, The World Bank.

Denizer, C., F.Iyigun, M. & Owen, A. L., 2002. Finance and macroeconomic volatility. Journal of Macroeconomics, 2(1), pp. 1-32.

Easterly, W., Islam, R. & Stiglitz, J., 2000. Shaken and Stirred: Explaining Growth Volatility, Washington DC: Annual World Bank Conference on Development Economics.

Fidrmuc, J. & Scharler, J., 2013. Financial development and the magnitude of business cycle fluctuations in OECD countries. Applied Economics Letters, 20(6), pp. 530- 533.

Greenwald, B. & Stiglitz, J., 1991. Financial Market Imperfections and Business Cycles. Quarterly Journal of Economics, 108(1), pp. 77-114.

Hahn, F. R., 2003. Financial Development and Macroeconomic Volatility. Evidence from OECD Countries, Vienna: WIFO Working Papers, No. 198, Austrian Institute of Economic Research (WIFO).

Ibrahim, M. & Alagidede, P., 2018. Effect of Financial Development on Economic Growth in sub–Saharan Africa: Does Sectoral Growth Matter? s.l.: Economic Research Southern Africa.

Islam, R., 2016. Financial Systems, Growth, and Volatility: Searching for the Perfect Fit, Washington DC: World Bank Policy Research Working Paper No. 7723.

Jorda, O., 2005. Estimation and Inference of Impulse Responses by Local Projections. American Economic Review, 95(1), p. 161–182.

Karangwa, M. & Gichondo, A., 2016. An assessment of the impact of the sectoral distribution of commercial bank credit on economic growth in Rwanda. BNR Economic Review, Volume 8, pp. 55-87.

Kigabo, T., Okello, J. & Mutuyimana, J. P., 2015. Financial development, monetary policy, and economic growth in Rwanda. BNR Economic Review, 7(2), pp. 79-100.

Levine, R., 1997. Financial Development and Economic Growth: Views and Agenda. Journal of Economic Literature, 35(2), pp. 688-726.

Levine, R., Loayza, N. V. & Beck, T., 2000. Financial intermediation and growth: Causality and causes. Journal of Monetary Economics, 46(1), pp. 31-77.

Mlachila, M. et al., 2016. Financial Development in Sub-Saharan Africa – Promoting Inclusive and Sustainable Growth, s.l.: International Monetary Fund, African Department.

NBR, 2017. Financial Stability Report, Kigali: National Bank of Rwanda.

Nyalihama, C. & Kamanzi, C., 2019. Financial sector development and impact on economic growth in Rwanda. BNR Economic Review, Volume 15, pp. 9-63.

Plagborg-Møller, M. & Wolf, C. K., 2020. Local Projections and VARs Estimate the Same Impulse Responses, New Jersey: Princeton University.

Ramey, G. & Ramey, V., 1995. Cross-country Evidence on the Link between Volatility and Growth. American Economic Review, Volume 85, pp. 1138-1151.

Ramey, V. A., 2016. Macroeconomic Shocks and Their Propagation. In: J. B. T. &. H. Uhlig, ed. Handbook of Macroeconomics. s.l.:Elsevier, p. 71–162.

Sahay, R. et al., 2015. Rethinking Financial Deepening: Stability and Growth in Emerging Markets., Washington.: IMF Staff Discussion Note 15/08, International Monetary Fund.

Smaghi, L. B., 2010. Has the financial sector grown too big? Frankfurt: European Central Bank, Nomura Seminar, The paradigm shift after the financial crisis.

Zhang, J., Wang, L. & Wang, S., 2012. Financial development and economic growth: Recent evidence from China. Journal of Comparative Economics, 40(3), pp. 393-412.