Determinants of Bank Credit on the Private Sector in Rwanda

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ABSTRACT: It is widely accepted among economists, policy makers and central bankers that the main objective of macroeconomic policy is to achieve a high and sustained economic growth rate while maintaining a low inflation rate. It is also generally believed that high inflation is detrimental to medium and long-run economic growth. This study thus aims at bridging these gaps in literature by examining empirically the determinants of credit to the private sector based on supply and demand factors over the period 2006Q1-2019Q4 by using ARDL model. This study is to investigate the determinants of CPS using the Autoregressive Distributed Lags model due to its several advantages. Both the demand and supply factors influencing bank credit in a single equation over a longer time period. Finding from the autoregressive distributed lag (ARDL) framework reveal that in the long run, banking deposits constitute the major determinants of CPS. A 1 percent increase in banking deposits will result into a 1.3% increase in CPS. Government domestic borrowing has been significant with expected sign but with a low coefficient. If GCCB increase by1%, CPS declined by 0.08% in the long run. This low coefficient may be explained by a low share of government domestic borrowing in total bank assets (8.4%). The study also revealed that, Non-performing loans ratio has been found insignificant in the long run over the period under review. Interest rate spread also explained CPS changes with a low coefficient in the long run. When IS increases by 1 percent CPS declined by 0.02%. The low coefficient of interest rate spread is basically explained by credit constrained borrowers, lack of financial literacy, credit information asymmetry, low bank competition which results into the rigidity in lending rate and maintain the spread relatively high in Rwanda.

KEY WORDS: Determinants, Bank Credit, Private Sector, Rwanda

1. INTRODUCTION

The 2008/2009 global financial crisis has renewed researchers' interest on the causes of banking crises given the devastating effects they have on the entire economy. Given that credit risk is the major risk that banks face, several studies have investigated the causes of credit risk in the banking sec-tor. In the relevant literature, credit risk is usually proxied by non-performing loans (NPLs) which are loans and advances overdue by 90 days or more from the due date. As Reinhart and Rogoff (2011) claim, NPLs are considered as a major source of bank failures and can mark the beginning of a banking cri-sis. Most of the studies on credit risk determinants focus on advanced economies and emerging markets probably because of data availability while there is limited number of empirical studies on the issue for Sub-Saharan African (SSA) economies.

Despite a general awareness on the factors that determine the bank credit to the private sector, there are limited empirical studies provided in the literature for Rwanda. Nevertheless, from our knowledge, only two studies have been conducted, the study conducted by Abuka and Egesa (2007), focusing on the demand side factors that determine credit to the private sector credit in the East Africa community countries (Rwanda, Burundi, Kenya, Uganda and Tanzania). Karangwa and Gichondo (2016) also conducted an empirical study by assessing the impact of the sectoral distribution of commercial bank credit on the Rwandan economy, focusing on the direction of causality between credit to the private sector and gross domestic product, and the impact of sectorial private sector credit on sectorial GDP.

However, there is no specific empirical study on the determinants of private sector credit by considering the demand and supply side factors for Rwanda. This study comes to fill the gap in this area by deeply identifying variables that may influence credit to the private sector growth in Rwanda. In this regard, the study complements additional supply side factors that were not considered by Abuka and Egesa (2007) for EAC such as banking deposits, non-performing loans ratio and real effective exchange rate. This

would be a valuable input to our empirical study in the context of financial sector stability in Rwanda, given National Bank of Rwanda's (NBR) mandate of maintaining a stable and sound financial system.

Many researchers have carried out different studies on determinants of credit to the private sector considering demand and supply side factors for country-specific and regional countries. Some combined the demand and supply factors in one model, while others showed the determinants of credit to the private sector on supply side and demand side in different models. The demand side factors comprise all factors that can push economic agents (households and corporate) to demand for loans, while supply side factors consider variables influencing the capacity of banks to grant credit. However, according to Mitchell (1994), modelling and estimation techniques of the determinants of credit to the private sector are complicated, owing to difficulties in separating demand-side from supply-side effects.

Macroeconomists and financial experts have focused on the determinants of bank credit, with more attention on the demand side analysis. However, few existing studies on the supply side determinants of bank credit are reported with inconsistent results, though they emphasized the role of economic growth (Adabowale and Olobanji, 2018). On this note, Abuka and Egesa (2007), Chebet and Muriu (2016), Boris (2001), Alessandra et al. (2001), Adabowale and Olobanji (2018), Mukuku (2018), Mohammed (2014), and Mbulawa (2015) identified the factors that affect credit growth based on demand-side approach. With regard to studies focusing on supply side factors, Million (2014), Kashif and Mohammad (2012), and Kai and Vahram (2011), examined the determinants of growth of the bank credit to private sector based on supply-side approach.

Private sector credit is very crucial for the private investment that supports economic development. To improve efficient delivery of services by the nascent (emerging) private sector, the latter needs to be adequately financed, where good monetary conditions and active banking sector are among the preconditions to enhance more credit.

The financing of projects can be either domestic or external. Domestic sources of finance are funds found inside the business, such as accumulated profits, which can be used to finance economic activities. External financing are mainly composed of funds from international market like foreign banks' and domestic banks' loans. By financing investments, banks play a crucial role in increasing employment, productivity and inducing growth of an economy. Banking financing is directed to governments, households and firms for a short, medium or long- term period with the objective of profitability, liquidity and solvency (Olokoyo, 2011). Commercial banks, however, mobilize funds from surplus economic units (savers) in form of deposits and channel them to the deficit economic units (ultimate borrowers) in form of credit.

In developed economies and some emerging market economies, the ratio of the private sector credit to GDP is very high (above 100 percent for some countries like Netherlands: 190.9 percent and China: 215.2 percent), while in developing countries this ratio is below 15 percent. In Rwanda where the stock market is not well developed, banking sector dominates the financial system with a share of 67 percent of the total assets, on average for the last fourteen years. The outstanding credit to the private sector as percentage of GDP is still very low standing at 15.7 percent compared with 19.2 percent for sub-Saharan Africa excluding South Africa and Nigeria.

Given the importance of financing the nascent private sector for boosting economic development, we found it relevant to conduct an empirical study on the determinants of bank credit to the private sector in Rwanda responding to the following two research questions:
(i) What are the major drivers of private sector financing in Rwanda?
(ii) What variables could we rely on when there is a need to boost credit to the private sector especially after its slowdown? On the basis of the study findings, the study suggests policy recommendations for policy makers to design appropriate policies for the private sector financing as an engine for economic growth.

The rest of the paper is structured as follows: Section two gives an overview of the literature and findings of other researchers on the subject matter. Section three describes the nature and the past behavior of credit to the private sector in Rwanda. The fourth section explains the methodological approach and data used in the study. Section five covers the estimation, analysis and discusses results. Finally, the study concludes and highlights some relevant policy recommendations as well as areas for further research.

2. LITERATURE REVIEW

There is a considerable body of empirical studies on credit to the private sector, and these adopt a variety of approaches when examining the determinants of credit to the private sector. The empirical studies reviewed have presented different results, where difference in findings depend on country's economy, period of study, methods employed as well as factors and indicators considered in the study.

In their empirical studies, Balaze et al. (2006), Claudiv (2009), Gerti and Irini (2013), Senei and Moeti (2017), Gideon et al. (2017), and Nampewo et al. (2016), combined the demand and supply side factors that determine credit to the private sector in one model. In this respect, Balaze et al. (2006) examined the determinants of the domestic bank credit to private sector as a percentage of GDP in the eleven Central Eastern European (CEE) countries. They used three alternative techniques for estimation: fixed-effect ordinary least squares; panel dynamic ordinary least squares and the mean group estimator. Their findings reveal a negative relationship between the private credit to GDP ratio (dependent variable) with bank credit to the public sector, lending rate, inflation and spread between lending and deposit rates as proxy for financial liberalization. The study suggest the usage of interest rate spread instead of interest rates as an important indicator, since the difference between lending and deposit rates reflects the profitability of the banking system as do returns on assets. This spread also shows the risk of lending to the private sector.

Claudiv (2009) identified the determinants of lending in domestic currency and in foreign currency separately in Romania using ordinary least squares. In the first equation, the results showed that domestic credit growth rate is positively linked with economic growth, deposits in domestic currency and unemployment rate but negatively associated with net wages growth and interest rates. In the second equation, foreign currency credit growth is determined by net wages growth and foreign currency deposits.

The empirical study by Gerti and Irini (2013) used Vector Error Correction Model (VECM) to identify the long run determinants of bank credit to private sector in Albania based on demand and supply side factors. Empirical results showed that credit to private sector growth is positively linked to economic growth. Banking and financial intermediation, financial liberalization boost lending demand while the lower cost of lending, decreasing government domestic borrowing, more qualitative bank credit materialized by the reduction of non-performing loans increase bank lending. They concluded that sound financial sector policies that stimulate banking sector funding and limit non-performing loans remain essential for robust credit growth.

Senei and Moeti (2017) investigated the effect of various factors on the supply of credit to the private sector in Lesotho. In their empirical study, they employed an autoregressive distributed lag co-integration approach using quarterly time series data. Empirical results of this study, both short and long run indicate a significant positive relationship between the supply of credit to the private sector and bank deposits. In contrast, commercial bank net foreign assets and interest rates are significant and negatively related to the supply of credit; non-performing loans are insignificant in affecting credit to the private sector.

Using the Autoregressive Distributed Lag (ARDL) approach, Gideon et al. (2017), examined relevant factors influencing allocation of bank credit to the private sector in the Ghanaian economy. Their empirical results show that broad money supply, bank assets, real lending rate, and bank deposits are significant determinants of bank credit in both the short and long run. Inflation also exerts significant positive impact only in the short-run. The study infers the lack of successive governments' commitment to pursue policies that boost the supply of credit to the private sector. Their findings further reveal that increases in deposits mobilization by banks does not necessarily translate into supply of credit to the private sector. A plausible deduction from the findings is that reduced government's domestic borrowing, lower cost of borrowing, and lower central bank reserve requirements for commercial banks in Ghana are needed to stimulate higher lending and credit demand.

Nampewo et al. (2016), empirically analyzed determinants of private sector credit in Uganda focusing on the role of mobile money. Their study investigates how mobile money services influence private sector credit growth. They applied vector error correction (VEC) model and Granger causality analysis. The VEC model reveals that mobile money has a significant positive long-run association with private sector credit growth. Granger causality analysis reveals long-run unidirectional causality from mobile money to private sector credit. The study concludes that mobile money is critical for financial intermediation because it attracts

resources from both the banked and the unbanked populations into the formal financial system, facilitating private sector credit growth.

Abuka and Egesa (2007) empirically explored the determinants of private sector credit in the EAC region using an East African panel data set with fixed effect model and focusing on demand side. The model used the ratio of private sector credit to GDP as a dependent variable, GDP per capita, bank credit to government as a share of GDP, lending rate, inflation, degree of financial liberalization, urbanization (share of urban population to total population) and access to arable land as explanatory variables. Their study concluded that GDP per capita, urbanization, arable land per person have a positive effect on credit demand, whereas credit to government was negatively linked to credit demand in Rwanda, Uganda and Tanzania. The crowding in effect was confirmed in Kenya and Burundi. The coefficients of nominal lending rate and inflation were wrong and not significant. The effect of financial sector liberalization was not remarkable.

Chebet and Muriu (2016) conduct an empirical study on the factors influencing the demand for credit by private sector in Kenya. Using vector Error Correction Model (VECM), the study established that public investment, short-term interest rates, long-term interest rates, employment and domestic debt have a positive impact on the demand for credit by the private sector, while GDP per capita and exchange rate have a negative impact contrary to expected positive sign. The policy implication of their results is that providing sound economic growth policies, a stable macro- economic situation, policies leading to lower credit cost and greater financial liberalization would simultaneously boost lending and lower the risk of lending to the private sector.

Through a co-integrating VAR for 16 industrialized countries, Boris (2001) finds significant positive relations between real credit to real GDP and property prices, and a negative correlation with real interest rates. Alessandra et al. (2001), using VECM for the euro area data, model the factors that affect the demand for credit and find that in the long run, the latter are positively related to real GDP growth and negatively correlated to the short term and long term real interest rates.

Adebowale and Olabanji (2018) examined a bound testing analysis of bank credit supply determinants in Nigeria with more attention on the demand side analysis. Their study employed Linear Autoregressive Distributed Lag (ARDL) co-integration test. The study specifically focuses on the short-run dynamic and long run effects of bank credit supply determinants in Nigeria. They found that exchange rate, money supply, net foreign liabilities and real GDP have a positive long run impact on bank credit to private sector in Nigeria, whereas the effect of the general price level is negative. In the short run, the effect of money supply, net foreign liabilities and reserve requirement on bank credit to the private sector is positive with only inflation exerting a negative influence.

Mukuku (2018) examined macro-economic determinants of private sector credit growth in sub-Saharan Africa (SSA). The study focuses on GDP growth (GDP), money supply (M2), inflation (CPI) and interest rates (INTR). Using a panel data approach, twelve SSA countries were analyzed with data observed over a thirty-six-year period. The key findings reveal that money supply is a significant determinant of private sector credit growth in SSA showing a positive correlation coefficient. Inflation, on the other hand, dampens the growth in credit to the private sector with a significant negative correlation. GDP growth was statistically insignificant in determining private sector credit growth, with recessionary periods experienced by the sample countries yielding a marginal negative correlation coefficient. Interest rates were also statistically insignificant with a negative correlation to private sector credit showing that credit growth was driven by the underlying need, rather than the cost of credit in SSA. The study recommends policy makers and African governments to formulate macro-economic policy that delicately balances the need to drive growth in required money supply, while at the same time maintaining stability in the rate of inflation and related variables. It is also recommended that financial institutions implement strategies that prioritize mobilization of loanable funds over interest rate margins. Private sector players are encouraged to focus on promoting investment-led credit consumption in key sectors of the African economy.

Mohammed (2014) conducted an empirical study on what influences bank's lending in Sub-Saharan Africa (SSA) using panel data regression model. He analyzed the broad determinants of the supply of bank loans using micro-bank/firm level and macro-country level data of 264 banks across 24 SSA countries, by examining cross-country determinants of bank lending, financial reform and banking freedom index as well as regional determinants of bank credit. The study shows that in countries where banks

are most concentrated, the supply of loan is less. He also found evidence to support the fact that bank density increases supply of loans. The study, however, reveals that, in a country where the ratio of banks' nonperforming loans to total loan is high, bank lending decreases though the coefficient is not significant.

Furthermore, findings of the study show that, activity restrictions, entry requirement and capital stringency, to a large extent, can explain the cross-regional variations in bank lending. Supply of bank loan is hindered in ECOWAS, where banks are not allowed to freely operate in non-banking activities. These findings clearly demonstrate that there are different determinants of bank credit delivery across various regions (ECOWAS, EAC and SADC) in SSA. It is therefore, recommended that policy makers adopt multi-faceted region-specific approaches in dealing with credit constraints facing the private sector.

Mbulawa (2015) conducted an empirical study on credit to private sector in South African Development Community (SADC) using eleven SADC countries to establish the determinants of credit to private sector, the possibility of a crowding out effect of government debt and the contribution made by institutional quality. The study used both the fixed effects and dynamic model based on GMM estimations. The study came out with a conclusion thus the development of financial markets in the SADC region is vital for private sector growth, and there is strong evidence suggesting that financial development, economic growth, trade openness and domestic credit by banks were important in explaining growth in credit to the private sector. Government debt was insignificant while institutional factors play a complementary role. Extension of financial resources to the private sector is enhanced by keeping low levels of corruption, improving government effectiveness as well as the regulation quality. Reduction in the risk profile for investments allows banks to release more financial resources to the private sector. Monetary policy initiatives like favorable credit rationing policies play a key role in developing financial markets.

A study on determinants of credit to the private sector in Pakistan was conducted by Kashif and Mohammad (2012) focusing on supply side factors, using ARDL model for the period spanning from 1971 to 2010. This study concluded that in the long run, foreign liabilities, domestic deposits, economic growth, exchange rate, M2 as a percentage of GDP have a positive impact on credit to the private sector growth, while inflation and money market rate do not affect credit to the private sector. In the short run, all variables are positively associated with credit to the private sector except domestic deposits and inflation, which are insignificant. Using dummy variables, there was no impact of financial liberalization on credit growth in Pakistan.

Million (2014) referring to the study done by Kashif and Mohammad (2012), examined the determinants of growth in bank credit to the private sector on supply side in Ethiopia using ARDL model. The results of the study revealed that domestic deposits, foreign liabilities, real lending interest rate, broad money M2 as a percentage of GDP and inflation have an impact on CPS growth in the long run. However, domestic deposits and economic growth do not affect credit to the private sector growth in the short run. Reserve requirement was an additional explanatory variable but was found insignificant in the short and long run. For the domestic deposits to be insignificant in the short run is due to the fact that the amount deposited by the current depositors is not directly used to give loans. The economic growth was not significant due to the economic condition that could not generate enough additional domestic deposits in short run in Ethiopia. This reduce the possibility of banks to give loans. The insignificance of reserve requirement ratio resulted from its stability in most cases. Based on empirical results, the study recommend that efforts should be geared towards keeping the inflation rate low and maintaining it stable.

Kai and Vahram (2011) identify both demand-side and supply-side factors of credit growth, with a focus on supply side for 38 emerging market economies. They covered both pre-crisis and post-crisis periods (2002-2010), and found that domestic deposits and non-residents liabilities positively contribute to the credit growth and that they symmetrically serve as funds for the latter whether domestic or foreign sources. GDP growth and inflation also increase credit, while higher deposit rates, signaling tighter monetary conditions and a tighter monetary policy in the U.S. will decrease credit growth. In another alternative equation, they add other factors such as exchange rate (to pick up the effect of foreign currency credit) and non-performing loans, US M2. These three variables were also significant with expected sign. Furthermore, the study showed that for most of the countries in Asia, domestic deposits and real GDP growth were the main determinants of bank credit in both the pre-crisis and post-crisis periods.

With the above empirical literature review on determinants of credit to the private sector in different regions, this study adopts a model that combines both demand and supply factors that have been identified by previous studies as being common in the private sector determination process, especially in emerging markets and developing economies.

3. THE NATURE AND PAST BEHAVIOR OF CREDIT TO THE PRIVATE SECTOR IN RWANDA

This section discusses the nature and past behavior of credit to the private sector in Rwanda from 2006 to 2019. It focuses mainly on the financial sector developments and selected macroeconomic variables linked to the private sector credit developments. We choose our sample based on GDP quarterly data availability, which starts from 2006Q1.
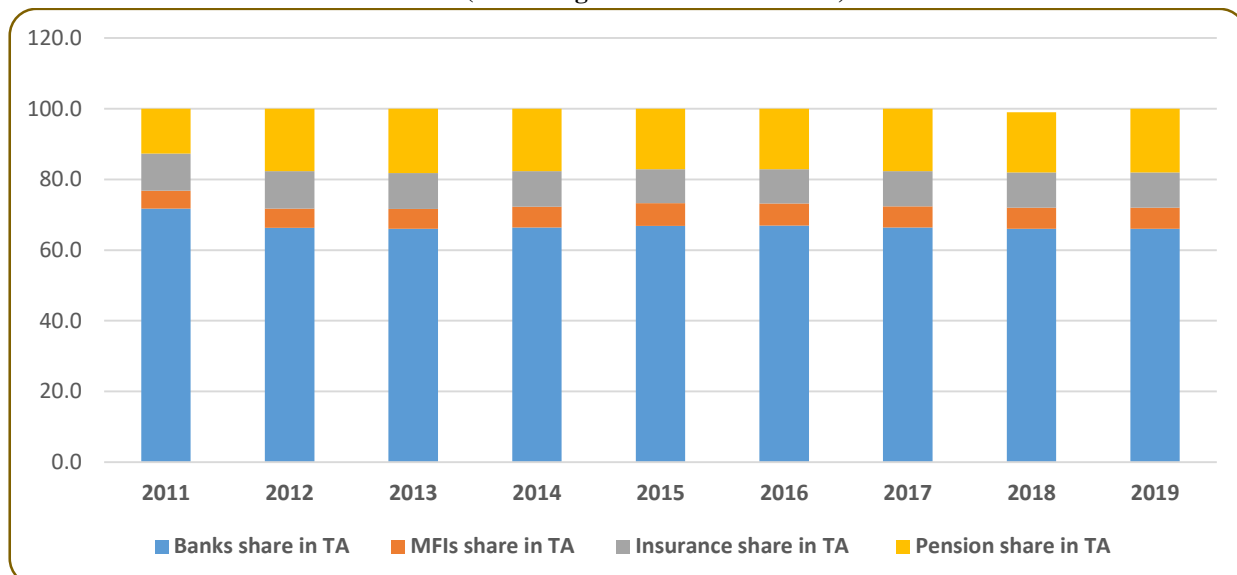
3.1 Financial sector developments in Rwanda

An efficient financial system plays an important role in helping a nation's economy to grow, since well-functioning banks spur technological innovation by offering funding to entrepreneurs who successfully implement innovative products and production processes, and identify and fund productive investments.

The financing to the private sector in Rwanda is mostly done by the banking sector, which is the largest component of the financial system, accounting for 66 per cent of the total assets in 2019. The sector is composed of 16 banks (11 commercial banks, three microfinance banks, one cooperative bank and one development bank), and of these two are domestic public banks, two domestic private banks and 11 are subsidiaries of foreign groups (mainly Pan-African).These banks operate a network of 258 branches, 63 sub-branches and 172 outlets.

However, since 2017, the number of bank branches continued to decline as banks embarked on provision of digital services through agencies, internet and mobile banking in order to rationalize operating expenses and improve efficiency. The banking sector remains concentrated with the share of the three largest banks' assets to total banking sector assets increasing to 48.4 percent in 2019 from 46.5 percent in 2018.

Banks hold the biggest share of assets of the entire financial system averaging to 67 percent for the last fourteen years, followed by Pension (17 percent), Insurance (10 percent) and then Microfinance Institutions (6 percent). Loans comprise a large share in total assets of the banking sector with 57 percent on average, followed by the financing of government in form of T-bills and T- bonds (9 percent) and investments abroad (8 percent)[1].

Chart 1- Structure of Financial Sector (Percentage shares in total assets)

Source: Own calculations

Considering other indicators of financial sector developments, the ratio of credit to private sector to GDP, the degree of the monetization of the economy represented by CPS/GDP, the ratio of money supply to GDP represented by M3/GDP, loan-to-deposit

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[1] Monetary Policy and Financial Stability statement, Feb. 2020 pg 51

ratio and total assets as a ratio of GDP continue to increase standing at 20.5 percent, 26.0 percent, 86.3 percent and 38.5 percent respectively in 2019 from 19.9 percent, 24.5 percent, 85.8 percent and 38.8 percent in 2018. Apart from loan-to-deposit ratio, which is very high compared to the average of Sub Saharan Africa (SSA[2]), other ratios are slightly below, but with an upward trend in their developments. This reveals the gradual improvement in the Rwandan banking sector like in other SSA countries. The low ratios indicate the low development of the financial sector in the region and the presence of lending activities constraints.

3.2 Selected macroeconomic variables linked to the CPS developments

This sub-section briefly analyses the developments of the selected macroeconomic variables and their link to the private sector developments in Rwanda. These variables are also in line with those that have been reviewed in the literature as demand and supply factors that determine the private sector credit growth. The selected macroeconomic variables are banking deposits, non-performing loans, interest rates (interest rate spread), real GDP, credit to government from commercial banks, inflation, reserve requirement, Bank's NFA, M3 or M2, Bank assets, exchange rate and non-resident liabilities.

3.2.1 Commercial bank deposits and CPS developments

As highlighted in the literature by some researchers such as Million (2014), Kashif and Mohammad (2012) and Kai and Vahram (2011), commercial bank deposits are supply side factors that determine credit to the private sector growth. In Rwanda, deposits of commercial bank clients constitute the main source of funds available for banks to finance economic activities. These deposits have been growing overtime in tandem with credit to private sector (CPS). For the last fourteen years (2006 – 2019), the share of deposits in total liabilities of banks averaged 75 percent, followed by the interbank funds (12 percent) and loans from abroad (7 percent).

Chart 2- Commercial bank deposits and CPS developments (FRW billion)
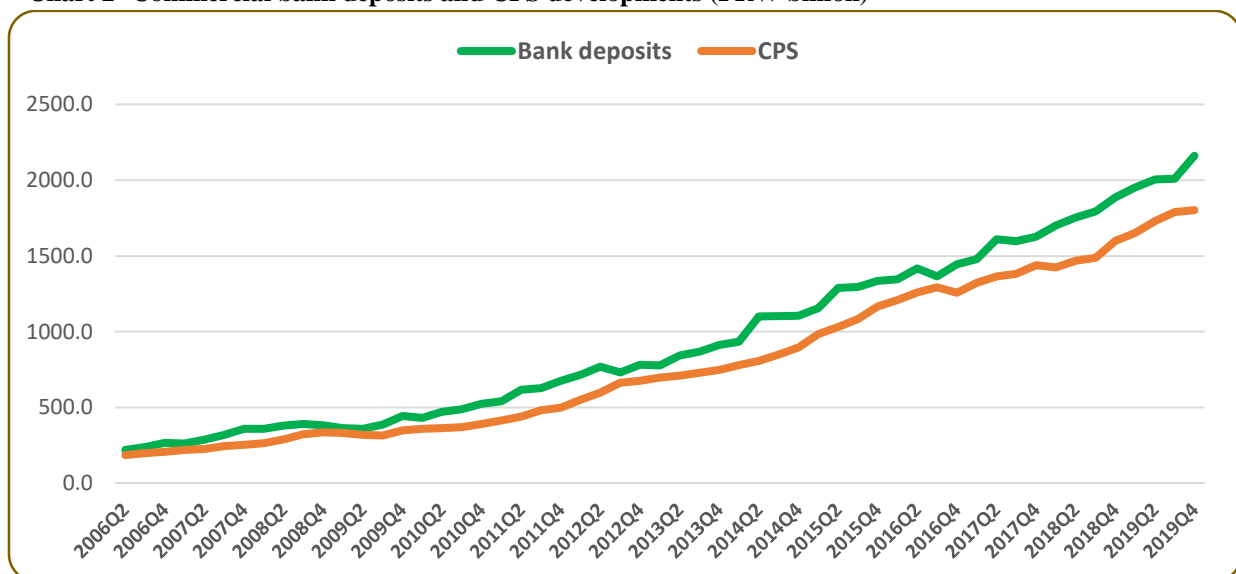
Source: Own calculations

**3.2.2 Economic growth and outstanding credit to the Private Sector**

As emphasized in the literature by some researchers such as Chebet et al. (2016), Mukuku (2018), Amidu (2014), and Mbulawa (2015), GDP growth are demand side factors that determine credit to the private sector growth. The growth in real GDP and private sector credit has been moving in the same direction during the period under review, as portrayed by chart 3 below. From GDP point of view, the four sectors of the economy, which are the main drivers of private sector credit growth, accounting for 83 percent of the total loans, are public works & building with an average share of 33 percent in the total outstanding loans for the last

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[2] SSA is Sub Saharan Africa excluding Nigeria and South Africa

ten years, followed by commercial & hotels (31 percent), non-classified activities (of which consumer loans account for 11 percent), and manufacturing activities (9 percent).

**Chart 3- Real GDP and CPS developments (FRW billion)**
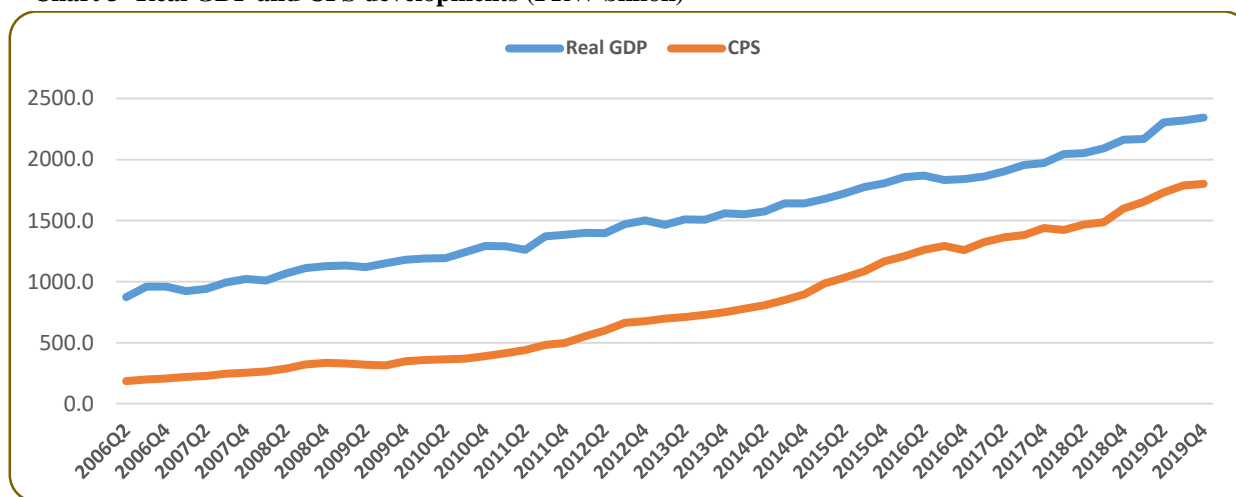
Source: Own calculations

However, as previously mentioned, deposits constitute a big share in total liabilities of banks. The predominance of demand deposits (around 42 percent on average) as a source of financing long- term investments can cause some risks such as liquidity pressures hence instability in the banking sector.

3.2.3 Government Credit from Commercial Banks and CPS developments

Commercial banks credit to government are demand side factors that determine credit to the private sector growth, as highlighted in the literature by some researchers such as Abuka and Egesa (2007), Senei and Moeti (2017), and Mbulawa (2015). In Rwanda, the share of government domestic borrowing from Commercial banks in total bank assets averaged 6.2 percent between 2006Q1 and 2019Q4. The chart 4 below shows that an increase in credit to the private sector has been followed by a decline in government credit from commercial banks for some quarters especially between 2010Q3 – 2011Q3 and 2013Q2 – 2015Q1.

Chart 4- Government domestic borrowing and CPS developments (growth rates)
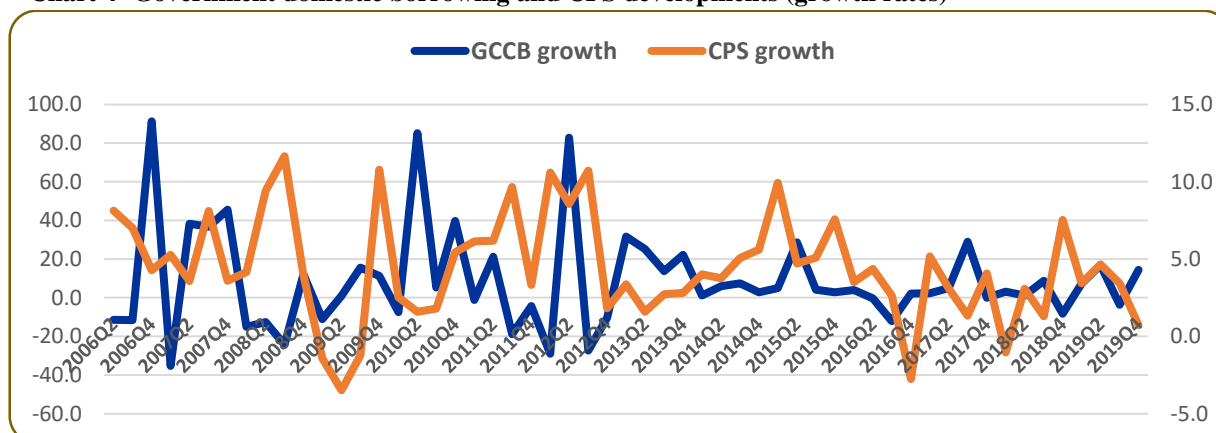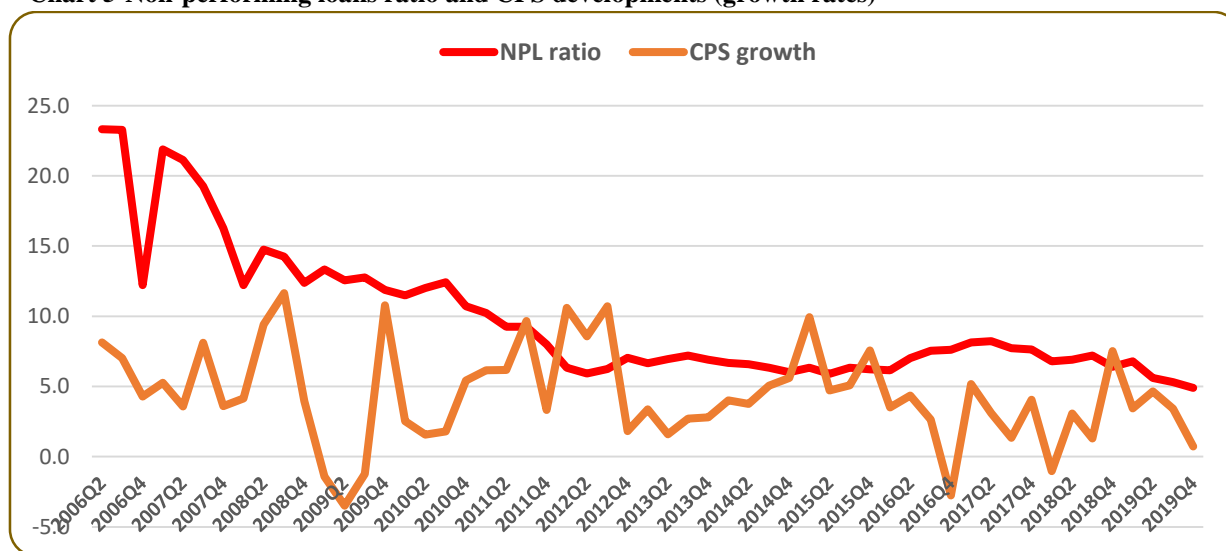

Source: Own calculations

The government of Rwanda normally adopts an expansionary fiscal policy stance and expands its spending to boost economic activities. However, the government has limited resources from taxes and grants, and in this respect, it can borrow from domestic banks or from international market. When it heavily borrows domestically, this leads to an increase in interest rates, which affect private investment decisions. A high magnitude of the crowding out effect may even lead to lesser income in the economy. With higher interest rates, the cost for funds to be invested increases and affects the private sector accessibility to debt financing mechanisms. The frequent appearance of government on domestic market can lead to low private investment funds. This is due to the preference of banks to invest in risk free securities.

3.2.4 Non-performing loans ratio and CPS developments

As highlighted in the literature by some researchers such as Gerti and irini (2013), Senei and Moeti (2017), and Kai and Vahram (2011), non-performing loans ratios have been considered as supply side factors that determine credit to the private sector growth. The non-performing loans (NPLs) are a proxy for the loan quality, and as the quality of bank assets deteriorates, the credit granted diminishes. Essentially, NPLs reduce the liquidity for banks to grant loans, therefore are negatively related to credit growth. In Rwanda, between 2006Q1 and 2010Q4, non-performing loans ratio (NPLR) averaged 15.2 percent. Despite this high level of NPLR, Rwanda experienced periods of high increase in credit to the private sector. However, a trend in different directions between CPS and NPL ratio has been observed for some quarters but not very high, except between 2010Q1 - 2011Q3 and 2013Q2 – 2014Q4.

Chart 5-Non-performing loans ratio and CPS developments (growth rates)

Source: Own calculations

The NPL ratio was very high standing at 20 percent on average between 2006 and 2007. In order to reduce this trend, NBR enhanced off site and on site supervision through continuous prudential meetings, monitoring of banks with high NPLs. In this respect, NBR requested commercial banks to comply with a target of NPL ratio of 10 percent by 2008, reducing it further to 7 percent in 2009 and to 5 percent by 2012 till now. These measures, prompted NPL ratio to decline to a single digit, standing at 7.2 percent between 2011 and 2017 on average from 15.7 percent between 2006 and 2010. It is important to highlight that between 2006Q2 and 2010Q4 was the period where CPS was increasing remarkably despite a high level on NPL ration (15.2 percent) on average).

3.2.5 Interest rate spread developments

The interest rate spread is defined here as the difference between the lending rate paid by borrowers to banks and deposits rate paid by banks to depositors/savers. Interest rate spread are demand side factors that determine credit to the private sector growth and have been highlighted in the literature by many researchers mostly who combined both demand and supply side factor such as Abuka and Eges (2007), Senei and Moeti (2017), Chebet and Muriu (2016), Gideon (2017), Million (2014), Balaze et al. (2009),

Mukuku (2018), Gerti and Irini (2013), Mbulawa (2015), and Nampewo et al. (2016). For the last decade, interest rate spread in Rwanda has stayed high, as lending rates remained rigid. Interest rate spread for Rwanda was 8.7 percent on average between 2006 and 2019, the second highest in the East African Community, after Uganda (10.4 percent). These rates are very high compared to those observed in economies with developed financial systems for example, South Africa (3.5 percent) and Singapore (5.1 percent). The high spread has an impact on incentives to borrowers and savers, this can negatively affect their saving, and investment decisions and consequently reduces credit to private sector. The high interest rate spread in Rwanda is explained by credit-constrained borrowers, less competition between banks and some risks associated to borrowers such as information asymmetry: borrowers are not aware of terms of credit contracts, lack of financial literacy, credit history, and sector risks among others.

Chart 6- Interest rate spread and CPS developments (growth rates)
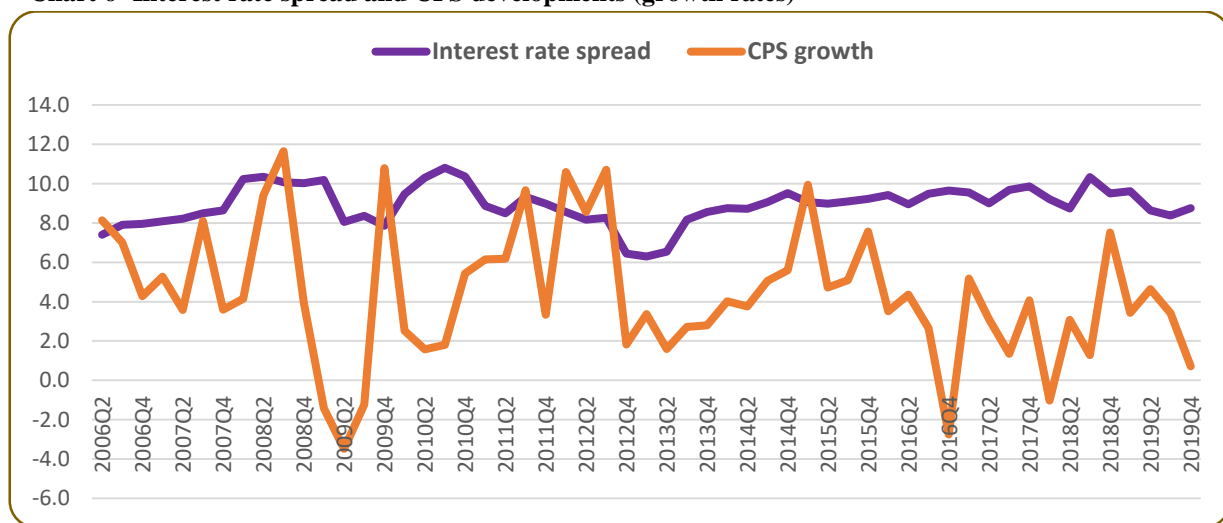
Source: Own calculations

Briefly, the selected macroeconomic variables either have the same or divergent trend with credit to the private sector, which is a descriptive analytical sign that they are either positively or negatively related to the private sector credit.

4. METHODOLOGY AND SOURCE OF DATA
4.1 Model Specification

The primary focus of this study is to investigate the determinants of CPS using the Autoregressive Distributed Lags model due to its several advantages that we will see in the following part. This methodology is similar to the one used in the studies done by Kashif and Mohammed (2006), Million Assefa (2014), Senei and Moeti (2017), Gideon et al (2017), Adelake and Awodoni (2018).

Studies presented in the literature review section suggest that CPS as an independent variable is a function of a varying set of macroeconomic variables. These variables include among others: domestic deposits, foreign liabilities, GDP, exchange rate, inflation, real lending rate, reserves requirement ratio, credit to government from commercial banks, non-performing loans ratio, interest rate spread, money supply M2 or M3 and inflation.

The empirical estimation of the determinants of bank CPS in Rwanda focused on economic activity, banking health, cost-related and other macroeconomic indicators. In this vein, it implies quarterly time series data of Real Gross Domestic Products (**RGDP**) which represents the overall state of the economy, bank deposits (**Dep**), Real Effective Exchange Rate (**REER**), credit to government from commercial banks (**GCCB**), non-performing loans ratio (**NPLR**) and interest rate spread (**SP**). All variables are in logarithm except interest rate spread and NPLR. The sample size is from 2006Q1 to 2019Q4 and has been chosen taking into

account availability of GDP data which start in 2006Q1. These data have been collected form National Bank of Rwanda and National Institute of Statistics of Rwanda (NISR).

The choice motivation of these variables mainly resulted from the literature review, but also motivated by their trend with CPS mentioned above in the section 2.

The model specified is as follows:

$$LCPS = \alpha + \beta LRGDP_t + \sigma LDep + \omega LREER_t + \lambda LGCCB_t + \varphi NPLR_t + \pi SP_t + \varepsilon_t \quad (1)$$

❖ **RGDP:** we expect a positive relationship between LRGDP and LCPS. Actually, when economic activities are in good conditions, economic agents increase demand for loans for consumption and investments as they have good returns to pay back loans without difficulties. Furthermore, Albulescu (2009) suggests that economic growth is expected to correlate positively with credit as the banks are more willing to lend in an economic upturn and vice versa. In this respect, the expansion in real GDP boosts income in agricultural, manufacturing and service sectors. This in turn leads to higher domestic deposits and increases the liquidity of banks hence the capacity of banks to give loans. The expected sign is positive.

($\beta > 0$)

❖ **Dep:** some researchers confirmed a positive relationship between banking deposits and CPS such as Million (2014), Kashif and Mohammed (2006), Albulescu (2009) and Kai and Vahram (2011).

In Rwanda, deposits constitute the main source of funds available for the banking sector to give loans to corporates, households and government. These deposits have a lion share averaged 78.5 percent of total liabilities between 2006 and 2019. Therefore, a positive sign is expected. ($\square > 0$)

❖ **REER:** generally, a depreciation in REER discourage imports as they become more expensive and exports come to be competitive. This incites economic agents and banks to demand for and give loans respectively for investment in exports products. For the net importers like Rwanda, credit will continue expanding even if imports are expensive due to currency depreciation. In this respect, economic agents will need more local currency to convert in foreign currency for financing their imports. **$\omega > 0$**

However, when banks use external borrowing to finance domestically, exchange rate appreciation implies a decline in credit risk or a decline in leverage or leverage growth. Banks would borrow more from international markets and lend in domestic markets, thus playing an intermediary role between international markets and domestic residents. As a result there will be a negative relationship between REER and CPS. **$\omega < 0$).** Therefore, the coefficient on REER becomes ambiguous.

❖ **GCCB:** some authors such as Egert et al (2006), Gerti and Irini (2013), Chebet and Muriu (2006) showed how increased government borrowing lowered credit to private sector. In this regards, when government borrows heavily from the domestic market, a shortage of funds arises caused by increased demand for investible funds. This drives interest rates up leading to the reduction of private borrowing and hence limiting private investment. This results into crowding-out of private sector. Government domestic borrowing is therefore expected to have a negative effect on the demand for and supply of CPS as a result of higher interest rates and reduction of funds available for the private sector, **$\lambda < 0$.**

❖ **NPLR**: Non-performing loans represent the part of credit not repaid and considered as bad credit for the banking sector. It is a proxy for the loan quality. As the quality of bank assets deteriorates, the credit granted diminishes. Actually, NPLs reduce the liquidity for banks to grant loans. NPLs are negatively related to credit growth. This confirms the results of Kai and Vahram (2011) **($\varphi < 0$)**.

❖ **SP:** interest rate spread is defined as the difference between lending rate and deposit rate. It has been used by some researchers (Abuka and Egesa (2007), Gerti and Irini (2013)), as a proxy of financial liberalization. When the spread decline which implies a high degree of financial liberalization and increased competition between banks, credit granted increases. The expected sign is negative. **$\Pi < 0$**

4.2. Choice of the methodology

To find the long and short-run equilibrium relationship between the dependent and independent variables at the same time, in terms of methodology, this study used the robust econometric technique of bound testing approach to co-integration within the framework of the Autoregressive Distributed Lags. This methodology was developed by Pesaran and Shin (1998), Pesaran, Shin &

Smith (2001). This methodology has been used by other many researchers as previously mentioned. The ARDL methodology was found appropriate due to its several advantages compared to other methods:

❖ Helps to show short run (SR) and long run (LR) relationships;
❖ Is applied irrespective of whether the regressors are I(0) or I(1) or combination of both;
❖ Provides unbiased estimates of the LR model and valid t-statistics even when some of the regressors are endogenous Emeka Nkoro et al (2016)
❖ Bound test for cointegration is appropriate to Engel-Granger two steps which is limited to bivariate testing and identifies only a single cointegration relationship among what might have been many relations. Similarly, the Johansen and Juselius approach, unlike the bounds cointegration method, fails to consider the mixture of regressors which are not integrated of same order, that is, I (0) and I (1)
❖ This approach is appropriate for smaller sample sizes ranging from 30 to 80 observations (Narayan 2005)

4.2.1. Econometric Estimation Procedure

The first step is to determine the order of integration (stationarity test). For this purpose, the Augmented Dickey-Fuller test (ADF) was used. After testing order of integration, we found that all variables are integrated of order zero I(0) or order one I(1). So we conclude that the ARDL method is valid. In our study, our ARDL (p,q) equation is formulated as follows:

$$LCPS_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \, LCPS_{t-i} + \sum_{j=1}^{q} \beta_j LRGDP_{t-j} + \sum_{j=1}^{q} \sigma_j LDep_{t-j} + \sum_{j=1}^{q} \omega_j LREER_{t-j} + \sum_{j=1}^{q} \lambda_j LGCCB_{t-j} +$$

$$\sum_{j=1}^{q} \varphi_j NPLR_{t-j} + \sum_{j=1}^{q} \pi_j SP_{t-j} + \varepsilon_t (2)$$

The second step is to check for the presence of long run cointegration using the bounds test method through the ARDL equation (2). From this, we get the equation which gives the short run and long run relationship in the form of conditional Error Correction Model (ECM), from ARDL according to Pesaran et al (2001):

$$\Delta LCPS_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta LCPS_{t-i} + \sum_{j=1}^{q} \beta_j \Delta LRGDP_{t-j} + \sum_{j=1}^{q} \sigma_j \Delta LDep_{t-j} + \sum_{j=1}^{q} \omega_j \Delta LREER_{t-j} + \sum_{j=1}^{q} \varphi_j \Delta NPLR_{t-j} +$$

$$\sum_{j=1}^{q} \lambda_j \Delta LGCCB_{t-j} + \sum_{j=1}^{q} \pi_j \Delta SP_{t-j} + \theta_0 LCPS_{t-1} + \theta_1 LRGDP_{t-1} + \theta_2 LDep_{t-1} + \theta_3 LREER_{t-1} + \theta_4 NPLR_{t-1} + \theta_5 LGCCB_{t-1} +$$

$$\sum_{j=1}^{q} \theta_6 SP_{t-1} + \mu_t (3)$$

The null hypothesis is no existence of the long run relationship (no cointegration against the alternative hypothesis of cointegration

$$H_0: \theta_0 = \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = 0 \quad \rightarrow \text{no cointegration}$$
$$H_1: \theta_0 \neq \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq \theta_6 \neq 0 \quad \rightarrow \text{cointegration}$$

Coefficients of long run $= -\dfrac{\theta_n}{\theta_0}$

Coefficient of short run are: $\square$, β, $\square$, ω, φ, λ, π, η

When the F-statistics outstrips the upper bound of the critical values which suggests that all variables are I (1), then we may reject the null hypothesis of no long run cointegration, concluding that the variables contained in the model have a long run relationship. However, if the F-statistics is less than the lower bounds of the critical values which considers that all variables are I (0), we fail to reject the null hypothesis of no long run cointegration among the variables and conclude that the variables being tested do not share a significant long run relationship.

5. ESTIMATION OF THE MODEL

The Bounds F test result in Table 1 below, shows the results with the estimated F-test value indicative of the presence of the long run relationships among the variables. As the calculated F-statistic of 5.997 exceeds the upper bound critical value at 10 percent, 5 percent, 2.5 percent and 1 percent %, then the null hypothesis of no cointegration is rejected. Since the cointegration is confirmed, we move to the following step where the ARDL model was established to determine long run and short run relationships.

Table 1: F Bounds Test

Test statistic	Value	Signif.	I(0)	I(1)
F- statistic	5.997	10%	1.99	2.94
K	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

5.1 Results

The stationary test has shown that some variables are stationary at level and others are stationary after differenced once, which was a prerequisite to proceed by estimation using ARDL model. The estimated variables are LCPS as dependent variable and, LRGDP, LDEP, LGCCB, LREER, NPLR, IS as explanatory variables. The selected model is ARDL (2, 0, 3, 2, 4, 1, 2) considering Akaike Information Criterion (AIC).

The estimation revealed that in the long run, banking deposits constitute the major determinants of CPS. This is consistent with the findings of several empirical investigations including the study of Million (2014), Kashif and Mohammed (2006), Albulescu (2009) and Kai and Vahram (2011)

A 1 percent increase in banking deposits will result into a 1.3% increase in CPS. This is due to the fact that the main mission of commercial banks is to collect deposits from economic agents in surplus (servers) to finance economic agents in deficit (borrowers). Therefore, bank deposits own a big share of deposits in total liabilities of banks which is around 78.5 percent in Rwanda between 2006 and 2019.

Government domestic borrowing has been significant with expected sign but with a low coefficient. If GCCB increase by1%, CPS declined by 0.08% in the long run. This low coefficient may be explained by a low share of government domestic borrowing in total bank assets (8.4%). This confirm the results of Egert et al (2006), Gerti and Irini (2013), Chebet and Muriu (2006) and Egesa and Abuka (2007).

Real effective exchange rate has been also significant in the LR. An appreciation of REER by 1 percent results into an increase in CPS by 0.37 percent. This is supported by the theory as already mentioned above, that the impact of REER can be positive or negative. In this regards, Rwandan banks used external loans to finance the domestic market. According to the theory, the REER appreciation declines the credit risk and motivates banks to play an intermediary role between international market and domestic market.

Interest rate spread also explained CPS changes with a low coefficient in the long run. When IS increases by 1 percent CPS declined by 0.02%. The low coefficient of interest rate spread is basically explained by credit constrained borrowers, lack of financial literacy, credit information asymmetry, low bank competition which results into the rigidity in lending rate and maintain the spread relatively high in Rwanda.

Real GDP appeared with a negative coefficient and not significant contrary to the results of other researchers except Million (2014) who found this variable negative and insignificant but in the short run. He supported this by stipulating that the economic condition could not generate enough additional domestic deposits in the short run. This situation may be explained by high significance of bank deposits with a coefficient which is higher than 1 in the model. In addition, higher growth in bank deposits is normally attributed to increased earnings in all sectors of economy economic meaning increase in economic activity.

Non-performing loans ratio has been found insignificant in the long run over the period under review. This may be explained by the risk averseness which was not satisfactory in Rwandan banks especially prior 2011 where NPLR was in double digits and banks continued to give loans as usual.

It is important to highlight that the above variables which are significant in the long run, are also significant in the short run. LRGDP and NPLR remained not explain CPS growth even in the short run.

The coefficient of ECT equivalent to -0.77 obtained in the table below is negative and highly significant. This supports the results of F- bounds test which confirmed the presence of the long run relationship between dependent variable and independents variables. It is a coefficient of adjustment towards the long run equilibrium. This means that 77 percent of deviations after a choc in the short run is corrected in a quarter which follows. It requests 1.3 quarters to fully turn to the long run equilibrium.

Table: Estimation results

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LCPS)
Selected Model: ARDL(2, 0, 3, 2, 4, 1, 2)
Case 2: Restricted Constant and No Trend
Date: 06/26/20   Time: 12:56
Sample: 2006Q1 2019Q4
Included observations: 52

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.667159	0.602824	1.106723	0.2769
ECT(-1)	-0.772329	0.123860	-6.235517	0.0000
LRGDP**	-0.106419	0.117373	-0.906677	0.3716
LDEP(-1)	1.014486	0.173248	5.855689	0.0000
LGCCB(-1)	-0.062295	0.028342	-2.197975	0.0355
LREER(-1)	-0.283637	0.098746	-2.872407	0.0073
NPLR(-1)	0.010846	0.003232	3.356021	0.0021
IS(-1)	-0.018135	0.005812	-3.120554	0.0039
D(LCPS(-1))	0.308803	0.128298	2.406923	0.0222
D(LDEP)	0.242225	0.097115	2.494207	0.0182
D(LDEP(-1))	-0.451974	0.166163	-2.720068	0.0106
D(LDEP(-2))	-0.327850	0.107862	-3.039521	0.0048
D(LGCCB)	-0.069275	0.023695	-2.923680	0.0064
D(LGCCB(-1))	0.030126	0.022364	1.347097	0.1877
D(LREER)	-0.493623	0.151516	-3.257882	0.0027
D(LREER(-1))	0.290661	0.158261	1.836590	0.0759
D(LREER(-2))	0.091445	0.142409	0.642128	0.5255
D(LREER(-3))	-0.295094	0.152379	-1.936578	0.0620
D(NPLR)	0.006639	0.002710	2.450099	0.0201
D(IS)	-0.011533	0.005994	-1.924099	0.0636
D(IS(-1))	0.016545	0.005974	2.769568	0.0094

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LRGDP	-0.137790	0.153065	-0.900210	0.3749
LDEP	1.313541	0.091525	14.35170	0.0000
LGCCB	-0.080658	0.034329	-2.349544	0.0253
LREER	-0.367250	0.110913	-3.311163	0.0024
NPLR	0.014043	0.003202	4.386219	0.0001
IS	-0.023481	0.006599	-3.558034	0.0012
C	0.863827	0.783274	1.102842	0.2786

EC = LCPS - (-0.1378*LRGDP + 1.3135*LDEP -0.0807*LGCCB -0.3672
    *LREER + 0.0140*NPLR -0.0235*IS + 0.8638)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.997665	10%	1.99	2.94
K	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

LR significant coefficients:

➢ LDep: $-\frac{1.01}{-0.77} = 1.31$ p = 0.00

➢ LGCCB: $-\frac{-0.06}{-0.77} = -0.08$ p = 0.04

➢ LREER: $-\frac{-0.28}{-0.77} = -0.37$ p = 0.01

➢ SP: $-\frac{-0.02}{-0.77} = -0.02$ p = 0.00

SR significant coefficients:

➢ D(LCPS(-1)): 0.31 p = 0.02
➢ D(LDEP): 0.24 p = 0.02
➢ D(LGCCB): -0.07 p = 0.01
➢ D(LREER): -0.49 p = 0.00
➢ D(LREER(-1)): 0.29 p = 0.08
➢ D(LREER(-3)): - 0.30 p = 0.06

5.2. Diagnostic test

Finally, this study performed a number of diagnostic tests. Residual diagnostic tests include normality test to check whether the error term was normally distributed, Heteroskedasticity to check whether the variance of the residuals was constant and serial correlation to check whether the error terms from different time periods were correlated and stability test to test if the coefficients of the model remain stable even if we change the sample.

The results of those diagnostic tests revealed that the model has not serial correlation and heteroskedasticity, the residuals are normally distributed and the model has no omitted variables meaning well specified.

Table 2: Diagnostic tests

Diagnostic Tests	Statistic	p-value
Jarque-Bera(normality)	0.000282	0.99
Breusch-Godfrey(serial correlation)	0.44	0.65
Breusch-Pagan-Godfrey(homoscedasticity)	1.33	0.23
Ramsey RESET(specification of the model)	1.35	0.19

5.3. Stability Test

In order to confirm the stability of the estimated coefficients given that the model is said to be correctly specified, Pesaran (1997) proposed that the cumulative sum of recursive residuals (CUSUM) and the CUSUM of squares tests be applied to assess the stability of the estimated parameters. As a result, the plots of the cumulative sums are expected to fall within the 5% critical lines of statistical significance where we shall conclude that the coefficients are stable and reliable.

Figure 1 and 2 plot the results for CUSUM and CUSUMSQ tests. The plots of CUSUM and CUSUMSQ statistic fall inside the critical bands of the 5% confidence interval of parameter stability.
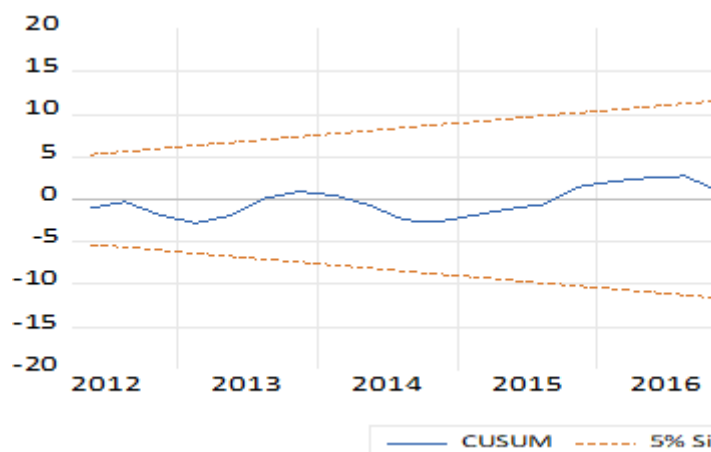
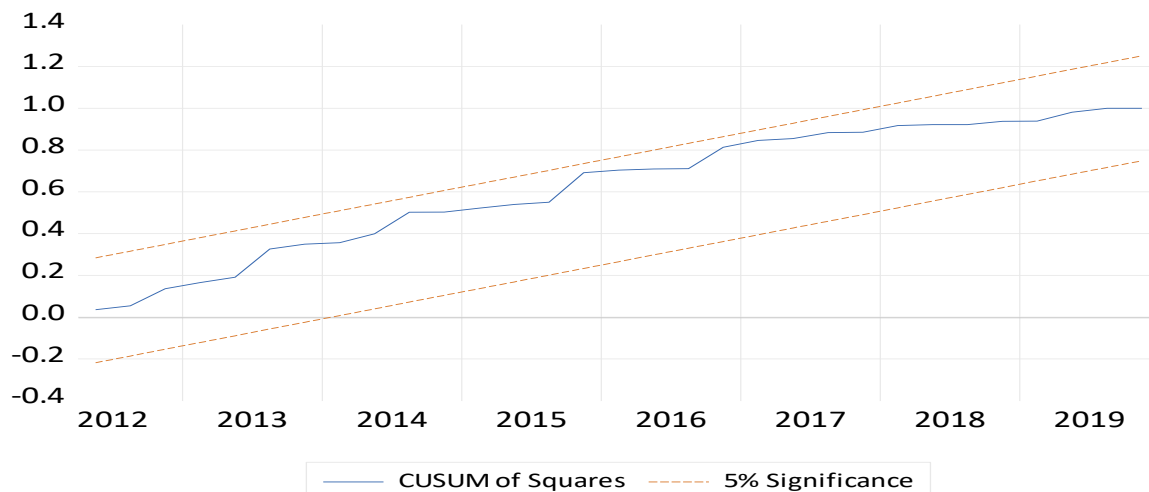**Figure 1:** Stability test (CUSUM)

Figure 2: Stability test (CUSUMSQ)

6. CONCLUSION AND POLICY RECOMMENDATIONS

Commercial banks remain dominant in Rwandan financial sector in terms of their shares in total assets and deposits in total liabilities of the banking system. Like in other sub-Saharan African countries, the financial sector in Rwanda is still underdeveloped but with a gradual improvement over the years.

This study examined empirically the determinants of credit to the private sector based on supply and demand factors over the period 2006Q1-2019Q4 by using ARDL model. The selected variables were credit to the private sector as dependent variable and bank deposits, government domestic borrowing, real effective exchange rate, real GDP, non-performing loans ratio and interest rate spread as explanatory variables.

The results reveal that in the long - run, banking deposits, real GDP, government domestic borrowing and interest rate spread are significant with the expected signs. The low coefficient on government domestic borrowing is explained by its low share in total bank assets reflecting the limited crowding out of the private sector. However, the low coefficient of interest rate spread is a result of credit constrained borrowers, information asymmetry, lack of financial literacy, low bank competition which result into the rigidity in lending rate and maintain the spread relatively high in Rwanda.

Non-performing loans ratio and real effective exchange rate were not significant in the long - run. The insignificance of non-performing loans ratio followed a low risk averseness of Rwandan banks especially before 2011 where this ratio was in double digit and banks continued to give more loans.

In the short run, only bank deposits and real effective exchange rate have been significant. The insignificance of LRGDP has also been found by some researchers explaining that economic condition could not generate enough additional domestic deposits in the short run to increase CPS.

As recommendations, given that deposits in commercial banks and real GDP are determinants of credit to the private sector growth in this study, government and NBR should ensure macroeconomic stability through the coordination between monetary policy and fiscal policy.

This study reveals a sort of crowding out effect of the PS though it is not very pronounced in Rwanda. In this respect, government should keep broadening tax base, ameliorate the means of tax collection, sensitizing the population about the goodness of paying taxes in order to increase its self-reliance.

The National Bank of Rwanda should continue enforcing the supervision of commercial banks in order to make the sector very attractive and have new entries in the sector. This will enhance competition between banks and help to reduce rigidity in bank lending rate, thus decrease interest rate spread in Rwanda will contribute to CPS growth.

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