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Original Research

IMPACT OF BANK CREDIT TO PRIVATE SECTOR ON ECONOMIC GROWTH IN RWANDA, AN ECONOMETRIC APPROACH

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Abstract
This study examined the impact of bank credit to private sector on economic growth in Rwanda. The general objective of the study was to investigate the impact of bank credit to private sectors on economic growth in Rwanda. The specific objectives were to examine the impact of bank credit to private sectors to gross domestic product and to examine the impact of money and quasi money on economic growth using the Johansen multivariate co-integration techniques and the error correction model to estimate the long run equilibrium and the short run relationship between bank credit to private sectors as well as economic growth, and between money supply and economic growth. The hypotheses of the study were "there is significant relationship between bank credits to private sector and economic growth in Rwanda". In order to avoid possible omission of variables, we added money supply, exports and consumer price index to model. The study showed that in the long run as well as in the short run, the impact of bank credit to private sector on economic growth as well as the impact of Consumer Price Index on economic growth is not statistically significant. Concerning money supply and exports in the long run as well as in the short run, the study showed that the impact on economic growth is statistically significant.

Keywords: Bank credit, Private Sector, Economic growth, Financial Development

Introduction
There has been extensive empirical work on the relationship between financial development and economic growth which has been largely surveyed in King and Levine (1993) and Levine (1997) works. King and Levine (1993), show a strong positive link between financial development and economic growth in a multivariate setting.

Usually, financial services work through efficient resource mobilization and credit expansion to raise the level of investment and efficient capital accumulation. The possible positive link between credit market and economic growth is fairly obvious because developed countries, without exception have more developed credit markets. Therefore, it would seem that policies to develop the financial sector would be expected to raise economic growth. Indeed, the role of bank credit is considered important to economic growth and development (Khan and Senhadji, 2000).

Economic growth is defined as a positive change in the national income or the level of production of goods and services by a country over a certain period of time. This is often measured in terms of the level of production within the economy. Other possible measures include total factor productivity, factors of production such as technological change, human capital termed the Schumpeterian approach, other measures of growth ranges from real per capita GDP; the rate of physical capital accumulation etc. (Odedokun 1998; King & Levine 1993; Allen & Ndikumama 1998).

Since the 19th century, many economists have argued that bank-based systems are better at mobilizing savings, identifying good investments, and exerting sound corporate control, particularly during the early stages of economic development and in weak institutional environments. Others, however, emphasize the advantages of markets in allocating capital, providing risk management tools, and mitigating the problems associated with excessively powerful banks. Economists have constructed a vast number of theoretical insights into the comparative advantages of different financial systems. The market-based view highlights the growth enhancing role of well-functioning markets in (i) fostering greater incentives to research firms since it is easier to profit from this information by trading in big, liquid markets, (ii) enhancing corporate governance by easing takeovers and making it easier to tie managerial compensation to firm performance, and (iii) facilitating risk management. Moreover, the market-based view stresses problems with banks (Levine, 2002: 399-400).

Proponents of market-based systems focus on the weaknesses of bank-based systems, arguing that: (i) large banks tend to encourage firms to undertake very conservative investment projects, and extract large rents from firms, leaving them with low profits and little incentive to engage in new and innovative products; and (ii) shareholders have little oversight over bank managers who control not only banks but also, indirectly through financing, the firms. Furthermore, the advocates of market-based systems claim that the latter provide a richer set of financial instruments that allows greater customization of risk management techniques than in a more standardized bank-based system (Khan and Semlali, 2000: 6-7). Hamilton (1781) argued that "banks were the happiest engines that ever were invented" for spurring economic growth.

Others, however, question whether finance boosts growth. Adams (1819) asserted that banks harm the "morality, tranquility, and even wealth" of nations. Economic theories mirror these divisions. Some models show that economic agents create debt contracts and financial intermediaries to ameliorate the economic consequences of informational asymmetries, with beneficial implications for resource allocation and economic activity. However, other models note that higher returns from better resource allocation may depress saving rates enough such that overall growth rates actually slow with enhanced financial development. (Levine et al., 2000: 32).

Statement of the Problem

A startling fact about economic growth is the large variation in the growth experience of different countries in recent history. Some parts of the world, like the United States or Western Europe, experienced sustained economic growth over a period of more than 100 years, so by historical

standards these countries are now enormously wealthy. This is not only true in absolute terms (i.e., GDP), but also if we measure wealth as income per capita (i.e., GDP per person). In contrast, there are countries where even today large parts of the population live close to the subsistence level, much the same as Europeans and Americans did some hundreds of years ago. There are very large differences in income per capita and output per worker across countries today. In Sub-Saharan Africa (SSA), although economic growth (average) slightly improved in 2014, it remains below recent performance (2002-2008). Real GDP growth was 4.5 percent in 2014, up from 4.2 percent in 2013, supported by continuing infrastructure investment, increased agricultural production, and buoyant services. Although the economy picked up in 2014, it remains weak compared to a peak average rate of 6.4 percent during 2002-08, which indicates SSA economy is punching below its weight. Growth was uneven amongst large Sub-Saharan economies. Stellar growth in Nigeria was offset by sluggish growth in South Africa and a slowdown in growth in Angola (NATIONAL BANK OF RWANDA, pg 4)

The economic growth has been a major concern of the government of Rwanda by putting a lot of effort to sustain Rwandan economy and to improve social welfare. Even though Rwandan economy has recovered considerably since the 1994 genocide against Tutsi; the GDP per capita is still low, around 695.1USD. Rwanda's economy grew by 7.8 percent in the third quarter of 2014 according to the financial stability report. This follows an increase of 7.5 and 6.1 percent in the first and second quarters of 2014, respectively. The service sector, which has the largest share of GDP, outperformed other sectors with growth of ten percent, while agriculture recorded 6 percent growth. The industry sector registered four percent growth.

Rwanda's good economic performance has been supported by the improvement in economic financing. Between December 2013 and November 2014, money supply rose by 18.0% compared to 12.4% recorded in the same period of 2013 and 14.3% initially projected. During the same period, credit to the private sector increased by 18.1% against 11.3% recorded in the same period of 2013 and 16.l% projected. New authorised loans grew by 42.2% in the first eleven months of 2014 amounting to Rwf 595.6 billion – against a decline of 8.3% in the same period of 2013.

According to the financial stability report, the service sector performance was boosted by information and communication, which registered 25% growth. Agriculture production continued to perform well in season B (boosted by food crops that grew at 7%) while negative growth (-5 percent) in manufacturing contributed to the reduced growth in the industry sector.

Research Objectives

The general objective of this study is to investigate the impact of bank credit to private sector on economic growth in Rwanda using the Johansen multivariate cointegration models for the period of 1990 to 2014.

Specific Objectives

The specific objectives of this research are the following:

i)To examines the impact of bank credit to private sector on gross domestic product

ii)To examine the impact of money and quasi money (M2) on economic growth.

Research Questions and Hypothesis

According to John W. Creswell, J,W (2014), Cited by Salongo M., research questions are formulated request for information that defines the problem to be studied, sets boundaries for information collection and outline the objectives of the investigation. They inquire about the relationship among variables that the investigator seeks to know.

This work therefore is guided by the following research questions:

i) Is bank credit to private sector a significant instrument for generating growth within the Rwandan economy?

ii) Does Money and quasi money (M2) have a positive impact on economic growth?

Hypotheses

The research hypothesis is there is significant relationship between bank credits to private sector and economic growth in Rwanda".

Review of Related Literature

Bank Credit

According to the Cambridge dictionary, bank credit is money that banks have lent or have available to lend. https://dictionary.cambridge.org/dictionary/english/bank-credit .There are various ways in which a bank can provide credit for its customers. First, it can provide a lump sum of money in the form of a loan. Second, it can a110w a customer to draw checks when he has insufficient money in his account to meet them. This is done by a110wing him an overdraft. Fina11y, it can make it possible for a customer to buy things without paying cash for them. This is done by the use of credit cards. https://doi.org/10.1007/978-1-349-16705-0_17

Private Sector

The private sector comprises businesses and industries that are autonomously managed by non-government entities, operating mainly to generate revenue.
(https://www.investopedia.com/terms/p/private-sector.asp)

The private sector is pivotal in free-market economies, like that of the United States, by fostering competition and innovation, which drive economic growth and it ranges from small sole proprietorships to large multinationals and include a diverse array of industries and organizations. These long-standing privileged partners of official development policies seem set to see their role boosted in the future; they constitute what we understand here by "private sector". An added difficulty lies in the fact that companies alone bring together a wide variety of actors whose interests, contribution and impact with regard to the development process differ. They range from

large multinationals to micro-enterprises, SMEs to cooperatives, and even informal economy structures. In the context of development effectiveness, it is, moreover, important to distinguish between the role of domestic companies and foreign multinationals, as their interests can in some instances be conflicting. (https://www.investopedia.com/terms/p/private-sector.asp)

Economic Growth

According to Wikipedia, economic growth is an increase in quantity and quality of economic goods and services that a society produces. It is also an increase in real gross domestic product (GDP) (that is, GDP adjusted for inflation). The gross domestic product (GDP) is one of the primary indicators used to gauge the health of a country's economy. It is the endless improvement in the capacity to satisfy the demand for goods and services, resulting from increased production scale, and improve productivity (innovations in products and processes) which is usually measured over a certain period of time. It is also a complex problem because several factors contribute to the growth process such as investment ratio (Harrod-Domar model; Marx, 1867; Pagano (1993); Greenwood and Jovanovic (1990); Weber, 1905), human capital (Romer, 1986; Kaldor, 1957; Arrow, 1962), research and development and trade openness (Lewis, 1980; Bhagwati, 2004; Rodrik, 1999) and so on. As argued by Tridico (2006), all the theoretical predictions which assume that a single specific factor makes some countries richer than others do not find consistent empirical confirmation.

Productivity

According to Paul Krugman (1994), “Productivity isn’t everything, but in the long run it is almost everything”. Over the longer term, economic growth will be determined primarily by the factors which determine productivity. The drivers of economic growth (such as access to credit facilities, labor, level of technology, etc.) are factors which either improves the quality of outputs, or the efficiency with which inputs are transformed into outputs. A strong and inclusive financial system; and availability of investable funds play vital roles in financing economic project and activities that would promote economic growth and development. This is because access to credit enhances the productive capacity of firms and enhances their potential to grow.

Role of Banks in Financial Intermediation

Besley and Bringham (2009) have clearly emphasized that the presence of intermediaries improves economic well-being. They further explained that financial intermediaries were created to fulfill specific needs of both savers and borrowers, and to reduce the inefficiencies that would otherwise exist if users of fund could get loans only by borrowing directly from savers.

Finance is required for different purposes by different people, organizations, and other economic agents. To provide the needed finance, there are varieties of institutions rendering financial services. Banks are among such institutions that render financial services.

They are mainly involved in financial intermediation, or indirect financing which involves channeling funds from the surplus unit to the deficit unit of the economy, thus transforming bank deposits into loans and credits.

There are businesses that have good ideas and business opportunities they would want to invest money in, but they do not have the money. They would be willing to borrow from the net savers who have idle funds. For this reason, these second groups are called net borrowers or the deficit unit of the economy. However, there are barriers that make it difficult for the borrowing to take place. And to remove this barrier, according to Anyanwaokoro, (1999:75) there is, therefore, a need for an intermediary who will play the role of bridging the gap between the net savers and net borrowers. This role is called financial intermediation. Financial intermediation is the role of channeling money from net savers who have idle funds to investors or borrowers who are in need of those funds. Against this backdrop, Nwanyanwu (2008), posits that the banking sector helps to make these credits available by mobilizing surplus funds from saver who have no immediate needs of such funds and thus channel such funds in form of credit to investors who have brilliant ideas on how to create additional wealth in the economy but lack the necessary capital to execute the ideas.

Financial Development and Growth

According to Demirgüç-Kunt and Levine (2008), the overall function of a financial system is to reduce information and transactions costs impeding economic activity, and its five core functions are to:

i). Produce ex-ante information about possible investments and allocate capital;
ii). Monitor investments and provide corporate governance after providing finance;
iii). Facilitate the trading, diversification and management of risk;
iv). Mobilize and pool savings; and
v). Ease the exchange of goods and services.

The efficiency of a financial system refers to how well a financial system performs the five core functions and financial development refers to an improvement in the efficiency of a financial system.

Financial development occurs when financial instruments, markets, and intermediaries ameliorate though do not necessarily eliminate – the effects of information, enforcement, and transactions costs and therefore do a correspondingly better job at providing the five financial functions. Thus, financial development involves improvements in the (i) production of ex ante information about possible investments, (ii) monitoring of investments and implementation of corporate governance, (iii) trading, diversification, and management of risk, (iv) mobilization and pooling of savings, and (v) exchange of goods and services. Let us now elaborate upon each of the five core functions so as to gain a clearer understanding of the nexus between financial development and economic growth.

Methodology

To collect data, we used time series covering the period from 1990 to 2014, using available information for Gross Domestic Product (GDP), Bank Credit to Private Sector (BCPS), Money supply (M2), Exports (X) and Consumer Price Index (CPI). The data were collected from some institutions like National Bank of Rwanda (BNR), World Bank sources, National Institute of Statistics of Rwanda (NISR). The study uses four independent variables: bank credit to the private sector (BCPS), money supply (M2), exports (X), consumer price index (CPI) and one dependent variable which is Gross Domestic Product (GDP) and are all measured in current local currency unit. All tests were run within Eviews 5. The previous empirical evidence has agreed upon the existence of a relationship between bank credit and growth of the economy. In order to investigate this relationship, we employed several analytical approaches. Secondly, we used econometrics methods to test the independence of all-time series.

Data Analysis

According to Gujarati (2003), it is important to test for stationarity before the attempt of any regression analysis using time series in order to avoid biased results from a spurious regression. In order to difference time series data to make it stationary the Augmented Dickey-Fuller t-statistic is used.

Here are the various cases of the test equation:

i). When the time series is flat (i.e. doesn't have a trend) and potentially slow-turning around zero, the following test equation is used:

$\Delta Z_t = \theta z_{t-1} + \alpha_1 \Delta z_{t-1} + \alpha_1 \Delta z_{t-2} + \ldots + \alpha_p \Delta z_{t-p} + \alpha_t$

Where the number of augmenting lags (p) is determined by minimizing the Schwartz Bayesian information criterion or minimizing the Akaike information criterion or lags are dropped until the last lag is statistically significant. EVIEWS allows all of these options to choose from.

The null hypothesis of the Augmented Dickey-Fuller t-test is H_o: $\Theta = 0$ (i.e. the data needs to be differenced to make it stationary) versus the alternative hypothesis of H_1: $\Theta < 0$ (i.e. the data is stationary and doesn't need to be differenced)

ii). When the time series is flat and potentially slow-turning around a non-zero value, the following test equation is used:

$\Delta Z_t = \alpha_0 + \theta z_{t-1} + \alpha_1 \Delta z_{t-1} + \alpha_2 \Delta z_{t-2} + \ldots + \alpha_p \Delta z_{t-p} + \alpha_t$

This equation has an intercept term in it but no time trend. Again, the number of augmenting lags (p) is determined by minimizing the Schwartz Bayesian information criterion or minimizing the Akaike information criterion or lags are dropped until the last lag is statistically significant. EVIEWS allows all of these options to choose from. We then use the t-statistic on the θ coefficient to test whether we need to difference the data to make it stationary or not.

The null hypothesis of the Augmented Dickey-Fuller t-test is:

H_o: $\Theta = 0$ (i.e. the data needs to be differenced to make it stationary) versus the alternative hypothesis of H_1: $\Theta < 0$ (i.e. the data is stationary and doesn't need to be differenced)

iii). When the time series has a trend in it (either up or down) and is potentially slow-turning around a trend line we would draw through the data, the following test equation is used:

$\Delta Z_t = \alpha_0 + \theta z_{t-1} + \gamma_t + \alpha_1 \Delta z_{t-1} + \alpha_2 \Delta z_{t-2} + \ldots + \alpha_p \Delta z_{t-p} + \alpha_t$

Notice that this equation has an intercept term and a time trend. Again, the number of augmenting lags (p) is determined by minimizing the Schwartz Bayesian information criterion or minimizing the Akaike information criterion or lags are dropped until the last lag is statistically significant. EVIEWS allows all of these options to choose from. We then use the t-statistic on the θ coefficient to test whether we need to difference the data to make it stationary or we need to put a time trend in the regression model to correct for the variables deterministic trend.

The null hypothesis of the Augmented Dickey-Fuller t-test is: H_o: $\Theta = 0$ (i.e. the data needs to be differenced to make it stationary) versus the alternative hypothesis of: H_1: $\Theta < 0$ (i.e. the data is trend stationary and needs to be analyzed by means of using a time trend in the regression model instead of differencing the data).

The Number of Augmenting Lags

As stated above the number of augmenting lags (p) is determined by minimizing the Schwartz Bayesian information criterion or minimizing the Akaike Information Criterion.

Table 1 : Choice of the Number of Lags for LGDP

	Trend and intercept		Intercept		None	
P	AIC	SCHWARTS	AIC	SCHARTS	AIC	SCHARTS
10	**-7.48 ***	-6.89	-5.43	-4.88	-4.29	-3.78
9	-5.47	-4.9	-3.87	-3.35	-3.93	-3.46
8	-5.11	-4.58	-1.57	-1.27	-1.48	-1.23
7	-3.09	-2.7	-0.29	-0.19	-0.37	-0.32
6	-3.09	-2.7	-1.57	-1.27	-1.48	-1.23
5	-3.09	-2.7	-1.57	-1.27	-1.48	-1.23
4	-0.68	-0.53	-1.57	-1.27	-1.48	-1.23
3	-0.84	-0.54	-0.29	-0.19	-0.37	-0.32
2	-0.68	-0.53	-0.29	-0.19	-0.37	-0.32
1	-0.68	-0.53	-0.29	-0.19	-0.37	-0.32
0	-0.68	-0.53	-0.29	-0.19	-0.37	-0.32

P= 10

Table 2: Choice of the number of lags for LBCPS

	Trend and intercept		Intercept		None	
P	AIC	SCHARTS	AIC	SCHARTS	AIC	SCHARTS
10	**0.62***	1.21	3.9	4.38	3.34	3.54
9	3.19	3.49	3.4	3.5	3.34	3.54
8	2.89	3.04	3.37	3.62	3.34	3.54
7	2.89	3.04	3.37	3.62	3.34	3.54
6	2.89	3.04	3.37	3.62	3.34	3.54
5	2.89	3.04	3.37	3.62	3.34	3.54
4	2.89	3.04	3.37	3.62	3.34	3.54
3	2.89	3.04	3.37	3.62	3.34	3.54
2	2.89	3.04	3.4	3.55	3.44	3.59
1	2.89	3.04	3.4	3.55	3.39	3.49
0	2.89	3.04	3.4	3.5	3.54	3.59

P= 10

Table 3: Choice of the Number of Lags for LM2

	Trend and intercept		Intercept		None	
P	AIC	SCHWS	AIC	SCHARTS	AIC	SCHARTS
10	-1.73	-1.43	-2.38	-1.9	-1.43	-1.38
9	-1.73	-1.43	-2.38	-1.9	-1.43	-1.38
8	-1.91	-1.57	-2.38	-1.9	-2.48	**-2.48***
7	-1.91	-1.57	-1.2	1	-1.43	-1.38
6	-1.82	-1.68	-1.35	-1.25	-1.43	-1.38
5	-1.82	-1.68	-1.35	-1.25	-1.43	-1.38
4	-1.82	-1.68	-1.59	-1.29	-1.61	-1.36
3	-1.73	-1.43	-1.32	-1.17	-1.41	-1.31
2	-1.82	-1.68	-1.32	-1.17	-1.41	-1.31
1	-1.82	-1.68	-1.32	-1.17	-1.41	-1.31
0	-1.82	-1.68	-1.35	-1.25	-1.43	-1.38

P= 8

Table 4: Choice of the number of lags for LX						
	Trend and intercept		Intercept		None	
P	AIC	SCHARTS	AIC	SCHARTS	AIC	SCHARTS
10	**-11.88***	-11.29	-4.89	-4.34	-4.61	-4.11
9	-0.24	-0.71	0.006	0.4	-0.1	0.24
8	-0.11	-0.28	0.25	0.34	0.16	0.21
7	-0.0952	-0.35	0.25	0.5	0.16	0.36
6	-0.05	0.099	0.25	0.5	-0.1	0.24
5	-0.05	0.099	0.25	0.5	0.16	0.36
4	-0.05	0.099	0.25	0.5	0.16	0.36
3	-0.26	-0.01	0.25	0.5	0.16	0.36
2	-0.05	0.099	0.25	0.34	0.16	0.21
1	-0.05	0.099	0.25	0.34	0.16	0.21
0	-0.05	0.099	0.25	0.34	0.16	0.21

P= 10

Table 5: Choice of the number of lags for LCPI

	Trend and intercept		**Intercept**		**None**	
P	AIC	SCHWARTS	AIC	SCHARTS	AIC	SCHARTS
10	**-5.35***	-4.76	-4.07	-3.55	-0.93	-0.83
9	-4.58	-4.01	-3.76	-3.32	-0.93	-0.83
8	-1.35	-1.05	-3.47	-3.08	-3.4	-3.05
7	-1.2	-1	-3.76	-3.32	-0.59	-0.34
6	-1.35	-1.05	-1.05	-0.75	-0.59	-0.34
5	-1.35	-1.05	-1.05	-0.75	-0.59	-0.34
4	-3.34	-2.99	-1.21	-1.18	-1.04	-0.99
3	-1.2	-1.05	-1.22	-1.12	-1.04	-0.99
2	-1.2	-1.05	-1.22	-1.12	-1.04	-0.99
1	-1.2	-1.05	-1.22	-1.12	-1.04	-0.99
0	-1.2	-1.05	-1.22	-1.12	-1.04	-0.99

P= 10

Data and Stationarity Test

The study used yearly data. The time series data used ranged from 1990-2014. All data was subjected to unit root tests to detect the integration order of each series. We used ADF tests methods. Table 1 summarizes the outcome of the ADF tests on all five variables in this study. The null hypothesis tested is that the variable under investigation has a unit root against the alternative

that it does not. On level, the null hypothesis that each variable has a unit root cannot be rejected by ADF tests.

Unit Root Test Results

Table 6. Augmented Dickey Fuller test (at level)

Variable	Deterministic structure	ADF-calculated	ADF-critical			Conclusion
			10%	5%	1%	
	Trend & Intercept	-2.86	-3.34	-3.79	-4.8	Nonstationary
	Intercept	-1.33	-2.69	-3.099	-4	
LGDP	None	3.2	-1.6	-1.97	-2.74	
	Trend & Intercept	-2.16	-3.34	-3.79	-4.8	Stationary
	Intercept	-1.34	-2.67	-3.07	-3.92	
LBCPS	None	**-1.7**	-1.61*	-1.95	-2.68	
	Trend & Intercept	-2.66	-3.27	-3.66	-4.5	Nonstationary
	Intercept	-1.22	-2.67	-3.06	-3.92	
LM2	None	-3.07	-1.6	-1.96	-2.72	
	Trend & Intercept	**-35.05**	-3.34*	-3.79*	-4.8*	Stationary
	Intercept					
LX	None					
	Trend & Intercept	-1.57	-3.34	-3.79	-4.8	Nonstationary
	Intercept	-2.13	-2.68	-3.08	-3.96	
LCPI	None	-2.01	-1.61	-1.96	-2.67	

Given that LBCPS and LX ADF computed is less than ADF critical value, these variables are stationary at level and for LGDP, LM2 and LCPI, ADF calculated is less than ADF-Critical, these variables are not stationary at level and the null hypothesis H_0 stipulated that the variable under investigation has a unit root against the alternative that it does not is accepted and we should apply the first difference.

Table 7: Augmented Dickey Fuller test (at First Difference)

Variable	Deterministic structure	ADF-calculated	ADF-critical			Conclusion
			10%	5%	1%	
LGDP	Trend & Intercept					Nonstationary
	Intercept	-2.06	-2.7	-3.12	-4.06	
	None	-0.39	-1.6	-1.97	-4.06	
LM2	Trend & Intercept					I (1)
	Intercept	-4.04	-2.64*	-3*	-3.77*	
	None					
LCPI	Trend & Intercept					Nonstationary
	Intercept					
	None	-0.41	-1.6	-1.97	-2.73	

Since ADF calculated for LM2 is less than ADF-critical value, LM2 is stationary after the first difference (I(1)) and as LGDP and LCPI ADF calculated is greater than ADF- critical, LGDP and LCPI are not stationary after first difference and we should apply the second difference.

Table 12: Augmented Dickey Fuller test (at Second Difference)

Variable	Deterministic structure	ADF-calculated	ADF-critical			Conclusion
			10%	5%	1%	
LGDP	Trend & Intercept					I(2)
	Intercept					
	None	-2.62	-1.6*	-1.97*	-2.75*	
LCPI	Trend & Intercept					I(2)
	Intercept					
	None	-5.59	-1.61*	-1.96*	-2.68*	

Co-integration test

Dependent Variable: LGDP
Method: Least Squares
Date: 10/16/16 Time: 12:55
Included observations: 25
Sample: 1990 2014

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBCPS	0.002056	0.021662	0.094906	0.9253
LM2	0.374430	0.217063	1.724981	0.1000
LX	0.417497	0.129653	3.220113	0.0043
LCPI	0.103856	0.117644	0.882802	0.3878
C	6.993688	2.268873	3.082450	0.0059
R-squared	0.992916	Mean dependent var		27.6069
AdjustedR-squared	0.991499	S.D. dependent var		1.07574
S.E. of regression	0.099187	Akaike info criterion		-1.60679
Sum squared resid	0.196760	Schwarz criterion		-1.36294
Log likelihood	25.08461	F-statistic		700.781
Durbin-Watson stat	1.875092	Prob(F-statistic)		0.00000

1.Estimation of the model

$LGDP_t = \beta_0 + \beta_1 BCPS_t + \beta_2 LM2_t + \beta_3 LX_t + \beta_4 LCPI_t + \mathcal{E}_t$

Estimated model:

$LGDP_t$= 6.993688+ 0.002056 **$LBCPS_t$** + 0.374430**LM_{2t}** + 0.417497**LX_t** + 0.103856**CPI_t** + **ε_t**

Probability: (0.93) (0,1) (0.0043) (0.3878)

n=25

R^2 = 0.992916

Adjusted R^2 = 0.991499

1. Interpretation of results

A. Interpretation of coefficients $\beta_1, \beta_2, \beta_3, \beta_4$

1. β_1= 0.002, for BCPS the probability is 0.93 which is greater than the level of 5% i.e in the long run the impact of bank credit to private sector on economic growth in Rwanda is not statistically significant. Thus the alternative hypothesis is rejected
2. The probability of 0.1 for M2 which is not greater than 10% means that in the long run the impact of money supply (M2) on economic growth in Rwanda is statistically significant at 10% level. When money supply increases by 1 unit, the Gross domestic product increases by 0.374 unit.
3. As the probability of X (0.0043) is less than 5%, there is a long run relationship between exports and economic growth. When exports increase by 1 unit GDP increases by 0.417 unit.
4. As the probability of CPI (0.3878) is greater than 5%, the impact of consumer price index on economic growth is not statistically significant.

B. Interpretation of R-squared

R^2 is the summary measure that tells how well the sample regression line fits the data. From the model above, R^2 of 0.99 means that in the long run 99% variation in Gross Domestic Product was explained by Credit to private sector, Money supply, exports and consumer price index and the remaining 1% was explained by variables not included in the model.

C. Interpretation of Adjusted R-squared

The Adjusted R-squared (0.991499) take account of more number of regressors if included and it still explains 99 % variation in the dependent variable.

D. Interpretation of Durbin-Watson statistic

As mentioned in table 3 with dl =0.832 and du= 1.521, we have du < d < 4 – du ⇒1.521 < 1,875092< 4 - 1,875092, with "dl" and "du" the lower and upper critical values (read from the table) and "d" the DW calculated, there is no autocorrelation.

Stationarity of Residuals

Null Hypothesis: R has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on AIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.552462	0.0001
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10%level	-1.608793	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(R)
Method: Least Squares
Date: 10/18/16 Time: 02:23
Sample (adjusted): 1991 2014
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
R(-1)	-0.943260	0.2 7 98	-4.552462	0.0001
R-squared	0.473770	Mean dependent var		-0.00252
Adjusted R-squared	0.473770	S.D. dependent var		0.12667
S.E. of regression	0.091858	Akaike infocriterion		-1.89630
Sum squared resid	0.194070	Schwarz criterion		-1.84724
Log likelihood	23.75656	Durbin-Watson stat		1.96862

With the ADF of – 4.552462 (lesser than -1.955681) we can conclude that residuals from the long-run equation are integrated of order zero, I (0), at 5% level of significance. Therefore, there is co-integration (long run relationship) amongst LGDP, LBCPS, LM2, LX and LCPI.

Error Correction Model

$\Delta LGDPt = \alpha Rt\text{-}1 + \Delta BCPSt + \Delta LM2t + \Delta LXt + \Delta LCPIt + \mathcal{E}t$

Dependent Variable: D(LGDP)
Method: Least Squares
Date: 10/16/16 Time: 14:20
Sample (adjusted): 1991 2014
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
R(-1)	-0.98460	0.262453	-3.751720	0.0014
D(LBCPS)	0.00242	0.014521	0.169531	0.8672
D(LM2)	0.55123	0.219976	2.505927	0.0215
D(LX)	0.29325	0.092284	3.178196	0.0050
D(LCPI)	0.02267	0.226826	0.100020	0.9214
R-squared	0.80208	Mean dependent var		0.13454
Adjusted Rsquared	0.76035	S.D. dependent var		0.19676
S.E. of regression	0.09635	Akaike info criterion		1.65913
Sum squared resid	0.17622	Schwarz criterion		1.41365
Log likelihood	24.90948	Durbin-Watson stat		1.98628

$\Delta LGDP_t = \alpha R_{t-1} + \Delta BCPS_t + \Delta LM2_t + \Delta LX_t + \Delta LCPIt + \mathcal{E}_t$

$\Delta LGDP_t = -0.98R_{t-1} + 0.002\Delta BCPS_t + 0.55\Delta LM2_t + 0.29\ \Delta LX_t + 0.022\Delta LCPI_t + \mathcal{E}_t$

Probability (0.0014) (0.8672) (0.0215) (0.005) (0.9214)

Interpretation of Results

The coefficient α = - 0,98 and the probability is 0.0014 less than 5%, error correction term correct disequilibrium of the system and the speed of adjustment of the disequilibrium is 98%. The sign is negative and is significant because the probability is less than 5%.

For $\Delta BCPS_t$, as the probability equals to 0.8672 > 5% this shows that in short run the impact of bank credit to private sector on economic growth is not statistically significant.

For DLM_2, as the probability equals to 0.0215 < 5% this shows that in short term the impact of money supply (M2) on economic growth is statistically significant. If money supply (M2) increases by 1-unit economic growth increases by 0.55 units in short term.

For DLX, as the probability equals to 0.005 < 5% this shows that in short term run there is relationship between exports (X) and economic growth. If exports increases by 1 unit GDP increases by 0.29 units in short term all other things remaining the same.

For DLIPC, as the probability equals to 0.9214 > 5% this shows that in short run the impact of consumer price index (CPI) on economic growth is not statistically significant.

From the model above, R^2 of 0.80 means that in the short run 80% variation in Gross Domestic Product was explained by Credit to private sector, Money supply, exports and consumer price index and the remaining 20% was explained by variable not included in the model.

Conclusions and Recommendations

In order to know the short run relationship between dependent and independents variables of our study, we used Error correction model and the chapter ended by the specification of our model.

The chapter four was about the presentation and analysis of empirical findings. It was necessary to include other variables in the models based on the relationship they can have with the dependent variables based on extensive literature review. Those variables were such as money supply (M2), exports (X) and consumer price index (CPI).

As the model was specified derived from the analytical model of Cevic and Rahmat (2008), which examined the finance-growth nexus in Libya the following step was the stationarity test for individual time series data for them to be assured if there are co-integrated. This has been achieved using Augmented dickey-fuller tests of unit roots. The test showed that Gross Domestic Product (GDP), Money supply (M2) and consumer price index (CPI) were no stationary at levels but Money supply (M2) became stationary after first differencing while Gross Domestic Product (GDP)) and consumer price index (CPI) became stationary after the second differencing. Concerning bank credit to private sector (BCPS) and exports (X), they were stationary at level.

The study shows that in the long run as well as in the short run, as the probability for bank credit to private sector (0.93) and the Consumer Price Index (0.3878) are greater than 0.05 the impact of bank credit to private sector on economic growth as well as the impact of Consumer Price Index on economic growth is not statistically significant. Concerning money supply and exports in the long run as well as in the short run, their impact on economic growth is statistically significant as their respective probability are 0.1 and 0.0043 respectively less than 0.1 and 0.05 and in the short run their respective probability are 0.0215 and 0.005 less than 5%. Serial correlation test was performed on the residuals to ensure that residuals were well behaved. Once the residuals are serially correlated and have no constant error variance, it may indicate that the model is not efficient and parameters estimated could be biased. These diagnostic tests showed that there is no autocorrelation.

Recommendations

The government of Rwanda through Ministry of Finance should device a means of compelling banks to channel credit facilities to the private investors on soft terms, i.e. making banks to channel reasonable percentage of their credit to private investors and encourage people to save as it forms the basis for credit accumulation for investment. This can be done by making savings attractive through increased interest on savings which is currently very low. On the other hand, the National Bank of Rwanda (BNR) should organize sensitization Programmes to private sectors on both the benefits of and pre-conditions for accessing credit facilities; and encourage rural banking and also encourage credit on priority areas of the economy which will help to develop these sectors. Such credit should be monitored to its full implementation to avoid diversion. Furthermore, rural banking scheme should be established so as to provide credit facilities to encourage micro-private business in the rural areas.

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