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Original Article

Effects of Domestic Credits, Personal Remittances & Population Growth on Inflation in Rwanda

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Abstract *- This paper investigates the long-run relationship between domestic credits, population growth, and personal remittances received, and inflation in Rwanda using Johansen Co-integration analysis and Error Correction Model (ECM). According to the results of the analysis, it was realized that there is a long-run relationship between domestic credits, population growth, personal remittances received, and Inflation. The government of Rwanda is advised to emphasize its credit control policy, to reinforce its population control policy, and to guide remittances from consumption motives to investment motives which can enhance economic growth. These practices should contribute more to decreasing the inflation rate in Rwanda.*

Keywords *- Co-integration, Error Correction Model, Domestic credits, Personal remittances, and Inflation.*

I. INTRODUCTION

It has been theoretically argued that domestic credits, population growth, and personal remittances received to play a crucial role in increasing the inflation rate. The theoretical and empirical studies also concentrate on the importance of domestic credits and personal remittances on the standard of living of people in different countries.

Inflation has been a macroeconomic problem in the economy of Rwanda, especially in 1984 (15.8%), in 1995 (51.2%), in 1997 (15.6%), in 2003 (21.9%), and in 2008 (14.2%), World Bank (2018). Inflation in Rwanda has been influenced by many factors, including famine caused by an increase in the general world price. Rwanda being an import-based economy, suffered in the 80s and other politico-economic problems resulted from war and genocide in the 90s and its after-mouth (Ruzima, 2015). The current study focuses on domestic credits, population growth rate, and personal remittances received in Rwanda.

Domestic credits and personal remittances are seen as an engine of economic and social development for a number of reasons, including increasing the purchasing power and capital to start a business. In Rwanda, from 1980 to 2018, there was an increase in domestic credits provided by commercial banks, there was an increase in population growth as well as an increase in personal remittances received (World Bank, 2018).

Therefore, the aim of this paper is to econometrically investigate the long-run relationship between domestic credits, population growth, and personal remittances, and inflation rate in Rwanda, using time series data for the period 1980-2018. Particularly, this work aims to empirically quantify the effect of domestic credits, population growth, and remittances received on inflation.

The paper is organized in the following ways. In section two consists of the review of related literature. Section three presents the Methodology detailing; Model Specification and data used. Section four focused on the empirical results and findings interpretation. Ultimately, Section five shows the conclusion and policy recommendation.

II. LITERATURE REVIEW

Since last decades different studies have been conducted on domestic credits, population growth, personal remittances, and Inflation. A variety of studies show almost the same results about the relationship between these variables. Though, they were conducted in different countries using different econometric techniques. About literature review scope, this study literature is limited to studies that focus on the univariate model's impact of Domestic credits, population

growth, and personal remittances received on Inflation. The Means that there was no other study that used a multivariate model. Below are some empirical studies conducted in different countries with the same variables.

(Antzoulatos, 1996) and (Ludvigson 1999) conducted their research in the USA using a Non-linear dynamic model to test the relationship between bank lending and inflation. They found out that Bank lending to the private sector is positively related to inflation.

(Bacchetta and Gerlach, 1997) Did their study on the USA, Canada, the U.K, Japan, and France use Kalman filtering techniques, and they found out that fall in credit extension is negatively related to inflation?

(Debelle, 2004) study on using the co-integration technique for the USA, Australia time series confirmed that the Banks credits that are uncontrolled give rise to inflationary pressures and weaken monetary policy in the long run.

(Younus, 2017) study on Bangladesh's time series using VAR and Granger causality, and he found out that the credits provided to private sectors are inflationary.

(Muto, Oda, and Sudo, 2016) studied the demographic effect on inflation using the full-fledged overlapping generations model and found that demographics have affected negatively on inflation.

(Lee, Qingjun, and Syed, 2013) conducted their study on the effect of demographic change on inflation in china using a Forward-looking and dynamic approach; they found out that demographic changes affect inflation positively.

(Abdul-Mumuni and Quaidoo, 2016) Used Co-integration techniques and VECM to find out the long-run relationship between personal remittances, CPI, and inflation, and they found out that in the long-run Personal remittances increase CPI and inflation in general.

(Iqbal, Nosheen, and Javed, 2004); conducted a study on the relationship between Personal remittances increased CPI and WPI using Co-integration techniques and VECM, and they found out that Personal remittances increase CPI and WPI in Pakistan under flexible exchange rate in Pakistan.

(Khan and Islam, 2013) studied the relationship between remittances and inflation in Bangladesh, and they showed that an increase in remittances (1%) rises inflation (2.48%) in the long run, but variables have no relationship in the short run. (Abosedra and Fakih, 2017) conducted an empirical study on the long-run relationship between remittances and inflation in Lebanon using Co-integration techniques and VECM, and the results indicated a long-run relationship between remittances and inflation in Lebanon but not in the short run. Based on the above empirical results, there is a need to conduct a multivariate model for further reference.

III. DATA AND METHODOLOGY

A. *Data*

The analysis utilized in this study coats the annual time series of 1980 to 2018 in Rwanda. The data set entails observation for Inflation (GDP deflator, annually), Domestic credits (currency, US$), Population growth rate (%, annually), and Personal remittances (currency US$). All data set have been brought from World Bank Indicators.

B. *Methodology*

We operated the stationarity test, which is aimed to firstly set up the degree of integration of each variable. As well as all the variables were not integrated into the level, we conducted the first difference, and all variables were stationary into the first difference. Our estimation was based on the co-integration analysis and ECM. The co-integration test and ECM have shown that there is a long-run relationship between variables. The results have shown that all independent variables are influencing the dependent variable positively.

a. *Model Specification*

GDP deflator$_t$ = f (Domestic, credits, population, personal remittances,….)

(1) Or $Y_t = f(X_1, X_2, X_3,\ldots)$

The function transformation has the following form:

$$\log(\text{GDP deflator})_t = \beta_0 + \beta_1 \log(\text{Domestic credits})_t + \beta_2 \log(\text{Population})_t + \beta_3 \log(\text{Personal remittances})_t + \mu_t$$

$$(2)\ \log(Y)_t = \beta_0 + \beta_1 \log(X_1)_t + \beta_2 \log(X_2)_t + \beta_3 \log(X_3)_t + \mu_t$$

In this position;
Y_t: Inflation rate expressed in terms of GDP deflator
X_{1t}: Domestic credits in period t
X_{2t}: Population growth rate in period t
X_{3t}: Personal remittances received in period t
β_0 = The Intercept.
β_1, β_2, β_3, and β_4 = the coefficient of the model of regression.
μ_t= Error term at period t.

IV. EMPIRICAL ANALYSIS

The analysis of this study starts by testing for the existence of unit root using augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests. The followed by co-integration tests, ECM, and Diagnostic tests.

A. *Unit Root Test: Augmented Dickey-Fuller and Philips-Peron Test*

In conducting unit root test, the hypotheses were the followings:

H_0: There is no unit root;
H_1: There is a unit root

There are different ways or techniques to test stationarity in the series of data, such as the Augmented Dickey-Fuller test (ADF test), Philips-Peron test (PP test), Dicker Fuller GLS (ERS) test, Kwiatkowski-Philipps-Schin-shin test, Elliot-Rothenberg-Stock point-optimal test, Ng-Perron test, etc. We have chosen the ADF test and PP test because they are best for every observation, and the ADF test is valid in large samples; it is based on linear regression, and it solves the issue of serial correlation. PP test was conducted to approve the ADF test.

The ADF tests follow these rules:

When $ADF_{cal} < ADF_{crit}$: There is no unit root and $\delta<0$ when $ADF_{cal} > ADF_{crit:}$ There is unit root and $\delta>0$. At the same time, to test the unit root by the Philips-Peons (PP) test. We follow the rules below:

When the $PP_{cal} < PP_{crit}$: There is no unit root and When the $PP_{cal} > PP_{crit}$: There is a unit root.

Table 1. Test of Stationarity at level

Variables	ADF		PP		Conclusion
	Test Statistic	Probability	Test Statistic	Probability	
Y	-4.36769	0.3012	-4.38645	0.2011	Non-stationary
X_1	0.672875	0.9993	0.56387	0.9991	Non-stationary
X_2	-3.43479	0.0656	-2.4144	0.3667	Non-stationary
X_3	-0.89403	0.9463	-0.2423	0.9896	Non-stationary

Source: Authors' computation using E-views.

An investigation of properties of time series data using ADF and PP tests shows that all variables Y (Inflation, expressed in GDP deflator), X1: Domestic credits, X2: Population growth, and X3: Personal remittances received) are non-stationary in level, i.e at I(0). For this reason, we have tested the stationarity of those variables in the first difference at all levels (1%, 5%, and 10%) (Table 1). For this reason, we need to conduct a stationarity test at first difference.

Table 2. Test of Stationarity at First Difference

Variables	ADF		PP		Conclusion
	Test statistic	Probability	Test statistic	Probability	
Y	-4.56864	0.0012	-4.47535	0.0011	Stationary
X_1	-4.49300	0.0478	-4.12056	0.0001	Stationary
X_2	-4.59300	0.0078	-4.34690	0.0098	Stationary
X_3	-7.16691	0.0000	-11.6420	0.0000	Stationary

Source: Authors' computation using E-views.

The results in table 2 show that all variables are stationary after the first difference I(1) at all levels (1%, 5%, and 10%), then we move to the co-integration test.

B. VAR Lag Order Selection Criteria

Provided that the order of integration of the studied series is in first differentials, we have to determine the co-integration between those variables. But before to finish this, we have to apply the VAR Lag order selection criteria method. The following table establishes the VAR Lag Selection Criteria.

Table 3. VAR Lag Order Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-133.7489	NA*	104.395	7.486049	7.5300*	7.50140
1	-132.1555	3.009746	101.02*	7.4530*	7.541055	7.4837*
2	-131.9944	0.295355	105.868	7.499688	7.631647	7.54574
3	-131.9680	0.046944	111.812	7.553776	7.729723	7.61518

Source: Authors' computation using E-views.

Usually, the maximum lags are determined by using AIC or SC with a condition of the smaller the value of an information criterion, the better the results (7.453082*<7.530035*), i.e., AIC. The findings of the VAR lag selection criteria in table 3 show that the number of delays chosen is equal to 1.

C. Johansen Co-integration Test

In conducting a co-integration test, the hypotheses were the followings:

H_o: There is no co-integration among variables,

H_1: There is co-integration among variables.

Table 4. Co-integration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.83397	114.717	47.85613	0.0000
At most, 1 *	0.53542	28.2804	29.79707	0.0001
At most, 2 *	0.38563	16.9151	19.49471	0.0101
At most 3	0.04979	1.88996	3.841466	0.1692

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.833972	66.43709	27.58434	0.0000
At most 1 *	0.535424	20.36531	21.13162	0.0040
At most 2 *	0.385636	16.02521	18.26460	0.0121
At most 3	0.049798	1.889969	3.841466	0.1692

Source: Authors' computation using E-views, 2020

The findings indicated by table 4 showed that the trace test and Max-eigenvalue test indicate the existence of one cointegrating equation at a 5% level of significance. Thus, the four variables in the model have a long-run equilibrium relationship among them.

V. ESTIMATION OF THE LONG-RUN EQUATION

After conducting all the above tests, it is evident that there is linearity, there is no multicollinearity, there is no autocorrelation, there is no heteroscedasticity, there is no instability of parameters, and there is no problem in model specification. Therefore, after showing that there is a long-run relationship between variables, the study goes on to proceed with a long-run estimation of the equation.

Table 5. Estimation of the Long-run Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(X_1)	0.768960	0.140673	4.61718	0.0014
LOG(X_2)	0.581415	0.165736	3.03522	0.0045
LOG(X_3)	0.548339	0.077427	2.88473	0.0445
C	1.752759	2.033519	3.32072	0.0021

R-squared	0.848147	Mean dependent var	2.745894
Adjusted R-squared	0.763703	S.D. dependent var	0.55612
S.E. of regression	0.502452	Akaike info criterion	1.55828
Sum squared resid	8.836014	Schwarz criterion	1.72890
Log-likelihood	-26.38645	Hannan-Quinn criteria.	1.61949
F-statistic	3.850552	Durbin-Watson stat	1.89575
Prob(F-statistic)	0.007573		

Source: Authors' computation using E-views, 2020

Table 5 provides the long-run estimation of the relationship between Inflation (Y), domestic credits (X_1), population growth (X_2), and personal remittances received (X_3). From the results of regression, the following is the estimated form of the model:
(3) LOG(Y) = 1.752759 + 0.768960*LOG(X_1) + 0.581415*LOG(X_2) + 0.548339*LOG(X_3)

VI. DISCUSSIONS ON THE RESULTS FROM ESTIMATED LONG-RUN EQUATION

These discussions give an interpretation of the regression results got from OLS estimation as given in appendices the table 5. We have to discuss the issues like F-statistic, R-Squared, regressors coefficients, and the constant term.

A. F-statistic

The findings indicated that F-statistic has a probability of 0.007573, which is less than the P-Value (0.05). This shows that the regression model is statistically significant at a 5 % level of significance.

Davidson and McKinnon (1999) argue that the above statistically significant results show that the regression model is true and does not occur randomly.

B. R-Squared (R^2)

R-squared (R^2) explains how best the model fits the data (Maddala and Kajal, 2009). The R^2 value (0.848147) shows that 84.81% of the variation in the regressand/dependent variable (Inflation) is explained by the regressors (Domestic credits, population growth, and personal remittances). This means that the remaining 15.19% of the changes in Inflation are explained by other factors outside the model. But in general, the above R^2 shows that the regression model has a very high explanatory power.

C. Domestic Credits (X_1) Coefficient

The long-run estimation results indicate that Domestic credits have a coefficient of 0.768960, which is also statistically significant at a 5% level of significance, i.e., it has a smaller p-value (0.0014) relative to the critical value (0.05). This implies that a 1% increase in Domestic credits leads to a 0.768960 percent increase in the level of Inflation, and this relationship is true.

The positive relationship between the Domestic credits and Inflation is also supported by general macroeconomic theory. Macroeconomics theory argues that an increase in the level of domestic credits from commercial banks leads to an increase in the Inflation rate as well as commercial banks credits increase the quantity of money in circulation (Parkin, 2012). From these findings, it is clearly indicated that the increased inflation rate in Rwanda is influenced by a very big amount of commercial banks credits provided to citizens. The government of Rwanda has to control the money supply by reinforcing a credit control policy.

D. Population Growth (X_2) Coefficient

The long-run equation results indicate that population growth has a coefficient of 0.581415, which is also statistically significant at a 5% level of significance, i.e., it has a smaller p-value (0.0045) relative to the critical value (0.05). This implies that a 1% increase in Domestic credits leads to a 0.581415 percent increase in the level of Inflation, and this relationship is true.

The positive relationship between Population growth and Inflation is also supported by general macroeconomic theory. Macroeconomics theory argues that an increase in the level of population growth rate leads to an increase in Inflation rate as well as population growth increases aggregate demand Rausch 2009.

From these findings, it is clearly indicated that the increased inflation rate in Rwanda is influenced by an increase in population. The government of Rwanda has to control the population growth rate by reinforcing family planning policy and migration policy.

E. Personal Remittances Received (X_3) Estimated Coefficient

The long-run estimation equation results indicate that personal remittances received have an estimated coefficient of 0.548339, which is also statistically significant at a 5% level of significance, i.e., it has a smaller p-value (0.0445) relative to the critical value (0.05).
This implies that a 1% increase in Personal remittances received leads to a 0.548339 percent increase in the level of Inflation and this relationship is true.

The positive relationship between the Personal remittances received, and Inflation is also supported by general macroeconomic theory. Macroeconomics theory argues that an increase in the level of Personal remittances received leads to an increase in the Inflation rate as well as increases the quantity of money in circulation (Anum Nisar Saira Tufail, 2013).

From these findings, it is clearly indicated that the increased inflation rate in Rwanda is influenced by an increase in personal remittances received. The government of Rwanda has to control personal remittances received by reinforcing the personal remittances received policy in Rwanda.

F. The Constant Term

The above results show that the constant term has a positive value, and it is statistically significant at a 5% level of significance, i.e., P-value (0.0021) is less than the critical value (0.05). This implies that when the values of the

explanatory variables (Domestic credits, population growth, and personal remittances) are equal to Zero, Inflation will be 1.752759. In other words, the value of the constant term gives the Y-intercept value of the estimated regression model.

VII. ESTIMATION OF THE SHORT-RUN MODEL

After proving co-integration, the following step is estimating the short-run model. Error correction model estimates the speed at which the explained variable returns to equilibrium after a change in the explanatory variable. The following table estimates Error Correction Model. The results are presented in Table 6.

Table 6. Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.861274	1.191941	3.990	0.0182
DLX_1	0.350180	789.5035	2.902	0.0155
DLX_2	0.401947	335.6912	6.538	0.0013
DLX_3	0.346395	625.4986	2.621	0.0470
R-squared	0.722812	Mean dependent var		28.325
Adjusted R-squared	0.701061	S.D. dependent var		19.233
S.E. of regression	280.3738	Akaike info criterion		6.4169
Sum squared resid	393047.3	Schwarz criterion		6.9682
Log-likelihood	-67.08489	Durbin-Watson stat		1.9034
R-squared	0.722812			

Source: Authors' computation using E-views, 2020

The findings in table 6 indicated that The Error Correction Coefficient (RESID (-1)) = - 0.861274 is negative and statistically significant as its probability is 0.018. This implies that 86% of any disequilibrium among variables will be corrected in one year. It means that 100% of errors will be corrected in 1 year, 1 month, and 27 days.

VIII. DIAGNOSTIC TESTS

A diagnostic test is a process used to make sure if the economic model is working as it should. The estimators of the model should be BLUE (Best Linear Unbiased Estimator). To be sure if the model is working as it should, a Residual test and Stability test have to be performed.

A. Heteroskedasticity Test

In conducting heteroskedasticity test, the hypotheses were the followings:
H_0: No heteroskedasticity,
H_1: Existence of heteroskedasticity.
Below table 7 presents the results of the heteroskedasticity Test.

Table 7. Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.331178	Prob. F(3,35)	0.279
Obs*R-squared	0.894197	Prob. Chi-Square(3)	0.262
Scaled explained SS	0.370212	Prob. Chi-Square(`3)	0.146

Source: Authors' computation using E-views, 2020

From table 7, As well as the Obs*R-squared 0.89 is higher than 0.1 level of significance or 10% level of significance, we accept H_0 and H_1 is rejected. Then, it is evident that error term variance is constant; we have homoscedasticity.

B. Serial Correlation Test

In conducting serial correlation test, the hypotheses were the followings:

H_1: There is a serial correlation
H_0: There is no serial correlation.

Table 8. Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.058826	Prob. F(2,33)	0.9430
Obs*R-squared	0.738550	Prob. Chi-Square(2)	0.9331

Source: Authors' computation using E-views, 2020

According to table 8, as well as Obs*R-squared 0.73 is higher than 10% level of significance, we accept H_0 and reject H_1, then there is no serial correlation.

C. *Test for Autocorrelation (Correlogram-Q-Statistic)*

The autocorrelation describes the correlation between values of the process at different times. It is said to occur when the error value at a different time is positively correlated.
In conducting a test of autocorrelation, the hypotheses were the followings:
H_0: There is no autocorrelation of errors,
H_1: There is the autocorrelation of errors.

Table 9. Correlogram Test for Autocorrelation

Autocorrelation	Partial Correlation	N_0	AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.057	0.057	0.1355	0.713
. | . |	. | . |	2	-0.012	-0.015	0.1417	0.932
.*| . |	.*| . |	3	-0.108	-0.107	0.6612	0.882
**| . |	**| . |	4	-0.257	-0.248	3.6725	0.452
. | . |	. | . |	5	-0.052	-0.035	3.7972	0.579
. | . |	. | . |	6	0.018	0.004	3.8126	0.702
.*| . |	**| . |	7	-0.153	-0.223	4.9876	0.661
. |*. |	. |*. |	8	0.166	0.116	6.4049	0.602
.*| . |	.*| . |	9	-0.082	-0.135	6.7676	0.661
. | . |	. | . |	10	-0.006	-0.035	6.7694	0.747
. |*. |	. | . |	11	0.122	0.070	7.6149	0.747
.*| . |	. | . |	12	-0.067	-0.065	7.8813	0.794

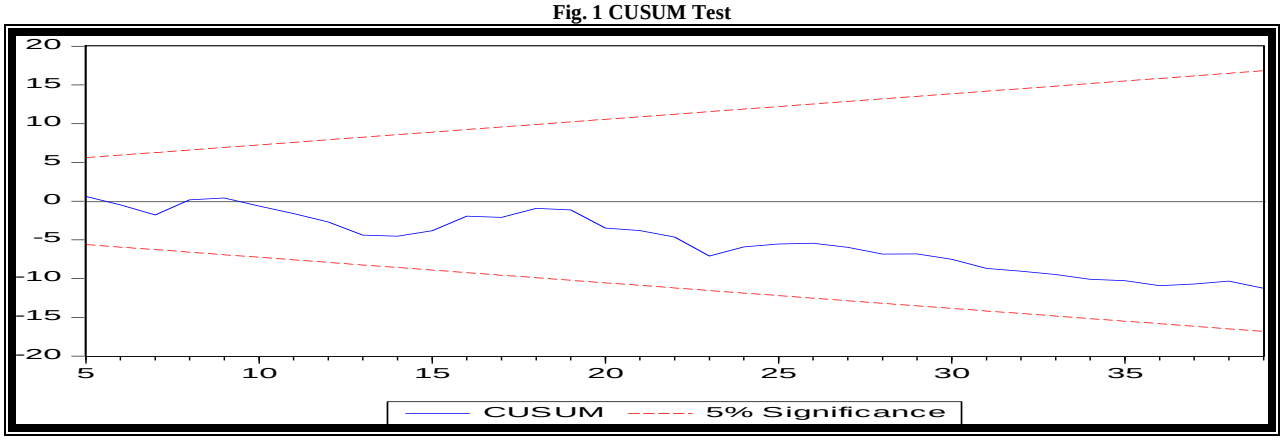
Source: Authors' computation using E-views, 2020

From the above results of table 9 in appendices, the probabilities are greater than 10% level of significance up to 12th Lag, and this means that the null hypothesis is accepted and the alternative hypothesis is rejected. The researcher concluded that there is no autocorrelation of errors at different times.

D. Stability Test

In conducting stability test, the hypotheses were the followings:
H_0: Existence of stability,
H_1: Absence of stability.

Fig. 1 CUSUM Test



Source: Authors' computation using E-views, 2020

According to the results from figure 1, the CUSUM line (blue) does not cross the red lines which represent the borders, we accept H_0, and we reject H_1. For this reason, the parameters are stable at a 5% level of significance.

E. Misspecification Test

In conducting misspecification test, the hypotheses were the followings:

H_0: The model is specified,

H_1: The model is not specified.

When we are collecting the data, some necessary data can be omitted, or in the formulation of the model, the wrong functional model can be used. This can cause the wrong parameters and unwanted results. Then, the model has to be specified in order to have reliable results.

Table 10. Ramsey RESET Test

	Value	Probability
t-statistic	0.70423	0.4861
F-statistic	0.495951	0.4861
Log likelihood ratio	0.564776	0.4523

Source: Authors' computation using E-views, 2020

The results show that the probability of Log-likelihood ratio 0.4523 or about 45% is greater than 10%. Then, the H_0 is accepted that the model is specified; see table 10.

F. Test for Multicollinearity Among the Explanatory Variables

Multicollinearity basically refers to a very strong correlation between explanatory variables; this causes efficiency problems in estimation, if and only if the value of the pair-wise correlations between the regressors exceeds 0.8 (Gujarati, 2003). The following table describes the correlation among independent variables.

Table 11. Correlation Matrix of Coefficients of Regression Model

Series	LOG(Y)	LOG(X_1)	LOG(X_2)	LOG(X_3)
LOG(Y)	1.000000	0.768960	0.581415	0.548339
LOG(X_1)	0.768960	1.000000	0.619662	-0.253185
LOG(X_2)	0.581415	0.619662	1.000000	0.141450
LOG(X_3)	0.548339	-0.253185	0.141450	1.000000

Source: Authors' computation using E-views, 2020

The results from table 11, it clear that from the simple correlation matrix obtained from E-views 7.0 and it is clear that all the pair-wise correlation is below 0.8. This means that the regression estimates of the model will be efficient.

G. Normality Test

In conducting normality test, the hypotheses were the followings:

H_0: The residuals are normally distributed,

H_1: The residuals are not normally distributed.

Table 12. Normality Test

Model	
Jarque-Bera Stat	0.150610
Probability	0.957461

Source: Authors' computation using E-views, 2020

The results of table 12 showed that Jacque-Bera Probability 0.957461, about 96% is greater than the 10% level of significance, which means that we cannot reject the null hypothesis, then it is confirmed that the residuals are normally distributed. The authors concluded that the model is good to be used by Rwanda's policymakers.

X. CONCLUSION AND POLICY RECOMMENDATION

A. Domestic Credits- Related Policy Implications and Recommendations

As it was shown in equation (3) in this article, the positive and statistically significant result for Domestic credits has essential policy implications for Rwanda's money supply policy in general but especially inflation policy.

The government of Rwanda, through the central bank, should continue with the bank (discount) policy; the bank rate refers to the interest rate charged by the central bank on commercial banks. This occurs when the commercial banks borrow cash from the central bank as a lender at last resort. The central bank has to reduce the money supply, aggregate demand and check on inflation by increasing the bank rate.

The government of Rwanda should enhance Selective credit control (credit squeeze); this is when the central bank directs or instructs commercial banks to give loans to specific sectors of the economy. For example: giving loans to priority sectors like agriculture. This reduces the number of sectors getting loans hence reducing the money supply in the economy.

The government of Rwanda, through the central bank, should increase the legal reserve requirement (reserve requirement ratio); this refers to the percentage of bank deposits required by law to be deposited by the commercial bank with the central bank. The central bank should set the minimum amount of bank deposits which commercial banks should deposit with it. By increasing the regal reserve requirement, the commercial banks will be having less loanable funds, though the decrease in inflation.

The government of Rwanda, through the central bank, should increase the Cash ratio (cash reserve); this refers to the fraction of the total bank deposits which remain in the commercial bank in cash form to meet the daily requirement of the customers (depositors). In this case, the central bank of Rwanda will reduce the money supply if it instructs commercial banks to increase the cash ratio.

The government of Rwanda should enhance the moral suasion policy; this is where the central bank persuades and requests commercial banks to follow the general monetary policy. In a period of inflation, a central bank should persuade commercial banks not to give out credit, and in a period of depression (deflation), the commercial bank should be persuaded to expand credits so as to stimulate economic activities. And this should be followed by the facilitation to creditors to pay their loans; like to decrease interest rate considering the central bank rate, and the center should instruct the commercial banks to keep monitoring and evaluating the projects for which the loans are taken in order to reduce risks to their clients. This will generate a win-win business environment in Rwanda.

The government of Rwanda, through the central bank, should enhance the Special deposits (Supplementary reserve requirement) policy; this is where the central bank instructs commercial banks to make certain deposits over and above the minimum regal reserve requirement. This should reduce the money available for lending (loanable funds) in commercial banks hence reducing inflation in Rwanda.

The government of Rwanda, through the Central Bank, should reduce the margin requirement; in this case, the commercial bank will not lend up to the full amount of the value of the collateral security, but it lends some amount that is lower. These policy recommendations will help to decrease the rate of inflation not only in Rwanda but also in other developing countries in general.

B. Population Growth-related Policy Implications and Recommendations

Based on the positive and statistically significant effect of Population growth on the inflation rate in Rwanda.

The government of Rwanda should encourage Population policy (control) by encouraging family planning.

In this way, the inflation rate will be decreased as long as the demand is reduced.

The government of Rwanda should encourage higher education so as to check on the fertility rates, and Education should also help to postpone marriages for the future. This should decrease the inflation rate as it can decrease the aggregate demand. Otherwise, the government has to boost production, especially in the agricultural sector, to satisfy an ever-increasing demand.

The government of Rwanda should enhance the rural development policies of making rural areas attractive so as to check on rural-urban migration. Such policies include rural electrification, food security, water supply. This should decrease inflation caused by rural-urban migration.

The government should stop encouraging emigration so that the excess population moves to other countries. The government can design programs to facilitate the export of excess labor force to other countries.

C. Personal Remittances Received-related Policy Implications and Recommendations

It was found out in this article that the Personal remittances received have positive and statistically significant effects on Rwanda's inflation rate in the long run. It implies that an increase in the population's purchasing power will lead to more consumption. Thus this will lead to an increase in inflation.

In Rwanda, policies should be taken to guide remittances from consumption motives to invest in productive sectors that cause economic growth. For this reason, financial institutions can contribute to orienting personal remittances into productive investment opportunities like the financial market.

Moreover, remittances have very little contribution towards inflation compared to the other significant variables of the model. Thus, the inflationary effect originating from remittance inflows can be sufficiently neutralized by promoting GDP growth. Therefore, ensuring the flows of remittances in productive sectors.

Finally, we would like to conclude that there is a significant contribution of Domestic credits, population growth, and personal remittances received to the increase in Inflation in the long run in Rwanda. So the government needs to always take into consideration the variables specified in this article during the process of monetary policy development and implementation.

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