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Original Article

Impact of Remittances on Inflation in Rwanda (1995-2021)

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Abstract *- The title of this paper is the influence of remittance inflows on Rwandan inflation for the Study Period (1995-2021). Specifically, the study analyzed the effect of Remittances on Inflation in Rwanda from 1995 to 2021. It pointed out the effects of external and money supply on inflation in Rwanda from 1995 to 2021 and provided some policy recommendations concerning the study findings. This study used secondary data collected from the World Bank dataset. Those data were time series data as the study used annual data. Using Eviews-12.0, the econometrics techniques were used to analyze the impact of independent variables (Remittances, External debt and Money supply) on the dependent variable (Inflation). The stationarity test was done to ensure whether to conduct the co-integration test or not. The results obtained after conducting the unit root test have been mixed as some series have been stationary at levels (I(0)), and others have been stationary after the first difference (I(1)). Having mixed unit root test results allowed the researcher to adopt the ARDL Bound co-integration test. The results of ARDL Bound analysis indicated the presence of lasting (long-run) relationships among the study series. The findings from ARDL ECM proved the existence of a significant immediate (short-run) relationship between the study series. With 0.973, it is clear that all explanatory variables together cause a variation of 97.3% to the dependent variable (INF) in the short run. Other factors remaining constant, it was revealed that received remittances possess a direct influence on inflation within Rwanda in the short run. Some recommendations have been given to the government of Rwanda, such as guiding remittances in investment rather than consumption motives, which leads to the growth of the economy. In this way, the financial institution can contribute to orienting remittances into productive investment opportunities like the financial market. Moreover, remittances have a higher contribution towards inflation compared to the other significant variables of the model. Thus, the inflationary effect originating from remittance inflows can be sufficiently controlled by promoting GDP growth. Therefore ensuring the flow of remittances in productive sectors.*

Keywords *- Remittances, External debt, Money supply, ARDL, Inflation.*

1. Introduction

Remittance is one of the most important external sources flowing into developing countries. Theoretically, remittances received have been said to be a major factor in driving up inflation. Both theoretical and empirical study also focuses on the significance of remittance of remittance on the living standards of living in various countries. Several research has been conducted to investigate the influence of transfers on economic concerns (Riungu, 2017).

In recent decades, remittance inflows to developing economies have continued to increase. These inflows reached US $436 billion in 2014, with US $34.5 billion in Sub-Saharan Africa (World Bank Migration and Remittance Fact Book, 2016). The global statistics show that these inflows have become a major source of foreign earnings, surpassing foreign direct investments, foreign aid, export earnings and other private capital inflows. The World Bank notes that these are only the officially recorded remittances.

The true size of remittances, including unrecorded inflows through formal and informal channels, is believed to be larger. According to the World Bank, remittance inflows to Rwanda increased from $3,381,209 in 1980 to $128,172,556 million in 2014, representing an increase of 37.91%. In Rwanda, in 2019, the remittances stood at $261 million before taking a plunge in 2020. The latest World Bank migration and development analysis shows that remittance inflows to Rwanda for 2021 were around $246 million after a drop to $241 million in 2020 due to COVID-19 (NISR, 2022).

The general price increase has always been one of the main macroeconomic goals of stabilization policies due to its negative economic consequences. It raises the cost of doing business, hence discouraging savings and investment. It also reduces the power of buying for low- and fixed-income groups, therefore adversely affecting consumption (BNR, 2018).

The achievements of Rwanda Vision 2030 aspirations are anchored on strong macroeconomic stability. An inflation rate of above 7.5% is considered a hindrance to economic growth as it reduces consumers' purchasing power. The Central Bank of Rwanda seeks to achieve a target inflation rate of 5%. Over the last decade, remittance inflows to Rwanda have been on an upward trend and have grown more than three-fold. In contrast, the overall inflation rate in Rwanda has been volatile, with high inflation rates of 15.1% and 14% recorded in 2008 and 2021, respectively. Therefore, there is a need to examine whether any relationship exists between these two variables.

There is a massive literature on the determinants of inflation (Ruzima and Veerachamy, 2015). However, few scientific studies have proved the effect of received remittances on the inflation rate. In the past, no studies have been carried out to establish whether remittances cause inflation or not in Rwanda. This study, therefore, seeks to zoom out the connection between remittances and the inflation rate in Rwanda. This was an opportunity to provide some recommendations about how the government of Rwanda should guide remittances so that they can enhance economic growth.

2. Literature Review

Abdul-Mumuni & Quaidoo (2015) empirically examine the influence of global inflow remittances on Inflation in Ghana from 1979 to 2013 by incorporating international remittances as an exogenous variable to the standard Inflation function. Applying the bounds testing approach, the empirical findings proved that internationally received remittances ultimately significantly influence inflation. Therefore, in the short term, no significant association is evident between these two variables. The study recommends that to reduce the influence of international remittances on the inflation rate and increase the impact on growth, the government should improve public infrastructure. By this, excessive transfer fees would reduce, and these remittances could be channeled into more productive sectors rather than being used mainly for consumption purposes.

Osigwe & Madichie (2015) examined the co-integration and granger causality between M2 (Money supply), remittance and exchange rate. The result obtained indicated the presence of co-integration, neutrality between M2 and remittance and unidirectional relationship between exchange and remittance.

Minta & Nikoi (2015) analyzed the influences of migrant remittances on the economic development of Ghana, using regression analysis of time series for the period 1992 to 2012 with emphasis or focus on growth and poverty. The study's interest factors were price increases, poverty, money transfers, poverty assessed by HDI, and economic expansion measured by GDP. According to the study, inflation had a detrimental impact on Ghana's economic growth, while remittances and the HDI had a favorable relationship. Money transfers did not, however, significantly contribute to Ghana's decrease in poverty. Thus, the study came to the conclusion that remittances had an effect on Ghana's economic growth that was both positive and negative. As a result, migration in Ghana might be considered a brain gain rather than a brain drain.

Beatrice and Samuel (2015) investigated the influence of remittances on economic expansion in Kenya (1993-2015), using the Granger causality test and the OLS estimation techniques. The variables included in the model include population, investment, openness, enrollment, inflation, net export, government consumption, and remittances. The study found that remittances impacted economic growth positively, and a bi-directional causal relationship was established between remittances and economic growth.

Wadood and Hossain (2017) have examined the relationship between prices and remittances. They concluded that there was a long-term correlation between worker remittances and the inflation rate. However, they could not find any proof of an immediate one in the Bangladeshi economy. According to Mpofu (2017), demand-pull inflation would result from remittances if the government did not direct the money into profitable ventures.

Abosedra and Fakih (2017) have examined the influence of remittances on inflation in Lebanon. The results indicated a significant long-term rise in the prices of consumption items; however, in the short run, positive shocks to remittances lower the prices of maximum-consuming items. Thapa and Acharya (2017) carried out a research study in Nepal and concluded that there was variation in different categories of consumption items; this showed that the rise in remittances had very important implications on relative prices.

Nyabyenda and Gakuru (2020) investigated population growth, domestic credits received remittances, and Rwandan inflation through Johansen's analysis of co-integration and ECM. They revealed the presence of long-term association among the variables in Rwanda. The Rwandan government was advised to focus on policies of credit control, policies of population control reinforcement, and directing remittances from motives of consumption to the motives of investment that can improve economic growth.

3. Methodology

In conducting this study, different methods and techniques were used. This section indicates the methods and techniques used during data collection and analysis. The chapter provides a full explanation of the research design, which is the plan, structure, and strategy of investigation conceived to test the study's hypotheses.

3.1. Used Data

The present research responded to the correlational research design since documents and reports will provide data. Thus, it was based on quantitative methods. This study used secondary data on inflation and remittances for the period 1995 to 2021. The data was gathered from World Bank yearly publications. The investigator put the data in a statistical program called EVIEWS12.0 to obtain statistics for the data.

3.2. Econometrics Techniques

For analyzing those macroeconomic variables, the Econometrics packages were used. Based on the econometric analysis, the model specification, the test of stationarity, the ARDL co-integration test, ARDL ECM, etc, the hypotheses were verified and, based on analysis recommendations, were suggested.

3.3. Model Specification

The econometric methods used independent variables' coefficient estimation to test the influence of explanatory variables on the explained variable. As the dependent variable (Inflation) has many determinants, adding some control variables has been necessary. The new model specification has been in the general form as:

$$GDP\ Deflator = f(R, ED, M, \ldots)$$

This function has been converted into the econometric model; it was derived as:

$$GDP\ Deflator = \beta 0+\beta 1\ R+\beta 2\ ED+\ \beta 3M+\ \mu t$$

Where:

R= Remittances received, ED = External debts, M = Money supply (M2), μ = error tem and β= coefficients.

β0 refers to the intercept (constant), which shows the level of GDP Deflator when the explanatory variables R, ED and M are zero.

$$Log\ GDP\ Deflator = \beta 0+\beta 1\ logR+\beta 2\ logED+\beta 3logM+\ \mu t$$

Before accepting the model, all residual and diagnostic tests have been verified. These include normality tests, Heteroscedasticity tests, serial correlation tests, stability tests and misspecification tests.

4. Empirical Analysis

4.1. Unit Root Test/Stationarity Test

The unit root was tested for our time series through ADF and PP tests. The hypotheses were the following:

H_0: Presence of unit root,

H_1: Absence of unit root

Every variable has been subjected to the test of stationarity. In empirical analysis, the test of the unit root unit is critical since it aids in determining the co-integration procedures that were used in the study. The level of integration for all variables is described in the tables below (dependent variable and independent variables)

Table 1. Test of stationarity at level

Variables	ADF			PP			Conclusion
	Test statistic	Prob	Critical Value	Test statistic	Prob	Critical Value	
Intercept							
INF	-8.118	0.000	-2.986	-9.164	0.000	-2.986	I(0)
R	0.291	0.973	-2.986	0.827	0.992	-2.986	Not I(0)
EXD	-1.585	0.474	-2.991	-1.467	0.532	-2.986	Not I(0)
M2	-3.056	0.046	-3.020	-8.301	0.000	-3.603	I(0)
Intercept and Trend							
INF	-7.846	0.000	-3.603	-8.914	0.000	-3.603	I(0)
R	-2.633	0.270	-3.603	-2.564	0.297	-3.603	Not I(0)
EXD	-0.944	0.933	-3.612	-0.581	0.971	-3.603	Not I(0)
M2	-2.856	0.195	-3.658	-8.301	0.000	-3.603	I(0)

Source: Authors' computation using E-views 12.0, 2022

Note: The ADF and PP unit root test of all the series was conducted at a 5% significance level. Not I(0) means not integrated order zero, and I(0) means integrated order zero.

From the above findings, we found that some variables (R and EXD) are not stationary at levels. This is indicated by the values of critical values that are lower than test statistics for each variable. Other variables (INF and M2) are stationary at levels. This is indicated by the values of critical values that are greater than the test statistics for each variable. For this reason, we have conducted the first differentiation.

Table 2. Test of stationarity at first difference

Variables	ADF			PP			Conclusion
	Test statistic	Prob	Critical Value	Test statistic	Prob	Critical Value	
Intercept							
R	-5.550	0.000	-2.991	-5.601	0.000	-2.991	I(1)
EXD	-6.001	0.000	-2.998	-7.019	0.000	-2.998	I(1)
Intercept and Trend							
R	-4.456	0.011	-3.673	-3.718	0.041	-3.622	I(1)
EXD	-3.622	0.000	-6.808	-6.808	0.000	-3.622	I(1)

Source: Authors' computation using E-views 12.0, 2022

Note: The ADF and PP unit root test of all the series was conducted at a 95% confidence interval. I(1) means integrated order one.

From the above findings, we found that some variables (R and EXD) are stationary after the first difference. This is indicated by the values of critical values that are greater than the test statistics for each variable. Then, it was allowed to do a co-integration test. So, it was concluded that time series data of both dependent and independent variables are stationary at mixed levels.

In view of these facts, the researcher applied the ARDL approach as a co-integration method, which is the most suitable method for this type of dataset. Because Engle and Granger (1987) and Johansen and Juselius (1990) tests must not use mixed-level co-integration, although the analysis sample is very small, the ARDL model could produce valid results, which means it is more suitable than others (Paul, 2014).

4.2. ARDL Bound Test

The bound test result of the F statistics value is crucial to deciding whether it is greater or smaller than the critical values of the upper bound. If the null hypothesis of the bound test fails to be accepted, there is long-run co-integration, which means that F-Statistic > Upper bound value. If F-statistic < Upper bound value, there is no long-run co-integration, thus accepting the null hypothesis.

Table 3. ARDL-Bound Test ARDL

F-Bound Test	Null Hypothesis: No levels of relationship			
Test Statistic	Value	Sign if	I(0)	I(1)
F-statistic	20.803	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: Authors' computation using E-views 12.0, 2022

The result illustrates that the F-Statistic > both upper and lower bound at 10%, 5%, 2,5,% and 1% levels of significance using unrestricted intercept and no trend. This confirms the long-run association among INF, PR, EXD and M2.

In the ARDL bound test, F statistics is 20.80324, greater than the critical values of both lower and upper bound. The H0 failed to be accepted at a 5% significance level; thus, co-integration exists for this equation. As a matter of fact, we find a long-run co-integrated link between inflation and explanatory variables (PR, EXD and M2).

4.3. ARDL long run coefficients Estimation

After bound test's results confirmed the long-run co-integration between the independent variable (INF) and its determinants, Remittances received, External debts and Money Supply (M2), with the optimal lag structure of the variables (2,2,4,4). The following table shows the results for ARDL long-run coefficients.

Table 4. ARDL long run coefficients estimation

Variables	Coefficient	Std. Error	t-statistic	Prob
INF(-1)	-0.499	0.143	-3.475	0.013
INF(-2)	-0.342	0.129	-2.634	0.038
RP	7.451	2.831	2.630	0.039
PR(-1)	-6.401	4.271	-1.501	0.184
PR(-2)	-9.391	3.851	-2.441	0.051
EXD	0.352	0.095	3.681	0.011
EXD(-1)	0.363	0.142	2.540	0.044
EXD(-2)	0.108	0.215	0.504	0.632
EXD(-3)	-0.142	0.191	-0.748	0.482
EXD(-4)	-0.246	0.091	-2.695	0.035
M2	0.251	0.141	1.778	0.125
M2(-1)	1.539	0.195	7.866	0.000
M2(-2)	1.022	0.157	6.478	0.000
M2(-3)	1.1994	0.176	6.799	0.000
M2(-4)	0.324	0.063	5.116	0.002
C	-72.037	10.498	-6.861	0.000
R-squared	0.948	Mean dependent var		5.953
Adjusted R-squared	0.821	S.D. dependent var		9 635131

Source: Authors' computation using E-views 12.0, 2022

Table 4 shows the estimation of coefficients for the long run with the ARDL (2, 2, 4, 4) model. In this study, the ARDL model was chosen by AIC. The results indicated that the inflation rate at one-time point in the past (INF (-1)) and two times in the past (INF (-2)) did not increase the inflation rate in Rwanda. The results also pointed out that Remittances received (PR) in Rwanda have a positive impact on the Inflation rate in Rwanda.

The coefficient indicated that a 1% increase in Remittances Received (PR) leads to a 7.4% increase in inflation in Rwanda. The table indicated that Remittances received at one-time points in the past (PR (-1)) have a negative impact on the inflation rate in Rwanda. The coefficient indicated that a 1% increase in Remittances Received at the one-time point in the past (PR (-1)) leads to a 6.4% decrease in inflation in Rwanda. The results indicated that remittances received twice in the past (PR (-2)) have negatively impacted Rwanda's inflation rate. The coefficient indicated that a 1% increase in Remittances Received two times points in the past (PR (-2)) leads to a 9.3% decrease in inflation in Rwanda. The findings also indicated that external debts (EXD) positively impact the Inflation rate in Rwanda. The coefficient indicated that a 1% increase in External debts (EXD) leads to a 0.35% increase in inflation in Rwanda.

The table indicated that the External Debt one time point in the past (EXD (-1) has a positive impact on the inflation rate in Rwanda. The coefficients indicated that a 1% increase in External Debt at one time point in the past (EXD (-1) leads to a 0.36% increase in inflation in Rwanda. The table pointed out that the External Debt four times points in the past (EXD (-4) has a negative impact on the Inflation rate in Rwanda. The coefficients indicated that a 1% increase in External Debt four times points in the past (EXD (-4) leads to a 0.24% decrease in inflation in Rwanda.

The study findings indicated that Money Supply (M2) is a one-time point in the past (M2 (-1) has a positive impact on the Inflation rate in Rwanda. The coefficients indicated that a 1% increase in Money Supply (M2) at one time point in the past (M2 (-1) leads to a 1.5% increase in inflation in Rwanda. It was clearly indicated that Money Supply (M2) two times points in the past (M2 (-2) has a positive impact on the inflation rate in Rwanda. The coefficients indicated that a 1% increase in Money Supply (M2) two times points in the past (M2 (-2) leads to a 1.02% increase in inflation in Rwanda. The Money Supply (M2) three times points in the past (M2 (-3) has a positive impact on the inflation rate in Rwanda. The coefficients indicated that a 1% increase in Money Supply (M2) three times points in the past (M2 (-3) leads to a 1.19% increase in inflation in Rwanda. The Money Supply (M2) four times points in the past (M2 (-4) has a positive impact on the Inflation rate in Rwanda. The coefficients indicated that a 1% increase in Money Supply (M2) four times points in the past (M2 (-4) leads to a 0.32% increase in inflation in Rwanda.

The value of R-squared 0.948 indicated that all the independent variables combined (Remittances Received, External Debts and Money Supply) caused variation in the dependent variable by 94.8%. This is statistically significant as the probability of the F-statistic is 0.010, which is less than 5%.

With the above Long-run ARDL Model, the Estimation Command was:

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ARDL INF PR EXD M2 @

With the above Long-run ARDL Model, the Estimation Equation was:

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INF = C(1)*INF(-1) + C(2)*INF(-2) + C(3)*PR + C(4)*PR(-1) + C(5)*PR(-2) + C(6)*EXD + C(7)*EXD(-1) + C(8)*EXD(-2) + C(9)*EXD(-3) + C(10)*EXD(-4) + C(11)*M2 + C(12)*M2(-1) + C(13)*M2(-2) + C(14)*M2(-3) + C(15)*M2(-4) + C(16)

With the above Long-run ARDL Model with substituted coefficients, the long-run ARDL equation was:

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INF = -0.499728168846*INF(-1) - 0.342379645991*INF(-2) + 7.44913764062e-08*PR - 6.40369355668e-08*PR(-1) - 9.39144471042e-08*PR(-2) + 0.35219902004*EXD + 0.363022209872*EXD(-1) + 0.108803484128*EXD(-2) - 0.142434911046*EXD(-3) - 0.246242592683*EXD(-4) + 0.251215282404*M2 + 1.53981764446*M2(-1) + 1.02234757621*M2(-2) + 1.19945574347*M2(-3) + 0.324254370735*M2(-4) - 72.0376241247

After proving the long-run association between variables, we were allowed to conduct the short-run model. The short-run model coefficients measure the dynamics of the model; the VECM measures the speed of adjustment to the long-run equilibrium that is taking place.

The crucial thing in the short run is adjustment Speed (VECT). The sign, which is negative, indicates that the economy will be at equilibrium, taking a given annual adjustment in the short run. After proving co-integration, the following step is estimating the short-run model. The error correction model estimates the speed at which the explained variable returns to equilibrium after a change in the explanatory variable. The following table involves a short-run model.

4.4. ARDL Short-Run Result

Table 6 applies the ECM to check the short-run effects of independent variables (Remittances received, External debts and Money supply) on Rwandan inflation. The following table illustrates the ARDL Short-run result with the Error Correction Model.

Table 5. ARDL Short-run result

ECM Regression Restricted Constant and No Trend				
Variable	**Coefficient**	**Std. Error**	**t-statistic**	**Prob**
D(INF(-1))	0.342	0.079	4.317	0.005
D(PR)	7.450	1.921	3.881	0.008
D(PR(-1))	9.390	2.500	3.754	0 009
D(EXD)	0.352	0.047	7.359	0.000
D(EXD(-1)	0.279	0.079	3.507	0.012
D(EXD(-2))	0.388	0.107	3.627	0.011
D(EXD(-3))	0.246	0.063	3.880	0.008
D(M2)	0.251	0.091	2.746	0.033
D(M2(-1))	-2.546	0.236	-10.783	0.000
D(M2(-2))	-1.523	0.154	-9.879	0.000
D(M2(-3))	-0.324	0.045	-7.184	0.000
CointEq(-1)*	-1.842	0.139	-13.166	0.0000
R-squared	0.973	Mean dependent var	0.204	0.204
Adjusted R-squared	0.944	S.D. dependent var		7.949
S.E. of regression	1.877	Akaike info criterion		4.400
Sum squared resid	35.257	Schwarz criterion		4 995
Log likelihood	-36.404	Hannan-Quinn criteria		4.540
Durbin-Watson stat	3.325			

Source: Authors' computation using E-views 12.0, 2022

As shown in Table 5, the value of the ECT coefficient (CointEq(-1) is significant (P-value = 0.0000), and it has a negative sign. This confirms that there is a co-integration relationship between the variables. About 184.2%, with a statistical significance of one percent disequilibrium from the previous year's shock, converge back to the long-run equilibrium in the current year.

This implies that all independent variables (PR, EXD and M2) significantly impact Rwandan inflation in the short run. With an R-Squared of 0.973, it is evident that all independent variables together cause a variation of 97.3% to the dependent variable (INF) in the short run.

The findings indicated a positive relationship between Money supply and Inflation (INF) in Rwanda during the study period. This is because a 1% increase in Money Supply (M2) leads to a 0.2% increase in inflation in Rwanda. The results pointed out that there is a positive relationship between Remittances received (PR) and Inflation (INF) in Rwanda. This was confirmed by the table findings indicating that a 1% increase in Remittances led to a 7.4% increase in Inflation (INF) during the study period. The results of ARDL ECM indicated a positive relationship between External Debt and Inflation in Rwanda during the study period. This is because a 1% increase in External Debt leads to a 0.35% increase in Inflation in Rwanda.

4.5. Diagnostics Tests

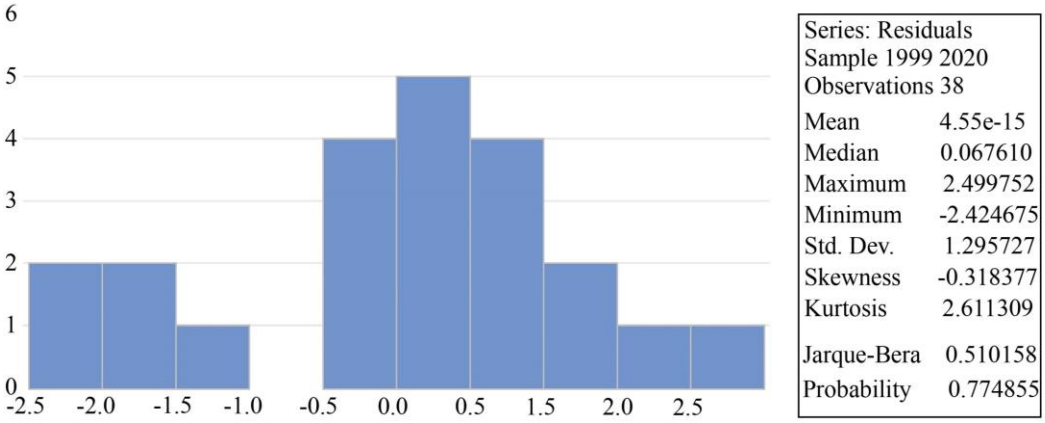

Fig. 1 Normality test

Source: Authors' illustration using E-views 12.0, 2022

The above results showed that Jacque-Bera Probability 0.510158, about 51%, is greater than the 10% significance level, which means that H_0 is accepted, which means normal distribution of residuals, and H_1 is not accepted. The researcher concluded that, the model is good to be used.

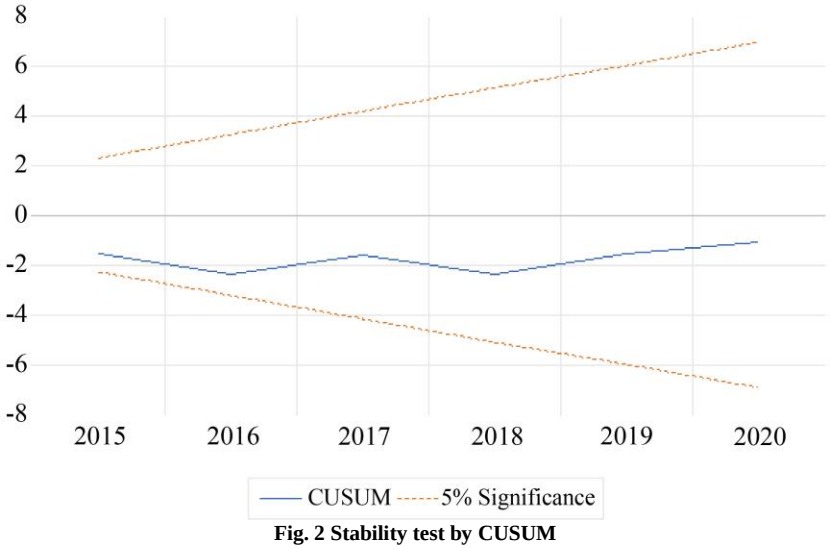

Fig. 2 Stability test by CUSUM

Source: Authors' illustration using E-views 12.0, 2022

From the above results, the blue line that represents CUSUM results does not cross the red lines, which present the boarders, and this implies that H0 is not rejected and the alternative hypothesis is rejected. Then, the researcher concluded that the model's parameters were stable at a 5% significance level.

The CUSUM of squares results also confirmed this, as the Blue line does not pass the red lines representing the borders. The researcher concluded that the model's parameters are stable at a 5 percent significance level.

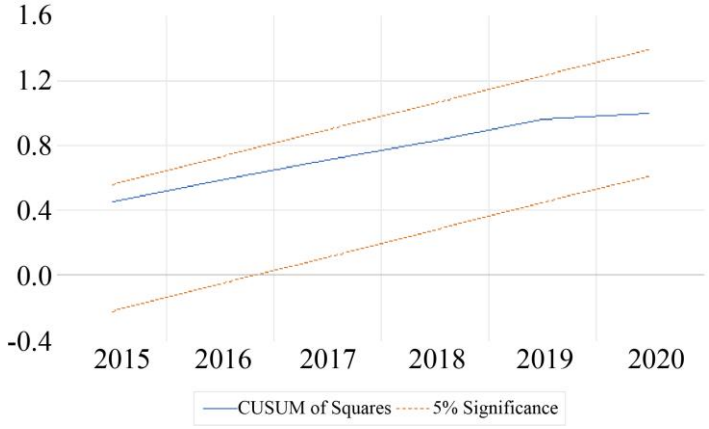

Fig. 3 Stability test by CUSUM of Squares

Source: Authors' illustration using E-views 12.0, 2022

4.5.1. The Remaining Diagnostic Tests

The following table summarizes the results of the remaining diagnostic tests. This includes normality test results, heteroscedasticity test, serial correlation test, multicollinearity test and misspecification test.

Table 6. The remaining diagnostic tests

Test	Method used	conclusion
Normality test	Jacque-Bera Probability	Residuals are normally distributed
Heteroskedasticity Test	Breusch-Pagan-Godfrey	Presence of Homoskedasticity
Serial correlation test	breusch- godfrey serial correlation Im	There is no serial correlation.
Multicollinearity test	Variance Inflation Factors (VIF)	Absence of multicollinearity among the independent variables of the study
Misspecification test	Ramsey RESET Test	The model is specified.

Source: Author's illustration, 2023

5. Conclusion and Recommendations

5.1. Conclusion

According to the study, remittances received throughout the study period favourably impacted Rwanda's inflation rate. The ARDL bound co-integration test revealed a long-term connection between these two variables, which supported this. According to the ARDL ECM results, a short-run causal relationship exists between remittances received and Rwandan inflation. According to the study's findings, the element with the greatest effect on Rwanda's inflation rate is the amount of remittances received. This suggests that when remittances to Rwanda rise, the country's inflation rate also rises. The remittances received once or twice in the past have had a detrimental effect on Rwanda's inflation rate. This is due to the fact that the majority of remittances received in Rwanda are used to fund productive ventures. Inflation is therefore caused when purchased, but as they are invested, it is decreased.

The study discovered that external indebtedness had a favorable impact on inflation in Rwanda during the study period. The ARDL bound co-integration test revealed a long-term connection between these two variables, which supported this. According to the ARDL ECM results, Rwanda's inflation and external indebtedness have a short-run causal relationship. This means Rwanda's inflation rate rises as its external debt increases. The external debts that Rwanda has accrued once and twice in the past have an effect on inflation. This is so that the majority of Rwanda's foreign loan payments can be put toward useful endeavors. Inflation comes as a result; when invested, it reduces inflation in the country.

The study discovered that the money supply (M2) had a favorable impact on inflation in Rwanda during the time of the study. The ARDL bound co-integration test revealed a long-term connection between these two variables, which supported this. According to the ARDL ECM results, Rwanda's money supply (M2) and inflation have a short-run causal relationship. This means that an increase in Rwanda's money supply (M2) will result in an increase in the country's inflation rate. In Rwanda, inflation has historically been positively impacted by the money supply (M2).

C While conducting diagnostics tests, the errors have no serial correlation, error variance is constant, errors are normally distributed, and there is no auto-correlation in errors. In conducting the stability of the model, the CUSUM test and CUSUM of squares test have indicated that the produced model is stable. In this context, a misspecification test using the Ramsey Reset test has indicated the absence of omitted variables and the absence of wrong variables.

Using different tests, we found that the model is BLUE (Best, Linear, Unbiased, and Estimate). All variables were specified and statistically significant at a 10% significance level.

5.2. Recommendations

Due to the study findings, the following recommendations are suggested to the government of Rwanda:

Policies in Rwanda should be developed to shift remittances away from consumer spending and toward investment in profitable sectors that stimulate economic expansion. As a result, financial institutions can help direct remittances towards profitable investment options such as the financial sector.

Additionally, remittances contribute more to inflation than any other significant variable in the model; therefore, encouraging GDP growth will be sufficient to control the inflationary effect resulting from remittance inflows, ensuring that the flows of remittances are directed towards productive sectors. The money supply increases inflation in Rwanda, so the government of Rwanda should be good at managing the money supply. Some tools such as reserve requirement, open market operations, the discount rate, and interest on excess reserves may be used. The government of Rwanda has to minimize external debt as their repayments have a negative impact on the welfare of the people in the country.

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