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Charles Ruranga (✉ cruranga@gmail.com)

University of Rwanda

Daniel S. Ruturwa

University of Rwanda

Valens Rwema

University of Rwanda

Research

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Posted Date: October 23rd, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-95124/v1>

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Impact of Exports and Imports on Economic Growth in Rwanda: 1961-2018

Charles Ruranga^{1*}, Daniel S. Ruturwa² & Valens Rwema²

¹African Centre of Excellence in Data Science (ACE-DS), College of Business and Economics, University of Rwanda & *Corresponding author: cruranga@gmail.com

²School of Economics, College of Business and Economics, University of Rwanda

Abstract

The aim of this paper is to investigate the impact of trade on economic growth in Rwanda. This paper uses exports and imports for trade and gross domestic product for economic growth. Research questions were formulated as (1) Are exports, imports and economic growth cointegrated? (2) Is there a long or short run relationship between those Variables? (3) Are there any causal relationships between factors (4) what the direction of the causality is it? Annual time series data from World Development Indicators for the period from 1961 to 2018 have been used. The methods of linear regression for estimation of Vector Auto regressions models have been used. Our findings established that VAR was appropriate model, and GDP, Exports were stationary at first differences while Imports was stationary at second difference but not at levels. Hence the two series were integrated of order one and the third one was integrated of order two. Tests of cointegration indicates that the three variables were not cointegrated, implying there was no long run equilibrium relationship between the three series. The causality test indicated that exports and imports influenced GDP. On the other hand, we found that there was a strong evidence of unidirectional causality from exports to economic growth. However, there was bidirectional causality between GDP and imports. These results provide evidence that exports and imports, thus, were seen as the source of economic growth in Rwanda.

Key words: *Exports, Imports, Economic growth, Cointegration, Causality.*

1. Introduction

Theoretically, it has been asserted that both exports and imports can play a vital role in economic development (Hussain A. A., 2015). The abstract and empirical research mainly concentrate on either the association between exports and imports on economic growth (Serhat Yuksel, 2016). Exports of goods and services are seen as an engine of economic and social development for a number of motivations, include exports that ask companies to alter and improve to maintain market share (Sahoo, 2014).

Exports guarantee higher revenues and profits, on the other side. Alternatively, they reduce dependency on local markets since; the market base will grow, leading only to a decrease of local clients, in the case of growth in overseas markets (Dickey D. &., 1979). If it is not, export are able to minimize the effect of the market volatility, business become more captive to financial change, altering client requirements and seasonal fluctuations in local economy (Dickey D. W., 1981).

Finally, and with regard to the advantages of exports, it can be summarized that an increase in export leads to an increase in the access to the currencies, which increases the national income, the

turnover and surpluses of the state (Khan, 2012). This lead to the improvement in the standard of living. Despite these export advantages, they sometimes do not produce profitable outcomes that do not add to the country's greater development, for several reasons, including: the existence of competition is greater than expected, the products is unpopular or popular in the markets other, instability in the target country as a result of wars or civil conflicts, weak media publicity and definition exported product or other similar reasons (Engle, 1987).

As far as imports are concerned, the weakness of the country in meeting its own requirements is usually expressed and made dependent and at the expense of foreign nations (Karamanaj, 2014). Imports lead, contrary to exports, to a local currency departure and weaken the equilibrium of trade so that economic growth will weaken (Serhat Yuksel, 2016). However, and in some cases it is considered the import source of economic growth, especially if it includes hardware and electronic equipment to help and contribute to the increase and improvement of the investment, or include products that require a production value of more than imported (Hatem Hatef Abdulkadhim Altaee, February 2016). Due to these reasons, the export and import remains a controversial topic their ability to influence the social and economic growth of the countries.

Rwanda is a developing country and geographically landlocked country and also is considered the fastest growing economy in East African Community with a GDP of 9.80 billion (2018) compared to 9.137 billion USD (2017), thus the per capita GDP is 826.30 USD per year, and after that was 780.80 USD last year, an increase over the previous reporting 4.2 percent (Planning, 2018-2019). In 2018 Rwanda's total trade amounted to US\$1,090.34 million, an increase of 9.16 percent over the fourth quarter of 2017, Exports totaled US\$ 169.91 million, Imports totaled US\$ 841.92 million and Re-exports were valued at US\$ 78.5 million (NISR, 2018).

Researchers and economists continue to discuss and argue about the connection between economic growth and growth in exports and imports (Uddin M. K., 2010). Some believes that export leads to economic growth and thereby encourage Export Led growth Hypothesis, while others sees economics growth leads to growth in export and support Growth Led Export Hypothesis (Shirazi N. S, 2005).

These divergent views on the relationship between export, import and economic growth put many developing economies in dilemma of whether to open up their economies to promote international trade or whether they should concentrate on economic activities that will promote international trade. It is due to these contradicting evidences about the dynamic relationship between exports, imports and economic growth that the paper attempt to revisit these relationships in the case of Rwanda for the period 1960 to 2017.

The objectives of this research are to:

1. Examine the relationships between Exports, Imports and GDP.
2. Determine whether the relationships are long run or short run phenomena, or both.
3. Determine whether there is any causal relationship between Exports, Imports and GDP.
4. Examine the direction of the causality.

2. Literature review

From its very beginning, Bangladesh, a developing economy, has had a trade deficit. This document strives to comprehend the conduct of the time series of Bangladesh's complete exports and imports. Root test units acknowledge the random walk in the complete time series of exports and imports. The Johansen co-integration test demonstrates that these two factors have a long-term balance connection. The research seeks to discover causal relationship through an error correction mechanism, if cointegration exists. The outcomes of the test of the test show long-term bidirectional causality and short-term unidirectional causality between Bangladesh import and export. The findings of the research shows that the global budget restrictions of Bangladesh do not violate them (Uddin J. , August 2009)..

The prospective weapon of export, importation and economic growth in Bangladesh's economy (Akhter, 2015). Bangladesh is a developing country; from its very beginning, its economy has been hit by trade deficits. The aim of this investigation is to investigate the effect on the economy of Bangladesh of exports and imports. In all manner of products and services, no nation in the globe is self-sufficient. To satisfy its own requirement, each nation must import. This is no exception for Bangladesh. The manufacturing of needed equipment, medicine, cars and other products in Bangladesh are dedicatory. Therefore, it must import products of this kind from outside. However, after satisfying their own requirement, all nations can generate one or more products excessively. Once its request has been met, Bangladesh can excessively generate jute, tea, clothing and many other products. Therefore, it is recognized that by importation of products, Bangladesh can satisfy its deficit and export its surplus products once the demand is satisfied. This research aims to investigate the links between Bangladesh's exports, imports and economic growth. The study was based primarily on secondary information sources gathered from different books, newspapers, research works, publications etc. In this research, the latest export, import and economic growth literature in Bangladesh has been tested. The research shows the favorable and reverse situation with regard to imports for the effects of exports on economic growth.

(Md. Tareq ferdous Khan, March 2012) The document shows unthinkable development in the GDP, the exporting of goods and services (EXPORT) and the importation of goods and service (IMPORT) during the last three decades in the macro-economic indicators. Each EXPORT and IMPORT indicator has occupied a substantial proportion of GDP in the past, although its

3. Methodology

The analysis used in this study coat annual time series of 1960-2017 in Rwanda from World Bank. The data set entails of observation for GDP (current US\$), exports of goods and services (current US\$), and imports of goods and services (current US\$). All data set are secondary brought from World Bank.

Total Exports (EXP) by Rwanda, complete imports (IMP) and economic growth (GDP) are the factors used in this research. As proxy for economic growth in Rwanda Gross Domestic Products is used. All the variables are taken in their raw data.

We will operate the further apt method, which is aimed to firstly set up the degree of integration of each variable. If the variables are all integrated in level, we will clench an estimate founded on a linear regression.

In contrast, if the variables are all integrated into the first difference, our estimation will be based on an estimate of the VAR model. Concerning the estimation of VAR models types and when the

variables are impartial in the first difference we will look and plot the cointegration between the variables, if the cointegration test denotes the non-attendance of cointegration relation then we will involve the Unrestricted vector Auto-Regression (Unrestricted VAR) and the Granger causality Tests. If the cointegration test elects the presence of a cointegration relation between the different variable studied, Vector error correction model (VECM) will be employed.

Early empirical formulation well tested to track down and to assume the causal bond between imports, exports and GDP growth by mixing exports and imports into the aggregate production function, and which is used (Ramos, 2001). The augmented production function, including both export and import is expressed as:

$$GDP_t = f(exports, imports) \quad (1)$$

The function can also be represented in a log-linear econometric format thus:

$$\text{Log}(GDP)_t = \beta_0 + \beta_1 \log(exports)_t + \beta_2 \log(imports)_t + \varepsilon_t \quad (2)$$

Where: β_0 is the constant term, β_1 coefficient of variable (exports), β_2 Coefficient of variable (imports), t is the time trend and ε is the error term.

4. Results and discussion

4.1 Unit roots Tests

Unit root tests of Log (GDP), Log (Exp) and Log (Imp) have been conducted using Augmented Dickey Fuller (ADF) and Philip Peron (PP) tests.

Table 1 Unit Root Tests: ADF

Variable	ADF		PP		Order of integ
	Test Stat	Probability	Test Stat	Probability	
Log(GDP)	5.81262	0.0001	6.04944	0.0000	I(1)
Log(Exp)	4.67039	0.0021	4.57944	0.0028	I(1)
Log(Imp)	11.4186	0.0000	7.89087	0.0000	I(2)

Source Views 7

The results of the stationary tests ADF and PP shows that GDP and Exports variables are integrated in order (1), while the Imports variable is integrated in order (2), namely in first difference for both GDP and Exports and second difference for Imports and in all levels (1%, 5%, 10%).

4.2 VAR Lag Order selection Criteria

As soon as the order of integration of the studied variables was in first differentials, we have determined the cointegration between them. However, before this step, one must determine the

number of delay existing in this estimate. To accomplish this, we have applied the VAR Lag order selection criteria method.

Lag order Selection Criteria

Lag	Log	LR	FPE	AIC	SC	HQ
0	40.5939	NA	4.73E-05	-1.44592	-1.333347*	-1.402761
1	56.9222	30.14454*	3.57e-05*	-1.727776*	-1.277489	-1.555146*
2	61.2726	7.529516	4.29E-05	-1.54894	-0.760942	-1.246843
3	64.5762	5.336719	5.39E-05	-1.32986	-0.204138	-0.898282
4	69.3381	7.142767	6.46E-05	-1.16685	0.296583	-0.605804
5	72.9504	5.001663	8.18E-05	-0.95963	0.841517	-0.269113

Source Eviews 7

The lag order selection was determined using five different criteria LR, FPE, AIC, SC, HQ. The results of the VAR lag or selection criteria show that the number of delay chosen is equal to 1. Therefore, and at this moment, we are ready to process the existing cointegration number.

4.3 Cointegration Analysis: Johanson Test

To obtain the number of cointegration existing in our situation, we use the most effective and suitable tests, which is the Johanson test.

Cointegration Test

Hypothesized CE(s)	No. of	Unrestricted Rank Test (Trace)	Cointegration	0.05 Value	Critical Probability
		Eigenvalue	Trace Statistics		
None		0.240668	25.87075	29.79707	0.1326
At most 1		0.164311	10.72833	15.49471	0.2287
At most 2		0.015441	0.855883	3.841466	0.3549
Trace test indicates no cointegration at the 0.05 level					

Source Eviews 7

The Johanson test indicates the absence of a cointegration relation between the variables studied. Therefore, we will use an estimate based on the VAR model and the Granger causality test.

4.4 VAR Estimation

The purpose of the model estimation is to identify and see if there are effects between the independent variable that are negative or positive on the dependent variable.

Vector Auto-regression Estimates

LEXPORTS	LGDP	LIMPORTS
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LEXPORTS(-1)	0.853523	0.174181	0.320804
	(0.17453)	(0.10800)	(0.08139)
	[4.89043]	[1.61276]	[3.94174]
LGDP(-1)	-0.080588	0.391635	0.139499
	(0.28142)	(0.17415)	(0.13123)
	[-0.28636]	[2.24885]	[1.06299]
LIMPORTS(-1)	0.331761	0.386000	0.841001
	(0.28232)	(0.17471)	(0.13165)
	[1.17510]	[2.20941]	[6.38798]
C	2.857900	2.802023	-0.151933
	(1.29420)	(0.80087)	(0.60351)
	[2.20824]	[3.49872]	[-0.25175]

Standard error in () & t-statistics []

$LOG (GDP) = C (1)* LOG (GDP (-1)) + C (2)* LOG (EXPORTS (-1)) + C (3) * LOG (IMPORTS (-1)) + C (4)$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.853523	0.174529	4.890427	0.0000
C(2)	0.099162	0.177055	0.560066	0.5763
C(3)	-0.080588	0.281423	-0.28636	0.775
C(4)	-0.469628	0.260664	-1.801659	0.0736

Source Views 7

The results of the VAR model estimate show that the variable that designates exports has positive effects on GDP, but it does not have significant probability. On the other hand, the variable that designates imports has a negative effect on GDP, but it also has a probability that is not significant.

4.5 Granger Causality Test

The objective of applying the Granger Causality Test is to verify whether there is a causal relationship between the different variables existing in our empirical investigation.

Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	Conclusion
LGDP does not Granger Cause LEXPORTS	56	0.27494	0.7607	not rejected
LEXPORTS does not Granger Cause LGDP		4.35969	0.0179	rejected
LIMPORTS does not Granger Cause LEXPORTS	56	0.67937	0.5115	not rejected

LEXPORTS does not Granger Cause LIMPORTS		16.0783	4.00E-06	not rejected
LIMPORTS does not Granger Cause LGDP	56	7.35149	0.0016	rejected
LGDP does not Granger Cause LIMPORTS		6.75404	0.0025	rejected

Source Views 7

The causality test indicates that exports influence the GDP and also imports influence GDP. On the other hand, GDP influence imports but does not influences exports.

4.6 Residual Diagnostics Tests

To verify that our empirical work is acceptable and that our estimate is well treated. We use a set of tests called residual diagnostic tests.

Residual Diagnostic Tests

Residual Diagnostics Tests	
R-squared	0.973793
Adjusted R-squared	0.97284
F-statistic	1021.833
Prob(F-statistic)	0.0000
Breusch-Godfrey Serial Correlation LM T Tests	34.88984
Heteroscedasticity Test : Breusch-Pagan-Godfrey	5.267022

Source Views 7

All residual diagnostic tests are satisfactory and assert that our model is acceptable and well treated (R^2 is greater than 60%, Fisher statistical probability is less than 5%, Breusch-Godfrey Serial Correlation LM T Tests are superior to 5%).

Estimated equation for our model

Dependent Variable: GDP

Method: Least Squares

Date: 04/07/20 Time: 18:36

Sample: 1961 2018

Included observations: 58

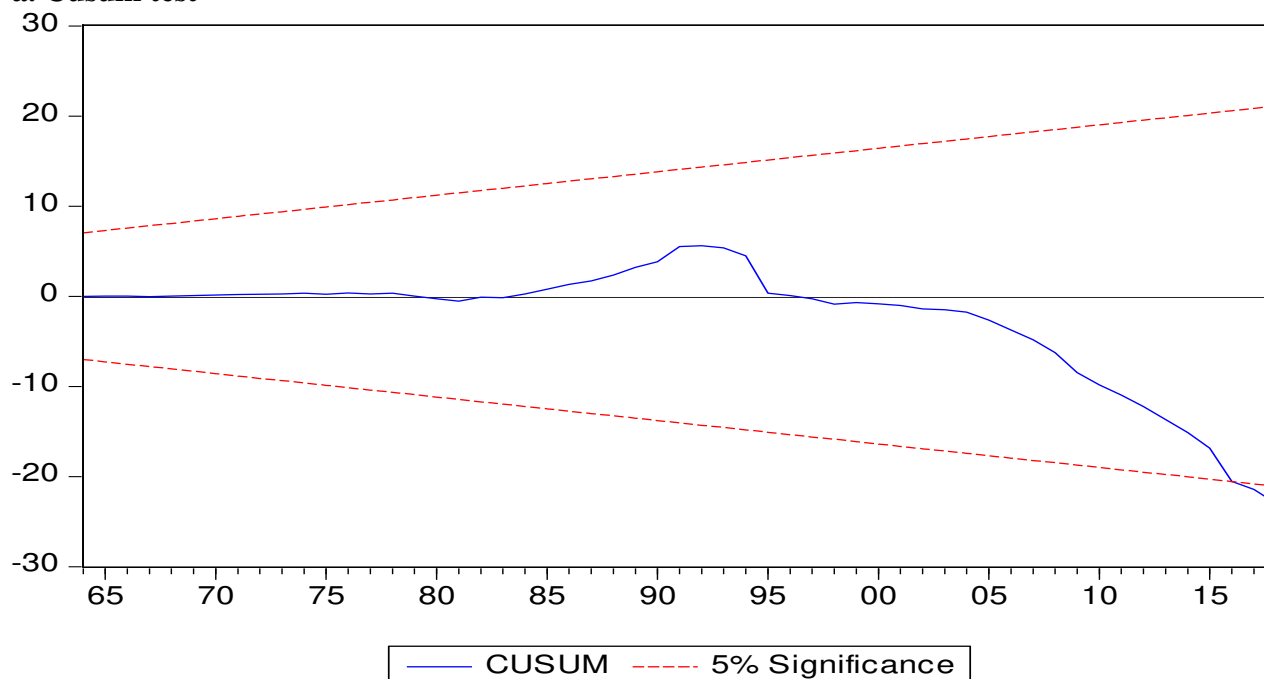
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.47E+08	67161209	6.658127	0.0000
EXP01	1.141864	0.699654	1.632040	0.1084
IMP	2.402814	0.316708	7.586846	0.0000

R-squared	0.973793	Mean dependent var	2.28E+09
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Adjusted R-squared	0.972840	S.D. dependent var	2.46E+09
S.E. of regression	4.06E+08	Akaike info criterion	42.53265
Sum squared resid	9.07E+18	Schwarz criterion	42.63923
Log likelihood	-1230.447	Hannan-Quinn criter.	42.57417
F-statistic	1021.833	Durbin-Watson stat	0.623953
Prob(F-statistic)	0.000000		

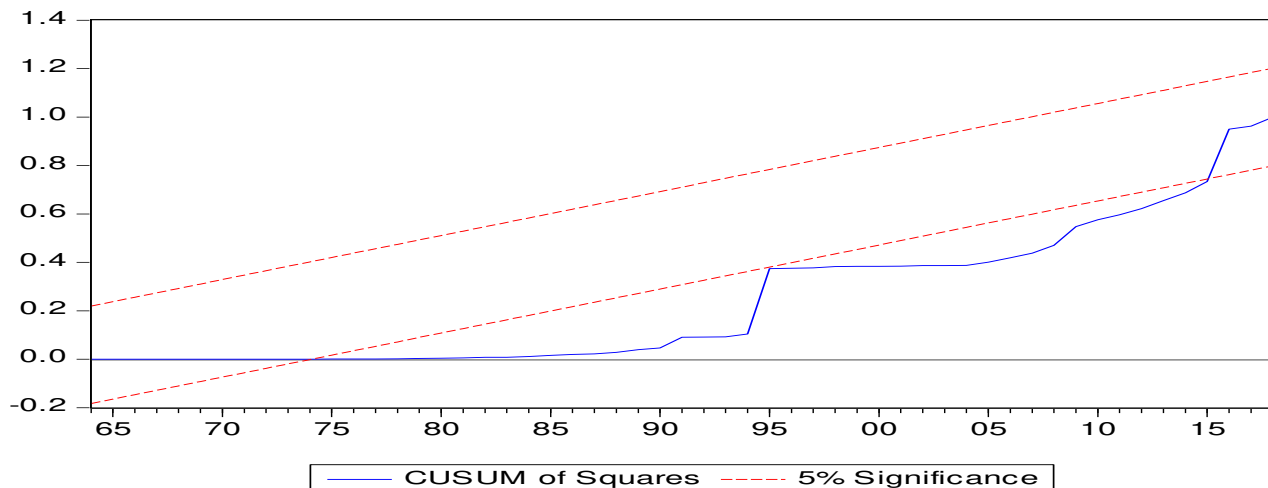
4.7 Stability tests of the specification model

a. Cusum test



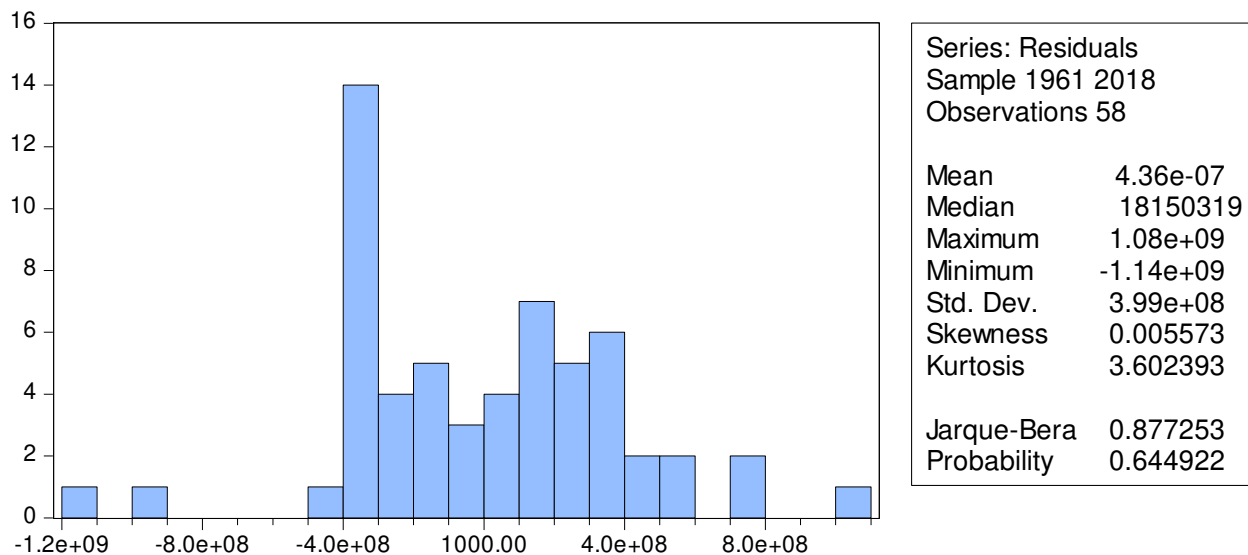
Since the blue line crosses the red line our model is not stable means that our dependent variable which is GDP (Gross Domestic Product) is also not stable.

b. Cusum test of squares



Likewise, as Cusum test the Cusum test of Squares also indicate that both model and dependent variable are not stable.

c. Normality test



Null hypothesis: residuals are normally distributed

Alternative hypothesis: residuals are not normally distributed

Since the probability is not significant we have weak evidence against the null hypothesis then we fail to reject the null hypothesis, hence our residuals are normally distributed.

4.8 Summary of findings

The aim of this research was to determine the association between the international trades on economic growth of Rwanda in the period of 1960-2017. The cointegration test, VAR model and Granger causality tests are used here to look into the association between these three variables.

The unit root properties of the data were examined using the Augmented Dickey Fuller test (ADF) and Phillips Perron test (PP) after that the cointegration and causality tests were conducted.

The cointegration test results show the absence of cointegration relation, which suggests using the VAR model. The estimation of the VAR model shows that exports influence economic growth while imports do influence Rwandan economic growth. Finally, and from the causality test, we find that exports cause economic growth and imports do cause economic growth. These results indicate that exports and imports are presented and seen as a source of economic growth in Rwanda. Therefore, our findings have led to the discovery that exports and imports cause economic growth; these results are expressed using the several advantages that characterize the social economic situation of Rwanda and its economic policy strategy.

We found that the coefficient of exports (Exp) and imports (Impo) have a positive impact on growth. It is statistically significant at 5 percent significance level. A one percent increase in exports will lead to an increase in real GDP by 4.67 percent approximately, and a one percent increase in imports will lead to an increase in real GDP by 11.42 percent approximately. This positive relationship between exports and real GDP and imports and GDP in Rwanda were consistent with a previous empirical study. This interesting result obtained from the empirical study confirms the positive sectors of Exports and imports dominance, which do generate direct growth impacts on the wider economy growth in Rwanda. Some conditions that are often associated with official exports and imports to developing countries, Rwanda inclusive, might be directly favorable to initiating higher levels of industrial performance as well as economic growth. For instance, substantial exports go to manufacturing sectors of the economy, particularly services sector for which reason exports and imports will make any significant impact on industrial performance and on economic growth (Adenutsi, 2008). The result obtained is consistent with several studies in developing countries.

5. Conclusion

The study examined the macroeconomic determinants of economic growth in Rwanda using cointegration approach. The empirical analysis was based on time Series econometrics. It is found in current study that all variables, growth in real GDP, exports and Imports, turned out to be non-stationary at their levels but became stationary at their first difference. The results of Johansen's cointegration test indicates that there exist a long run and short run relationship between growth in real GDP, exports and imports. All explanatory variables have a positive effect on growth in real GDP. As a result, increase in these variables lead to improve the real GDP. Hence, variables are significant determinants of growth in real GDP in Rwanda.

All coefficients are positive as expected based on theory. It is statistically significant at 5 percent significance level. Specifically, a one percent increase the explanatories had caused real economic growth in other words, gross domestic product (GDP) has been increased respectively, and approximately for each determinant enumerate above. It was inferred that these variables have the positive impacts on real GDP in Rwanda, in general. This means that Rwanda economic growth depend clearly of the above mentioned determinants. These results are in support of theory and concurs with the results obtained during analysis. Through the obtained results, the study has found that there is a positive relationship between exogenous variables mentioned and economic growth in Rwanda, all other things being equal. Results of the study indicate that exports and imports have positively and significantly contributed to economic growth.

Acknowledgements

The authors would like to thank the anonymous referees for their helpful suggestions and comments.

Authors' contributions

All authors have participated in development of research project, data collection, data analysis and paper writing.

Funding

This study was not funded.

Availability of data and materials

Data used in this study are included in this published article in appendix.

Ethics approval and consent to participate

All participants in this study did so willingly

Consent for publication

All authors agreed on the publication of this paper.

Conflict of interest

The authors declare that they have no conflict of interest.

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Appendix: Data used in this study

Years	GDP	EXP	IMP	years	GDP	EXP	IMP
1961	119000024	14800000	12000000	1990	2405021933	147651245.8	415791834
1962	122000016	14000000	12000000	1991	2550185618	143182955.2	358799633.5
1963	125000008	11600000	16000000	1992	1911600970	139864281.5	345146615.4
1964	128000000	7600000	16200002	1993	2029026704	112984489.2	370561935.1
1965	129999994	15600000	16400000	1994	1971525999	102031320	404236979.4
1966	148799980	18000000	25200000	1995	753636371	47498580	488303932.7

1967	124525702.9	14045713.1	24902858.29	1996	1293535011	66627296.73	334008606.6
1968	159560018	16773000	24593001	1997	1382334879	83373731.5	362153710
1969	172200018	15049999	26070001	1998	1851558302	144372284.3	475297259.2
1970	188700037	14489999	27089999	1999	1989343495	111106099	461714689.5
1971	219900006	25299999	33500001	2000	1817654508	113094523.3	445787126.4
1972	222952578.2	22766639	37610085.72	2001	1734938652	109644384.5	431623403.1
1973	246457838.3	20411486.9	40062970.52	2002	1674685248	141817491.5	406587569.7
1974	290746157.1	33721790.5	39083911.25	2003	1677552332	118119710.9	397639541.1
1975	308458423.2	37535558.2	65821689.96	2004	1846198771	156051743.2	434576075.7
1976	571863295.7	52450624.4	101216639.4	2005	2088961969	232361645.8	517259532.9
1977	637754162.1	92977882.2	123695655.1	2006	2581313486	294943231.1	650812641.9
1978	746650558.6	106530355	131859980.3	2007	3152324689	383005356.3	786621166.9
1979	905709147.3	133872851	215559862.3	2008	3824788145	599140697.1	964455942.4
1980	1109346221	233473706	252391554.1	2009	4860093843	609899959.5	1449766636
1981	1254765350	181144471	331033109.1	2010	5378925895	631152212.8	1596232359
1982	1407062608	138251015	306102669.4	2011	5773084568	695039484.3	1731424282
1983	1407242640	162572533	339856004.7	2012	6563320570	895592501.5	1985240873
1984	1479688126	171374038	307168308.3	2013	7334917697	937907530.1	2331374611
1985	1587412957	200513014	312153000.7	2014	7621923308	1073961239	2433689123
1986	1715625839	184987471	341193178.5	2015	8016591928	1180211471	2638306272
1987	1944711061	244728623	391947117.8	2016	8277613194	1178598262	3171144191
1988	2157434025	160729968	412959379.9	2017	8475681533	1264597146	2805809833
1989	2395493878	158571150	421685680.5	2018	9135454442	1666361005	2993903411

Figures

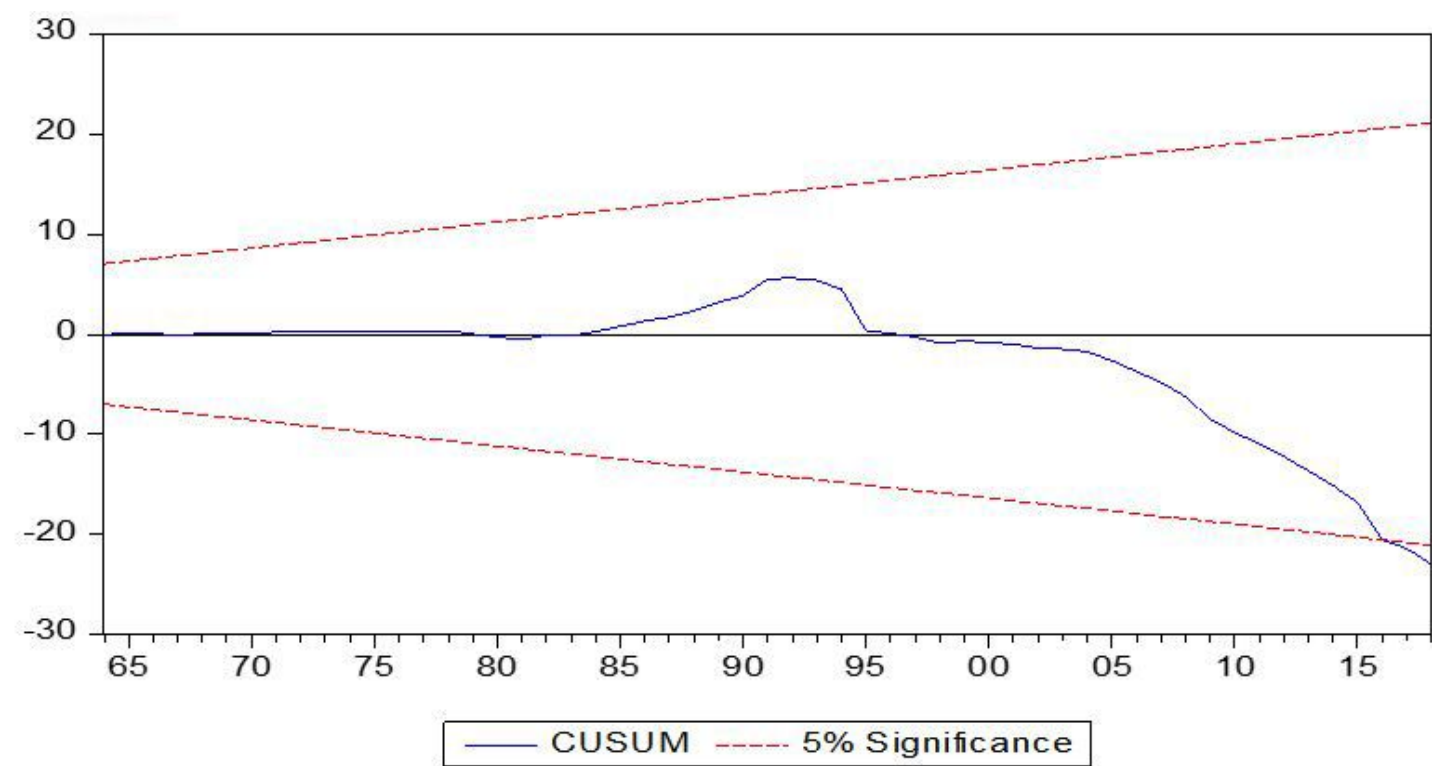


Figure 1

Cusum test

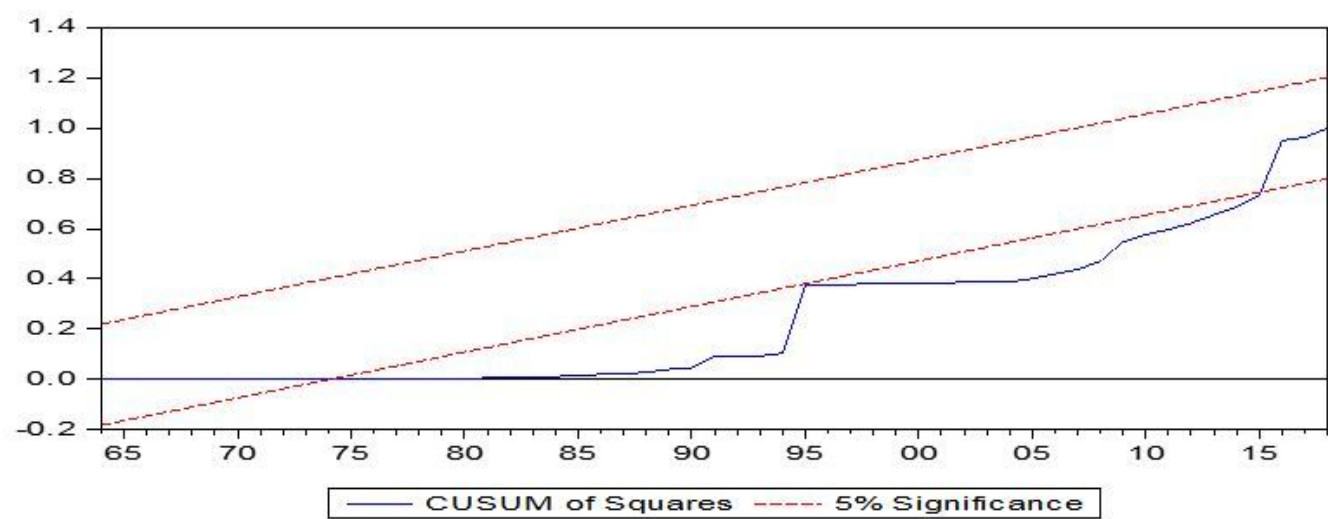


Figure 2

Cusum test of squares

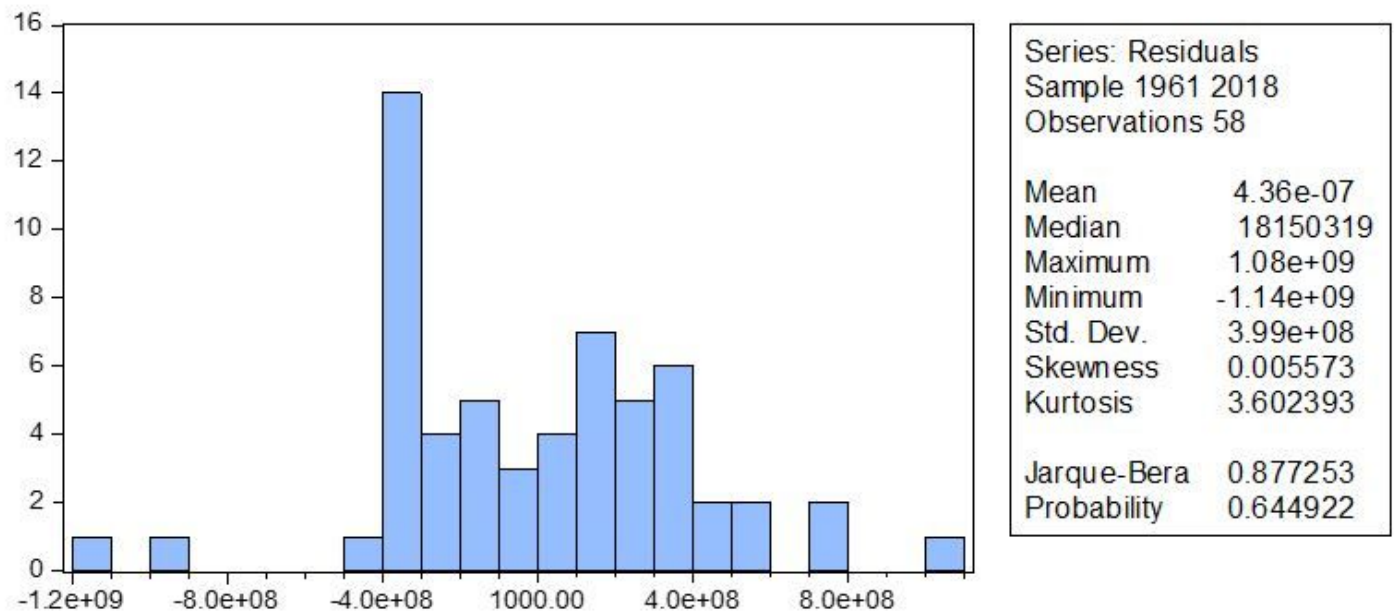


Figure 3

Normality test