Testing the relationship between tourism receipts , economic growth and the real effective exchange rate in Algeria during the period (1995 - 2020) using cointegration and Toda yamamoto causality

اختبار العلاقة بين عائدات السياحة، النمو الاقتصادي و سعر الصرف الفعلي الحقيقي في الجزائر خلال الفترة (1995– 2020) باستخدام التكامل المشترك و سببية Toda yamamoto

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Abstract

This study aims to testing and analyzing the relationship between tourism receipts , economic growth and real effective exchange rate in Algeria over the period (1995 -2020), using cointegration and toda yamamoto causality test the johansen cointegration test show that a long run relationship exists between variables, The impact of tourism receipts on economic growth is about 1.571074 % this effect is statistically significant at 5% level also a significant causal relationship in the short run is found from LTRSM and LREER to LGDP at 1% and 5 % level of significant according to toda yamamoto causality test

***Key words**: Tourism , Economic growth , Cointegration , Causality , Algeria*

الملخص :

تهدف هذه الدراسة إلى اختبار وتحليل العلاقة بين عائدات السياحة ، النمو الاقتصادي وسعر الصرف الفعلي الحقيقي في الجزائر خلال الفترة (1995–2020)، وذلك باستخدام التكامل المشترك واختبار السببية لـ Toda yamamoto، أظهر اختبار Johansen للتكامل المشترك وجود علاقة طويلة المدى بين المتغيرات ، بلغ تأثير عائدات السياحة على النمو الاقتصادي حوالي 1.57%، وهذا التأثير ذو دلالة إحصائية عند مستوى 5%، كما توجد علاقة سببية معنوية على المدى القصير عند مستوى 1% و 5 % من لوغاريتم العائدات السياحية ، لوغاريتم سعر الصرف الفعلي الحقيقي الى لوغاريتم الناتج الداخلي الخام.

الكلمات المفتاحية: السياحة، النمو الاقتصادي، التكامل المشترك، السببية، الجزائر

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1. INTRODUCTION

Tourism is one of the fastest growing industries in the world and an important part of economic growth and development strategies, It is the third biggest economic activity in the world after oil and motor vehicles ; so, many countries adopted on tourism for sustainable economic growth (**Sinclair**, **1998**), considered as a source of foreign exchange (currency) necessary to finance the formation of gross fixed capital, which is necessary to increase productive capacity, promote new investment in infrastructure and enhance competitiveness. Reduce unemployment, increase national income and stimulate other economic sectors with direct and indirect impact. It is known as having a positive impact on the increase of economic growth (**Brida**, **2010**), tourism's as well an important operator for local corporations to profit from economies of scale, technology development, a motivation of human capital accumulation (**Brida et al, 2009**)

According to the World Tourism Organization, the number of international tourists coming in 2017 reached about 1 billion and 322 million tourists, a growth rate of 7% over 2016. The number of incoming tourists is expected to reach 2.09 billion by 2028 (**UNWTO, 2017).**

As one of the largest economic sectors in the world, tourism and travel

mainly support economic growth and job creation. In 2017, the total share of tourism and travel in global GDP reached 10.4%, or the US $ 8.272 billion, and the sector provided more than 313 million jobs or 9.9% of total employment. World Travel and Tourism figures also indicate that tourism spending reached $ 1.49 billion, accounting for 6.5% of the world's total exports. Tourism investments amounted to $ 882.4 billion, equivalent to 4.5% for 2017 (**WTTC, 2018**).

In Algeria, despite its natural qualifications, and the great effort made during the initial period of its independence to give the tourism sector the deserved look after, tourism remained among secondary sectors that did not receive the care and support. In spite of the second attempt to promote the sector through the preparation of the guiding plan for tourism development horizons 2025, which is a road to the state to develop tourism in Algeria, but the sector did not know the desired starting point.

Currently, many signs point to a future trend that the tourism sector in Algeria can identify. Despite the deteriorating security conditions surrounding the neighboring countries in the east and south, which directly affect the profitability of one of the most important attractions of Algerian tourism (desert), but the government announced in its program that the tourism sector is one of the priority sectors of the national economy among the five leading sectors.

The aim of this paper is to examine the link between tourism receipts, exchange rates and economic growth on Algeria using Toda-Yamamoto causational relationship over the period 1995-20120

Research problem

Is there a significant effect of real effective exchange rate and tourism receipts on economic growth in Algeria ?

Research hypothesis

there is a long run Relationship between *tourism receipts , real effective exchange rate and economic growth in Algeria*

- There is a causality between *tourism receipts, real effective exchange rate and economic growth in Algeria*

2. LITERATURE REVIEW

Most of the last studies are heading to develop growth models in which tourism is a source of currency, stimulating investment, creating employment that ultimately leads to economic growth (Fayissa et al 2007, Mahmoudinia 2011, Ghartey 2013, Mallick et al 2016, Phiri 2016, Muhtaseb 2017).

The economic estimates inspired these works by using a lot of models and economical techniques. The causal analysis has been used by the majority of these experimental studies.

Bilal et al (2010), analyze the impact of international tourism on economic growth in Turkey by reliance on the ARDL approach to Co-integration and Error correction model by using quarterly data. The results indicate the existence of a long-term relationship between the tourism sector, the real exchange rate and economic growth

. Belloumi (2010), finds a co-integrating linkage between tourism and economic growth, the Granger causality test indicates that tourism has a positive impact on gross domestic product growth

Chor (2012), analyses the relationship between tourism revenue, real gross domestic product and real exchange rates in Malaysia during the period 1974-2009. This study applies the bounds testing approach and error-correction modelling, the results revealed that there is causality in the long-run between tourism revene and real gross domestic product , also a uni-directional causality from real exchange rates to tourism revenue is found

Hooi, Sio and Chee (2014), examined the impact of tourism on economic growth in Malaysia and Singapore during the period 1980-2009, their results show that there is no causal nexus between economic growth and tourism expansion in Malaysia and Singapore in the short-run.

Ivana et al (2015), studied the relationship between tourism revenue , real effective exchange rate and economic growth in Croatia using a quarterly data 1996-2013, The results suggests that there is a causality in short-run term between openness in the economy and gross domestic product, as well as between real effective exchange rate and GDP.

Harun et al (2016), studied the relationship between tourism revenue, exchange rate and economic growth in Turkey during the period 1972-2014 by using Johansen co-integration and Granger causality. This study found out that 1% increase in tourism is associated with an increase in economic growth by about 0.314%.

, Benzarour and satour (2017) used the Co-integration and Causal analysis, by studying the long-run link between tourism and economic growth over in Algeria the period 1995-2014, They showed that tourism has an impact on economic growth uni-directionally.

There are many articles about the relationship between tourism receipts, exchange rates and economic growth. In the literature, as it summarized above. Although, the presented study is similar to them in some perspectives. However, it has a different point of view in the methods teams and analyses used. annual data was used for the study variables during the period 1995-2020, which includes the econometrics methodology , which includes using cointegration and causal relationships between variables and the ordinary least squares method to estimate the long-term equilibrium relationship

3. DATA METHODOLOGY AND RESULTS

3.1 . Data and Methodological framework:

Various functional forms have been tested to check the relationship between tourism receipts, exchange rate and economic growth in Algeria. The most appropriate functional forms of the interested variables ware specified as:

3.2 . Type and Sources of Data:

To examine the relationship between tourism receipts, exchange rates and economic growth in Algeria, this research employs annual data during the period 1995-20120 was extracted from the Data Market*. The data availability was the major reason for the time period selection. The sample data include real GDP (dollar), tourism receipts (dollar) and exchange rate (dollar). All the variables are used in logarithmic forms.

As a first stage of the empirical analysis, a unit root test is conducted to determine the stationarity of the time series data. Most of the time series variables are non-stationary, and the use of such data leads to spurious regression, which can't be used to get objective and accurate results from. The order of integration of the variables included in the model is determined by using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests

3.3.The model specification and desctriptive statistics

Based on the characteristics of the Algerian economy and the research problem , in addition to the data collected and previous studies on the subject, the following econometrics model can be proposed.

$$LGDP = f\ (LGDP_{t-1}\ \ LTRSM\ ,\ LREER)$$

$$LGDP = \alpha_0 + \alpha_1 * LGDP_{t-1} + \alpha_1 * LTRSM + \alpha_2 * LREER + U_t \ldots.(1)$$

Table 1: Variables explanation

Variable	***Explanation***
LGDP	Gross domestic product (in ***logarithm***) **source: www.worldbank.org**
$\boldsymbol{LGDP_{t-1}}$	Gross domestic product (in ***logarithm***) lagged one period
LREER	Real effective exchange rate (in ***logarithm***) **source: www.worldbank.org**
LTRSM	Tourism receipts (in ***logarithm***) **source: www.worldbank.org**

Table 2: desctriptive statistics of variables

	GDP	***TRSM***	***REER***
Mean	8.84E+15	214.6923	106.6899
Median	1.10E+16	187.5000	102.0197
Maximum	2.10E+16	473.0000	135.5487
Minimum	4.18E+10	28.00000	91.22158
Std. Dev.	8.38E+15	137.5967	12.05803
Skewness	0.052986	0.228649	0.926103
Kurtosis	1.262628	1.746847	2.680038
Jarque-Bera	3.282166	1.927808	3.827464
Probability	0.193770	0.381401	0.147529
Sum	2.30E+17	5582.000	2773.938
Sum Sq. Dev.	1.76E+33	473321.5	3634.901
Observations	26	26	26

Source : Authors based on Eviews 12

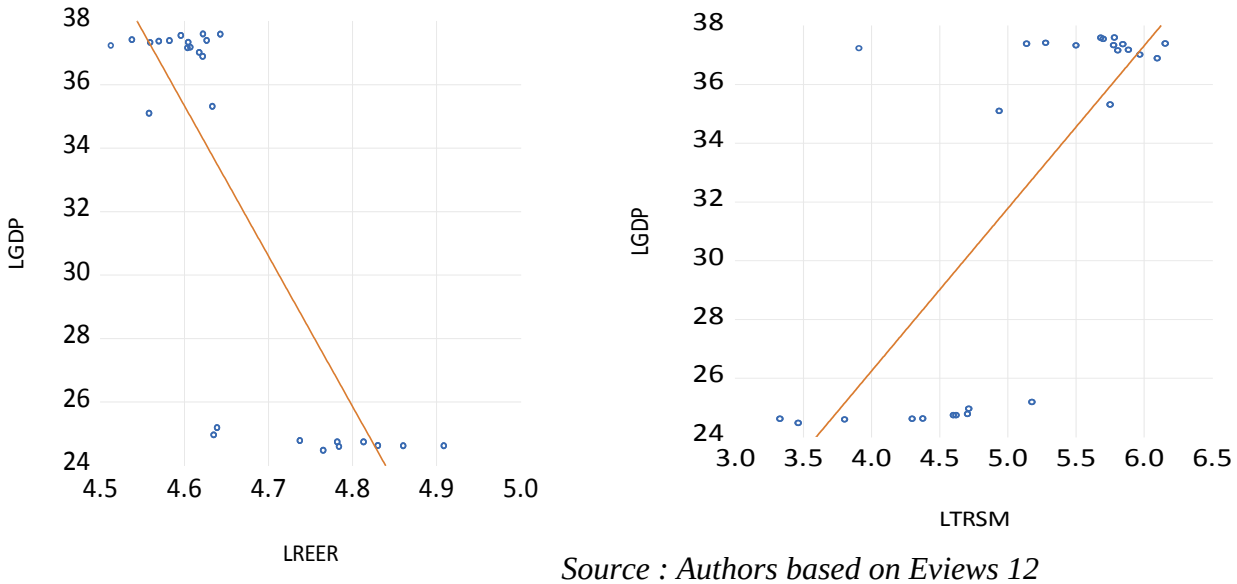
Table 3: *Correlation matrix between variables*

Correlation matrix			
Probability	***GDP***	***TRSM***	***REER***
GDP	**1.000000**		
TRSM	**0.670296 (0.0002)*** **	**1.000000**	
REER	**-0.700068*** (0.0001)**	**-0.572788 (0.0022)*** **	**1.000000**

*****significant at 1% level**

Source : Authors based on Eviews 12

Figure 1: Correlation between variables



Source : Authors based on Eviews 12

From the correlation matrix between variables, we can see that:

The logarithm of tourism receipts *(LTRSM)* is positively correlated with the logarithm of gross domestic product (LGDP) , this relationship is statistically significant at 5 % and 1% level , also the real effective exchange rate is negatively correlated with LGDP at 1 % and 5% level of significance, moreover the correlation between *LTSRM* and *LREER* is negaitive and statistically significant at 1 % level of significance this results are consistent with theoretical background.

3.4.Unit root test

Relying on the time series for the study variables prompts us to determine the degree of integration of these series through the unit root test. We will rely on the Augmented Dickey-Fuller test (ADF) and Philippe Perron PP to confirm the results of the first test.
The augmented Dickey-Fuller test is based on the following regression:

$$\Delta xt = \rho x_{t-1} + \sum_{j=1}^{p} \phi j \Delta x_{t-j+1} + \varepsilon t \ldots\ldots (1)$$

$$\Delta xt = \rho x_{t-1} + \sum_{j=1}^{p} \phi j \Delta x_{t-j+2} + c + \varepsilon t \ldots\ldots (2)$$

$$\Delta xt = \rho x_{t-1} + \sum_{j=1}^{p} \phi j \Delta x_{t-j+2} + bt + c + \varepsilon t \ldots (3)$$

After estimating the three models, the tϕj statistic is obtained, Student distribution

The unit root test is based on testing the following two hypotheses:

$$H_0 : \rho = 0 \quad , H_1 \quad |\rho| < 0$$

$$\hat{\sigma}^2 = \frac{1}{n} \sum_{t=1}^{n} e_t^2$$

$$s_t^2 = \frac{1}{n} \sum_{t=1}^{n} e_t^2 + 2 \sum_{t=1}^{I} \left(1 - \frac{i}{I+1}\right)$$

$$PP : t_{\hat{\phi}}^{*} = \sqrt{k} \; x \frac{(\widehat{\phi 1} - 1)}{\hat{\sigma}_{\hat{\phi}\,1}} + \frac{n(k-1)\hat{\sigma}_{\hat{\phi}\,1}}{\sqrt{k}}$$

Table 4 : Unit Root Test

Variables	ADF unit root test	
	Level	First difference
LGDP	-1.671932 **(0.733)**	-4.959*** **(0.002)**
LREER	-2.2354 **(0.451)**	-4.4785*** **(0.008)**
LTRSM	0.0785 **(0.995)**	-4.5798*** **(0.007)**
	PP unit root test	
	Level	**First difference**
LGDP	-1.7179 **(0.7129)**	-4.9598*** **(0.0029)**
LREER	-2.2354 **(0.4511)**	-4.4599*** **(0.0087)**
LTRSM	2.290224 **(0,998)**	-5.646386*** **(0.0006)**

Source : Eviews 12

Through the results of the stationarity test of the variables, we note that all the variables are integrated for order I(1) , and therefore the cointegration test can be applied

3.5.Johansen co-integration and Toda yamamoto causality test

The cointegration test of johansen is based on calculating the trace statistic and comparing it to the critical values, where the null hypothesis indicates the absence of a co-integration relationship between the variables and the alternative hypothesis indicates the presence of co-integration between all variables. The trace statistic can be calculated as follows:

$$\lambda_{trace} = -T \sum_{\lambda=r+1}^{k} log(1 - \lambda_i)$$

T number of observations , λ_i the eigenvalues.

Table 5 : Johansen co-integration test

Hypothesized No. of CE(s)	***Eigenvalue***	***Trace Statistic***	***0.05 Critical Value***	***Prob.*****
H_0 : r = 0 * H_1 : r > 0	0.686733	41.87239	29.79707	0.0013
H_0 : r = 1 ** H_1 : r > 1	0.396681	14.01558	15.49471	0.0825

****the null hypothesis is rejected at 5 percent significance level***

***** the null hypothesis cannot be rejected at 5 percent significance level***

Source : Authors based on Eviews 12

The results of the cointegration test indicate the existence of a long-term equilibrium relationship between the variables, meaning that they do not differ greatly from each other in the long run as they behave similarly. morever, these results confirm that both the real effective exchange rate and tourism revenues are considered determinants of economic growth in the long term for the Algerian economy

Table 6 : Regression estimation results , LGDP (dependent variable)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	69.80368**	32.13631	2.172112	0.0414
LGDP(-1)	0.581610***	0.112927	5.150328	0.0000
LTRSM	1.571074**	0.710477	2.211295	0.0382
LREER	-13.72642**	6.201618	-2.213361	0.0381
R^2	**0.900558**	***DW-STAT***		**2.121708**
F-statistic	**63.39305**	***Prob(F-statistic)***		**0.000000*** **
Specification test		**Stat test**		**Probability**
Serial Correlation LM Test:		*F = 0.817067*		*0.4567*
Heteroskedasticity Test: ARCH		*F= 0.691368*		*0.5125*

****significant at 1% level , **significant at 5% level**

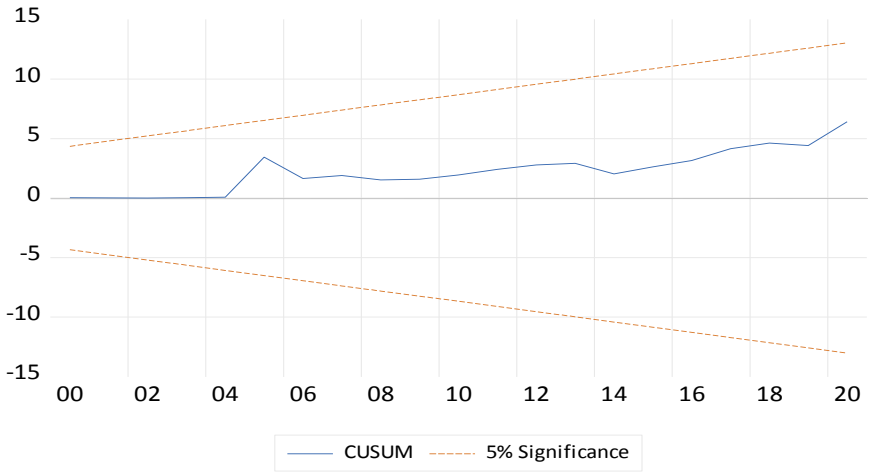
Source : Authors based on Eviews 12

An increase in *LGDP* Lagged one period of 1 % is associated with an increase in the *LGDP* of about 0,58 % and statistically significant at 1 % and 5 % level this result indicates that the gross domestic product increased during the study period

From the estimation results we can see that The impact of tourism receipts is about 1.571074 % this effect is statistically significant at 5% level, this effect confirms the contribution of the tourism sector in the formation of the gross domestic product , this results are consistent with theoretical background. On the other hand, the exchange rate has a significant impact on gross domestic product at 5 % level of significance

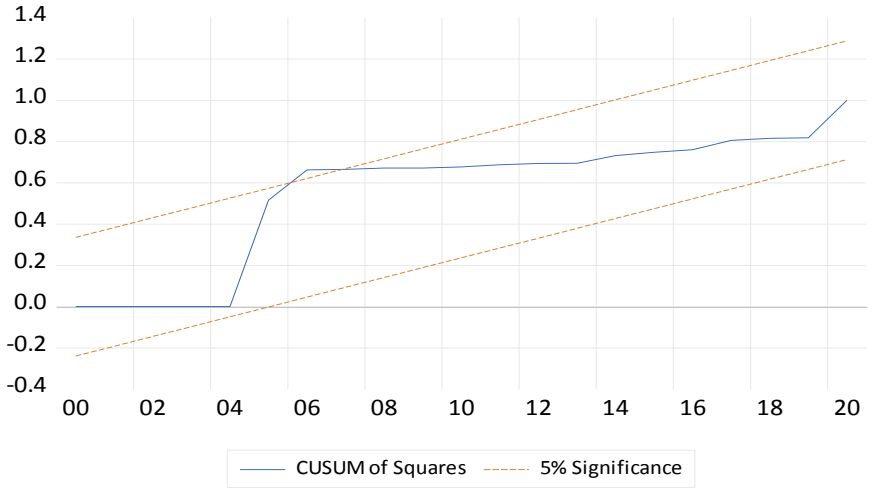
The coefficient of determination R^2 indicates that the model has explained 90% of the changes of the dependent variable. This result indicates a good specification of the model. On the other hand, we Through the results of the Lagrangian multiplier test for serial correlation, we note that the probability value is greater than 0,05 , and therefore we accept the null hypothesis, meaning that the residuals are not self-correlated at 5% significant level. Also The results of homogeneity of variance confirm to us that the variance of the model residuals is constant, also we can see that the regression model is statistically significant at 1% and 5 % level according to the *F* statistic test.

Figure 2: CUSUM test



Source : Eviews 12

Figure 3: CUSUM of squares test



Source : Eviews 12

According to the cumulative sum and cumulative sum of squares tests statistic for regression model .we can see that the model is stable and satisfies the stability coditions at 5 % level , however cumulative sum of squares statistics indicates instability of the coefficients at 5 % level of significance , we conclude the good specification of the model

Table 7 : PP test (residuals)

Variable	PP	0.01	0.05
	Statistic	Critical Value	Critical Value
Residuals	-5.803***	--4,4163	-3.622

Source : Eviews 12

Through the results of the unit root test for the residuals, we can see that the probability value of ADF the test is smaller than 0,05 , and therefore we reject the null hypothesis, meaning that the residuals are stationary at level I(0)

Table 8 : Toda Yamamoto Causality test

Dependent variable / Independent variable	LGDP	LREER	LTRSM
LGDP		2.002932 **(0.3673)**	5.545978 (0.0625)
LREER	26.91394*** **(0.0000)**		2.11676 **(0.347)**
LTRSM	11.58431*** **(0.0031)**	3.486528 **(0.1749)**	

***the hypothesis is rejected at 0.01 significance level**

Source : Authors based on Eviews 12

The Toda Yamamoto Causality tests results suggest that *LREER* , and *LTRSM* Causes *LGDP* at 1 % and 5 % level of significance respectively , Thus , it can be argued that past values of *LREER* , and *LTRSM* contribute to the prediction of the present value of *LGDP* , we conclude that the LGDP in Algeria is influenced real effective exchange rate and tourism receipts in the short run .

4.CONCLUSION

This study aimed to measure the relationship between the real effective exchange rate, tourism revenues and economic growth for the Algerian economy during the period(1990 – 2020) . Cointegration and causality testing were used. The following results were obtained.

- The results of the cointegration test confirmed to us the existence of a long-term equilibrium relationship between the variables

- The impact of tourism receipts on GDP is about 1.571074 % this effect is statistically significant at 5% level, this effect confirms the small contribution of the tourism sector in the formation of the gross domestic product in Algeria , this results are consistent with theoretical background

- From the results obtained, it can be concluded that the contribution of the tourism sector to the formation of the gross domestic product is small in the Algerian economy, and this is due to the small size of investment in this sector. Therefore, in order to achieve economic diversification, the government must promote the tourism sector.

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Appendices

1. LS estimation

Dependent Variable: LGDP
Method: Least Squares
Date: 08/12/23 Time: 17:54
Sample (adjusted): 1996 2020
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	69.80368	32.13631	2.172112	0.0414
LGDP(-1)	0.581610	0.112927	5.150328	0.0000
LTRSM	1.571074	0.710477	2.211295	0.0382
LREER	-13.72642	6.201618	-2.213361	0.0381

R-squared	0.900558	Mean dependent var	32.61175
Adjusted R-squared	0.886352	S.D. dependent var	6.052020
S.E. of regression	2.040236	Akaike info criterion	4.409655
Sum squared resid	87.41384	Schwarz criterion	4.604675
Log likelihood	-51.12069	Hannan-Quinn criter.	4.463745
F-statistic	63.39305	Durbin-Watson stat	2.121708
Prob(F-statistic)	0.000000		

2. Autocorrelation Correlogram

Date: 09/01/23 Time: 15:59
Sample (adjusted): 1996 2020
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. *| . |	. *| . |	1	-0.107	-0.107	0.3194	0.572
. *| . |	. *| . |	2	-0.133	-0.146	0.8380	0.658
. *| . |	. *| . |	3	-0.087	-0.123	1.0711	0.784
. *| . |	. *| . |	4	-0.070	-0.123	1.2308	0.873
. | . |	. *| . |	5	-0.058	-0.124	1.3450	0.930
. *| . |	.**| . |	6	-0.160	-0.249	2.2507	0.895
. | . |	. *| . |	7	0.043	-0.095	2.3207	0.940
. |* . |	. | . |	8	0.142	0.026	3.1234	0.926
. *| . |	.**| . |	9	-0.154	-0.236	4.1178	0.903
. |* . |	. | . |	10	0.091	-0.012	4.4887	0.923
. | . |	. *| . |	11	-0.013	-0.105	4.4967	0.953
. | . |	. | . |	12	0.055	-0.028	4.6555	0.969

*Probabilities may not be valid for this equation specification.

3. Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.817067	Prob. F(2,19)	0.4567
Obs*R-squared	1.979891	Prob. Chi-Square(2)	0.3716

4. Heteroskedasticity Test: ARCH

Heteroskedasticity Test: ARCH

F-statistic	0.691368	Prob. F(2,20)	0.5125
Obs*R-squared	1.487317	Prob. Chi-Square(2)	0.4754

4.Johansen Cointegration

Date: 09/01/23 Time: 16:01
Sample (adjusted): 1997 2020
Included observations: 24 after adjustments
Trend assumption: Linear deterministic trend
Series: LGDP LTRSM LREER
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.686733	41.87239	29.79707	0.0013
At most 1	0.396681	14.01558	15.49471	0.0825
At most 2	0.075657	1.888138	3.841465	0.1694

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.686733	27.85682	21.13162	0.0049
At most 1	0.396681	12.12744	14.26460	0.1059
At most 2	0.075657	1.888138	3.841465	0.1694

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values.

5 . Toda Yamamoto causality

VAR Granger Causality/Block Exogeneity Wald Tests			
Date: 09/01/23 Time: 16:03			
Sample: 1995 2020			
Included observations: 24			
Dependent variable: LGDP			
Excluded	Chi-sq	df	Prob.
LTRSM	11.58431	2	0.0031
LREER	26.91394	2	0.0000
All	36.68566	4	0.0000
Dependent variable: LTRSM			
Excluded	Chi-sq	df	Prob.

LGDP	5.545978	2	0.0625
LREER	2.116764	2	0.3470
All	7.694822	4	0.1034
Dependent variable: LREER			
Excluded	Chi-sq	df	Prob.
LGDP	2.002932	2	0.3673
LTRSM	3.486528	2	0.1749
All	3.840373	4	0.4280

6- DATA (Log variables)

	LGDP	LREER	LTRSM
1995	24.45530755215532	4.76581958134546	3.465735902799726
1996	24.57216913163599	4.784611525602559	3.80666248977032
1997	24.59816026964207	4.861138947370125	3.332204510175204
1998	24.59837133439554	4.909330951405551	4.30406509320417
1999	24.60772588485024	4.830817680618089	4.382026634673881
2000	24.72678081140801	4.782576341131365	4.624972813284271
2001	24.72594636157479	4.813817111943555	4.605170185988092
2002	24.76210395886271	4.73822670237674	4.709530201312334
2003	24.94076933406806	4.635520668942503	4.718498871295095
2004	25.16982217852761	4.63970924671169	5.181783550292085
2005	36.87284077493135	4.62238257720365	6.102558594613569
2006	36.99859597932204	4.618183534869675	5.973809611869261
2007	37.14129569547002	4.604381369754355	5.811140992976701
2008	37.37786070635541	4.627339036079525	6.159095388491932
2009	37.1577111889217	4.60792391000746	5.88887795833288
2010	37.31888055536398	4.605170185988092	5.780743515792329
2011	37.53457366635227	4.596364099775261	5.703782474656201

2012	37.57880781069397	4.643523437428307	5.68697535633982
2013	37.58213148488211	4.622988968333142	5.786897381366708
2014	35.29869397910449	4.633988697777409	5.755742213586912
2015	37.34805257624653	4.570299725485608	5.849324779946859
2016	37.31157759457554	4.560008367414423	5.505331535932363
2017	37.37256016447862	4.582961783812804	5.14166355650266
2018	37.40046857504527	4.538116605324824	5.283203728737989
2019	35.07970436249312	4.558566604947422	4.941642422609304
2020	37.2180429599191	4.513291483126688	3.912023005428146