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STUDYING THE LONG-TERM RELATIONSHIP BETWEEN GOVERNANCE AND ECONOMIC GROWTH DURING THE PERIOD Q_1 2010-Q_4 2021- A COMPARATIVE STUDY BETWEEN ALGERIA AND EGYPT

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ABSTRACT:

The study aimes at search for the relationship between governance and economic growth during the period $Q_1$2010-$Q_4$2021. The data has been converted to quarterly in order to study the relationship between the variables in the long term. Depending on (the index of effective governance, the rule of law, and administrative corruption) as independent variables, (the rate of economic growth) as a dependent variable, based on the VECM model. The results of the Johnson test showed the existence of a co-integration relationship between the indicators of good governance and economic growth, and the existence of an equilibrium relationship in the long term, while there is a unidirectional causal relationship between the governance effectiveness index and the administrative corruption index in Algeria, and the existence of a unidirectional causal relationship that goes from the effectiveness of governance towards administrative corruption in Egypt and the absence of the relationship in the opposite direction. In addition to the presence of a negative impact of each of the indicators of effectiveness of governance and administrative corruption on economic growth, and from it, the relationship between them is an inverse relationship in both Algeria and Egypt. It was also concluded that there is a positive effect of the rule of law indicator on economic growth, and from it the relationship is a positive relationship.

Keywords: Governance, economic growth, Algeria, Egypt.

INTRODUCTION:

The study of the relationship between good governance and economic growth is one of the topics that attracted the attention of many researchers and economists in its study, as economists agreed on the existence of a strong relationship between good governance and economic growth. This made the issue of good governance and economic growth one of the contemporary issues, given the importance of the latter in advancing economic development and the development of states. This gave good governance great importance that made it a priority for decision-makers, as it works to transform economic growth into sustainable development. However, the relationship between the

latter and economic growth remained not fully defined: there is a debate among researchers about whether growth leads to good governance, or applying governance in an effective way that leads to economic growth. Some researchers found that the relationship between them is moving from good governance towards economic growth, and that it has a positive impact on economic growth, while others found that some indicators of good governance negatively affect economic growth. In addition, Samarasinghe (2018) stated that theoretical models, including the Solow model and the new growth theory, despite providing a certain level of explanation for economic growth, its concept is still incomplete, and the current growth models have not succeeded in explaining the difference between countries. However, the importance of government policies is highlighted in the impact of good governance indicators on economic growth, given that they are a set of principles and institutions that are used to impose power.

STUDY PROBLEM:

Based on what was mentioned previously, and given the interaction that occurs between the indicators of good governance and economic growth, given that they are variables that are related to each other, and each of them affects the other, therefore it was necessary to search for the relationship between each of these variables, and in order to reach a conclusion on this topic, the following questions were raised: **What is the nature of the relationship between good governance and economic growth during the period $Q_1$2010-$Q_4$2021?.**

STUDY HYPOTHESES:

In order to be able to answer the question raised, the following hypotheses were formulated:

- There is a reciprocal relationship between indicators of good governance and economic growth during the period $Q_1$2010-$Q_4$2021.
- There is a negative impact of the governance effectiveness index on economic growth during the period $Q_1$2010-$Q_4$2021.
- There is a positive impact of the rule of law index on economic growth during the period $Q_1$2010-$Q_4$2021.
- There is a negative impact of the administrative corruption index on economic growth during the period $Q_1$2010-$Q_4$2021.

OBJECTIVES AND IMPORTANCE OF THE STUDY:

The objective of this study is to search for the nature of the relationship between each of the economic growth and indicators of good governance in Algeria and Egypt during the specified period, and whether there is an effect between these variables, and ascertaining the existence of a long-term relationship between economic growth and each of the indicators of good governance in the two countries. While the importance of the study lies in highlighting an issue of great importance to economists and economic policy makers, its importance is embodied in focusing on highlighting the relationship between these economic variables that play a major role in influencing the level of economic activity of the country.

STUDY METHODOLOGY:

In order to answer the problem raised and test the hypotheses, two approaches were relied upon. The first was the descriptive analytical approach. Its use is evident in the theoretical aspect about the relationship between good governance and economic growth, in addition to shedding light on the applied literature that dealt with the same subject of the study or even part of it. The second approach is the experimental measurement approach, by studying the nature of the relationship between the variables adopted in the study during the specified period using the VECM model, by relying on the Eviews program.

1. THE THEORETICAL RELATIONSHIP BETWEEN GOVERNANCE AND ECONOMIC GROWTH:

According to (Albassam, 2013) economic growth is related to government practices and the way governments govern directly and indirectly. In addition, management operations are affected by economic crises. International organizations such as the International Monetary Fund, the United Nations, and the World Bank have argued that good governance is an effective way to achieve goals such as economic growth and human development. Scholars and researchers agree that there is a strong relationship between economic growth and governance. However, it is controversial whether good governance practices leads to economic growth or whether economic growth leads to good governance. As mentioned by (Al-Naser & Hamdan, 2021), the theory indicates that long-term economic growth is positively or negatively affected by government policy although it is considered internal, great attention has been recently paid to the relationship between good governance and economic growth and that there is a positive relationship. However, there is still debate about whether good governance leads to economic growth although international organizations have argued that good governance leads to economic growth. On the one hand, discussions and arguments on this issue helped establish the conceptual background to define the relationship between good governance, economic efficiency, effectiveness, and growth, and on the other hand, great emphasis remained on impact. Good governance is defined as the measures that aim to change the ineffective political and institutional structure. Studies of this trend have found that institutional quality is effectively and strongly affected by long-term growth. Several studies such as Daniel Kaufmann and Aart Kraay (1999), Stephen Knack and Philip Keefer (1995, 1997), Robert Brro (1996) have shown that good governance variables such as control of corruption and stability are closely related to variables such as the growth rate of GDP per capita, or investment, as the aim of these studies is to show that good governance indicators have positive effects on economic growth. Where I began to study the relationship between good governance and economic growth is in 1984. In fact, the period of economic growth that was studied is the result of the political and institutional capabilities that have been developed since the fifties of the last century in the countries of Stan, for example. Accordingly, the indicators of good governance in the eighties and nineties are not related to the economic growth that results in the same period. Rather, there is a gap that must be taken into account when studying the impact of good governance on economic growth (Mira & Hammadache, 2017).

2. APPLIED LITERATURE:

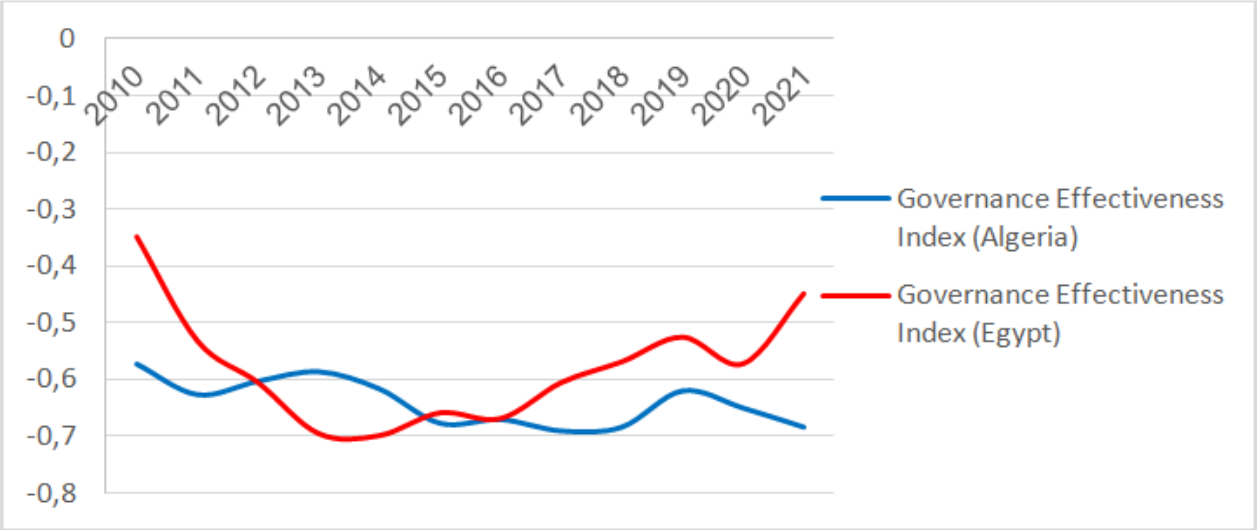
Many applied studies appeared that tried to explain the relationship between good governance and economic growth, for example, (Fayissa & Nsiah, 2013) found that effective good governance or its absence contributes to explaining the difference between African countries in terms of growth. (Emara & Jhonsa, 2014) stated that there is a positive and significant impact of governance indicators on economic growth, in addition, there is a statistically significant causal relationship from the per capita income towards the quality of governance. (Emara & Chiu, 2016) found that there is a positive impact of governance on economic growth. (Bhattacharjee & Halda, 2015) Confirmed that there is a positive and significant impact of participation, accountability, and effective governance on economic growth in South Asian countries, and that there is a negative impact of trade openness on economic growth. (Lahouij , 2016) emphasized that there is a close relationship between governance and economic development. However, (Andohol, 2019) emphasized the existence of a unidirectional causal relationship from economic growth towards the aggregated governance index, while the relationship in the opposite direction was absent. He also agreed with (Samarasinghe, 2018) that governance has a direct impact on economic growth, and controlling corruption is a critical determinant of economic growth. For his part (Erum, Naveed, & Imtiaz, 2018) found a positive relationship between the index of corruption control and investment on economic growth in Pakistan, in addition to the existence of a long-term equilibrium relationship

between investment and indicators of governance and economic growth, while in the short term, it was found that there is a positive relationship between the corruption control index and public investment, while there is a negative relationship between the political stability index and private investment on economic growth. However (Bouzid, 2019) found that there is a negative correlation between the index of corruption control and the rule of law and the index of political stability and economic growth in Tunisia, and that effective governance affects economic growth in the long term during the study period. (Jiandang , Jie, Zhou, & Liang, 2018) also found that the quality of governance has a positive effect on economic growth, due to strengthening governance in terms of helping or weakening the grip of power grabs.

3. ANALYSIS OF THE DEVELOPMENT OF THE GOVERNANCE EFFECTIVENESS INDEX IN ALGERIA AND EGYPT DURING THE PERIOD 2010-2021:

In this part, the development of the governance effectiveness index will be analyzed, which consists of (governance effectiveness, rule of law, and administrative corruption). The development of the index was calculated by collecting the values of these indicators and taking the average, and the following figure illustrates this.

Figure (1): The evolution of the governance effectiveness index in Algeria and Egypt during the period 2010-2021



Source: Prepared by researchers based on data available on the website: https://www.amf.org.ar

After calculating the governance effectiveness index for both countries, we can see that the government effectiveness index in Algeria and Egypt was characterized during the study period by a fluctuation in the value of the index, so that the value of the governance effectiveness index in Algeria was (-0.57) for the year 2010, and Egypt matched it with an index value of (- 0.35). The index values for both countries continued to rise until 2018, where the value of the Governance Effectiveness Index during this year was estimated at (-0.68) in the state of Algeria, while the State of Egypt had an index value of (-0.67) in 2016. In the year 2016, Algeria and Egypt had a meeting point with regard to the value of the index, as they both recorded the same value, which is (-0.67). Both countries also recorded the same value during the year 2012, as the value of the governance effectiveness index for the State of Algeria was (-0.60) and (-0.60) for the State of Egypt, and this confirms the curve shown in the above figure. After that, the value of the index rebounded until it recorded a value of (-0.45) during the year 2021 for the State of Egypt, which was offset by an increase in the value of the index (-0.68) for the State of Algeria.

What can be said is that the States of Algeria and Egypt recorded almost the same degree in the value of the effectiveness of governance index, and by reference to the annual report issued by the Arab Monetary Fund Group, so that the value of each of the indicators lies between (2.5) and (-2.5), as the effectiveness of governance index focuses on its effects on the quality of public services, the quality of the civil service and its degree of independence from political pressures, the quality of policy formulation and implementation, and the credibility of governance's commitment to these policies, so that we find that Algeria ranked 22nd despite the efforts and programs that were developed and implemented by the Algerian government in order to develop the country and its progress in the field. The average value of the index is about (-0.899) points for the average period (2018-2021). As for the State of Egypt, it ranked 17th, and thus it ranked first when compared to the State of Algeria, where the average value of the index was about (-.0326) points for the average period (2018-2021), and this indicates the good application of the State of Egypt to the strict laws that Prevent the spread of corruption in the country, which negatively affects the development of the country.

4. PRESENTATION AND DISCUSSION OF THE RESULTS OF THE ECONOMETRIC STUDY:

4.1. Definition of the study sample and the approved variables:

The study was limited to all of Algeria and Egypt, in order to drop the standard study, which aims to know the nature and direction of the relationship between good governance and economic growth. A comparative study between Algeria and Egypt, the community was selected according to the criterion of the availability of data for the variables used, for the period from $Q_1$2010-$Q_4$2021. Note that the statistics were collected from the reports available on the World Bank, the Arab Monetary Fund, in addition, the annual data has been converted into quarterly data, based on the eviews program, and accordingly, we have (41 views). The dependent variables can be mentioned in the following points:

- ✓ **independent variables:**
  -Effectiveness of Governance: It is symbolized by the symbol (GE);
  -The rule of law: It is symbolized by the symbol (RL);
  -Administrative Corruption: It is symbolized by the symbol (CC).
- ✓ **The dependent variable:** the rate of economic growth, denoted by the symbol (GDP).

4.2 Studying the stationarity of Time Series:

To study the stationarity, the unit root tests, represented by the Dickey- Fuller test, were used as one of the most used tests in applied studies, in order to know the degree of chain integrity. It is clearly evident through the results shown in Appendix No. (1,2): that the calculated values are less than the tabulated values in the three models (in the presence of a constant, in the presence of a constant and a general trend, without a constant and a general trend), and in this case the alternative hypothesis is rejected and the null hypothesis is accepted (the existence of unit root in the series) which time series (Governance Effectiveness Series (GE), Rule of Law Series (RL). Administrative Corruption Series (CC), and Economic Growth Series (GDP)) are non-stationary at the level, and in order to make the series stationary, the first difference was entered at which the series stationary. This is indicated by the results of the calculated values being greater than the tabular values. Accordingly, the alternative hypothesis is accepted which states that (the time series is stationary) at the first difference, and from it can be said that the time series have the same degree of integration I (1). Since the series have the same degree of integration, this indicates the possibility of a co-integration relationship between the variables, and for this the co-integration test will be performed.

4.3 Co-integration Methodology and Error Correction Model:

-Johansen and juselius co-integration test: The co-integration test is relied upon in order to ensure whether or not there is a simultaneous integration relationship between the variables of the study, and the following table shows the results of the co-integration test between the variables in Algeria and Egypt.

Table 1: The results of the Johanson test

The first model: the state of Algeria				
Date: 02/04/23 Time: 17:04				
Sample (adjusted): 2010Q3 2021Q1				
Included observations: 43 after adjustments				
Trend assumption: Linear deterministic trend				
Series: GDP GE CC RL				
Lags interval (in first differences): 1 to 1				
Unrestricted Co-integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.615712	90.22966	47.85613	0.0000
At most 1 *	0.538017	49.10604	29.79707	0.0001
At most 2 *	0.242108	15.90025	15.49471	0.0434
At most 3 *	0.088405	3.980055	3.841466	0.0460
Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.615712	41.12362	27.58434	0.0005
At most 1 *	0.538017	33.20579	21.13162	0.0006
At most 2	0.242108	11.92020	14.26460	0.1137
At most 3 *	0.088405	3.980055	3.841466	0.0460
The second model: the state of Egypt				
Unrestricted Co-integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.930171	178.5172	47.85613	0.0000
At most 1 *	0.674740	64.06380	29.79707	0.0000
At most 2 *	0.258205	15.76925	15.49471	0.0455
At most 3	0.065781	2.925888	3.841466	0.0872
Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.930171	114.4534	27.58434	0.0000
At most 1 *	0.674740	48.29455	21.13162	0.0000

At most 2	0.258205	12.84337	14.26460	0.0828
At most 3	0.065781	2.925888	3.841466	0.0872
Unrestricted Co-integration Rank Test (Trace)				

Source: Prepared by researchers based on the Eviews program.

It is clear from the results of Table 1 of the impact test and the maximum latent value test shown in the above table that the calculated value for the impact test is greater than the tabular value at a significant level of 5% with respect to the four hypotheses (None, At most 1 *, At most 2 *, At most 3 *), thus, based on the results of the impact test, it was concluded that there are four relationships of joint integration between the indicators of good governance and economic growth in Algeria.

The results of the Great Latent Value Test also agreed with the results of the Impact Test, which indicates the existence of two long-term relationships between the variables of the study, as the calculated value for the Great Latent Value Test estimated at (41.12362) is greater than the tabulated value estimated at (27.58434) at a significant level of 5%. This is in relation to the first hypothesis (None), and therefore there is a co-integration relationship. As for the second hypothesis (Atmost1), only it amounted to (33.20579), which is greater than the tabular value estimated at (21.13162) at a significant level of 5%, and accordingly there is a co-integration relationship. In this case, the null hypothesis, which indicates (the absence of a co-integration relationship), is rejected, and the alternative hypothesis, which indicates (the existence of a co-integration relationship), is accepted.
- While with regard to the State of Egypt, the results of the impact test shown in Table 1 above are that the calculated value for the impact test is greater than the tabulated value at a significant level of 5% with regard to the three hypotheses (None, At most 1 *, At most 2), and this indicates that there are three Relationships of mutual integration between indicators of good governance and economic growth in Egypt.

The results of the Great Latent Value test confirmed the existence of co-integration relationships, as it indicated the existence of two long-term relationships between the variables of the study, as the calculated value for the Great Latent Value test estimated at (114.4534) is greater than the tabulated value estimated at (27.58434) at a significant level of 5%, and this is in relation to the first hypothesis (None), and accordingly there is a co-integration relationship. As for the second hypothesis (Atmost1), only it amounted to (48.29455), which is greater than the tabular value estimated at (21.13162) at a significant level of 5%, and accordingly there is a co-integration relationship, in this case the null hypothesis is rejected, which indicates (the absence of a co-integration relationship) and accepting the alternative hypothesis which indicates (the existence of a co-integration relationship).

Since the results of the two tests are different, the test in which there are the least number of relations will be relied upon, i.e. there are two relations of co-integration.

After confirming the existence of a long-term relationship between the variables of the study that were relied upon, in this case the causality test can be applied in order to know the direction of influence between these variables. But before that, it is necessary to know the optimal lag for the two models.

4.4 CHOOSE THE NUMBER OF LAGS:

The delay degrees are determined in order to know the optimal deceleration period for the model, according to the following criteria (AIC, SC, HQ), where the results of the following table show that the optimal lag is at p = 2 in both Algeria and Egypt.

Table No. (2): The results of the number of lags

VAR Lag Order Selection Criteria						
Endogenous variables: GDP GE CC RL						
Exogenous variables: C						
Date: 02/04/23 Time: 17:52						
Sample: 2010Q1 2021Q4						
Included observations: 43						
The first model: the state of Algeria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	156.8136	NA	9.62 e-09	-7.107609	-6.943776	-7.047193
1	312.2389	274.7051	1.47e-11	-13.59250	-12.77334	-13.29042
2	398.8582	136.9794	5.64e-13*	-16.87712*	-15.40263*	-16.33338*
The second model: the state of Egypt						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	118.1403	NA	5.81e-08	-5.308853	-5.145021	-5.248437
1	346.1191	402.9392	3.05e-12	-15.16833	-14.34917	-14.86625
2	517.2267	270.5888*	2.29e-15*	-22.38264*	-20.90815*	-21.83889*

Source: Prepared by researchers based on the Eviews program.

4.5 Causality Test (Granger): The results of the causality test for both the first and second models can be illustrated through the following tables.

Table 3: Results of the Causality Test (Granger)

Pairwise Granger Causality Tests					
Date: 02/04/23 Time: 10:20					
Sample: 2010Q1 2021Q4					
Lags: 2		Mode :1		Mode :2	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.
DGE does not Granger Cause DGDP	42	0.46229	0.6334	0.07923	0.9240
DGDP does not Granger Cause DGE		1.10395	0.3422	0.30791	0.7368
DCC does not Granger Cause DGDP	42	4.05926	0.0255	0.17200	0.8426
DGDP does not Granger Cause DCC		6.15195	0.0049	0.05613	0.9455
DRL does not Granger Cause DGDP	42	1.47080	0.2429	0.44330	0.6453
DGDP does not Granger Cause DRL		0.99090	0.3809	0.09809	0.9068
DCC does not Granger Cause DGE	42	0.15447	0.8574	2.36081	0.1084
DGE does not Granger Cause DCC		0.01209	0.9880	5.58009	0.0076

DRL does not Granger Cause DGE	42	1.82055	0.1761	0.08624	0.9176
DGE does not Granger Cause DRL		4.77426	0.0143	0.04651	0.9546
DRL does not Granger Cause DCC	42	0.52735	0.5945	0.57417	0.5681
DCC does not Granger Cause DRL		0.84683	0.4369	2.78110	0.0750

Source: Prepared by researchers based on the Eviews program.

Based on the above table and in view of the results of the first model, it is clear that there is a causal and reciprocal relationship between each of the administrative corruption index and economic growth, as indicated by the probability value of the F-statistic, which is less than a significant level at 5% for the relationship going from the variable DCC to the variable DGDP and vice versa, this means that administrative corruption causes economic growth, and economic growth also causes administrative corruption. There is also a one-way relationship that moves from the governance effectiveness index towards the administrative corruption index, as the probability value of the F-statistic is less than 0.05, and this means that the variable DGE causes DCC, while the relationship is absent in the opposite direction. That is, DCC does not cause DGE. Also, there is no causal relationship between the remaining variables, because the probability value of the F-statistic is greater than a significant level at 0.05.

While the results of the causality test according to Granger with regard to the second model show that the probability values of the F-statistics are all greater than the level of significance at 0.05, meaning that there is no causal relationship between the variables of the study in the State of Egypt during the studied period, except for the existence of a one-way causal relationship that tends to From the effectiveness of governance towards administrative corruption, that is, the variable DGE causes DCC, while the relationship is absent in the opposite direction, that is, the variable DGE does not cause DGE.

4.6 ESTIMATING THE VECM MODEL:

After confirming the existence of long-term co-integration relationships between the indicators of good governance and economic growth, and knowing the direction of impact, the VECM error correction model can be estimated in both Algeria and Egypt. In this case, the focus will be on three parts, as follows:

4.6.1 The first part: long-term parameters and error correction coefficient: Its results can be clarified based on the results of Appendix (3,4).

- The results of Appendix No. (3) of the estimation of the VECM estimator model in Algeria indicate that the error correction coefficient (CointEq1) is negative and significant at a significant level of 5%. This means that (-0.593727) short-term errors are automatically corrected over time to reach equilibrium in the long term, i.e. it takes about (1/0.593727 = 1.68427) That is, it takes about 1.68 time units, which is equivalent to six months.
- The results of Appendix No. (4) related to estimating the model in the State of Egypt indicated that the error correction coefficient (CointEq1) also appeared negative and significant at a significance level of 5%, and this means that (-0.159530) short-term errors are automatically corrected over time to reach equilibrium In the long run, i.e. (1/0.159530=6.2641) that is, it takes about 6.26 time units, which is approximately twenty-one months .

From the foregoing, it can be said that the imbalances in the past period are not fully corrected during the current months, and the reason behind this is the absence of strategies and means that fight and limit, especially the phenomenon of corruption, which has become widespread in many fields, which works to impede the development of the country's economy. The more the state seeks to combat these difficulties and address these imbalances that arise, the more time it takes for correction.

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4.6.2 Part Two: Short Term Transactions: It is evident from the results of the two appendices (3.4) that there are four estimated equations, which is proportional to the number of variables used in the study.

- The economic growth equation in terms of indicators of good governance in Algeria takes the following formula:

D(DGDP) = - 0.593726925513*(DGDP(-1) - 66.8922876922*DGE(-1) - 145.683552826*DCC(-1) + 129.002316015*DRL(-1) - 0.273019182752) - 0.21865125163*D(DGDP(-1)) - 0.171225911547*D(DGDP(-2)) - 29.0916669439*D(DGE(-1)) - 15.5805959478*D(DGE(-2)) - 28.692043504*D(DCC(-1)) - 106.911033196*D(DCC(-2)) - 73.1998984619*D(DRL(-1)) + 100.468414523*D(DRL(-2)) + 0.129984566458

Source: Eviews output

- The economic growth equation in terms of indicators of good governance in Egypt takes the following formula:

D(DGDP) = - 0.159530014913*(DGDP(-1) - 20.6837886851*DGE(-1) - 8.51604285135*DCC(-1) + 23.5183542927*DRL(-1) - 0.0135376375629) + 1.14668985234*D(DGDP(-1)) - 0.51972898603*D(DGDP(-2)) + 8.10064154046*D(DGE(-1)) - 10.8689948656*D(DGE(-2)) - 1.73479979636*D(DCC(-1)) - 0.558617386394*D(DCC(-2)) - 5.27558671229*D(DRL(-1)) + 7.67280506773*D(DRL(-2)) + 0.00602873946565

Source: Eviews output

By looking at two equations, we find that despite the different values of the study variables in both Algeria and Egypt, the results of the equation agreed in terms of clarifying the impact resulting from the impact of the indicators of good governance on economic growth during the study period.

- It was observed that there is a negative effect of the administrative corruption index on the rate of economic growth, which indicates that the relationship that links the administrative corruption index (CC) and economic growth (GDP) with one slowing period of the corruption index is an inverse relationship, where an increase in the corruption index by 1% leads to a decrease in the rate of economic growth, which is consistent with reality, and the reason for this is due to the absence and weakness of the oversight apparatus on which the government relies, and the failure to keep pace with digitization in many areas. As a result of a rise in the corruption index, local and foreign investment decreases, which in turn leads to a decline in the rate of economic growth. The results were consistent with the study of (Bouzid, 2019) and contradicted the results of the study (Erum, Naveed, & Imtiaz, 2018).

- There is a negative impact of the Governance Effectiveness Index (GE) on economic growth (GDP), which indicates an inverse relationship between the Governance Effectiveness Index and economic growth, meaning that the more effective one-unit governance leads to a lower rate of economic growth, the absence of good governance leads to the spread of corruption As a result, economic growth declines, due to the absence of officials in charge of implementing strict policies, and standing up for their efficient and effective implementation.

- The existence of a positive effect of the rule of law index (RL) on economic growth, that is, the relationship between the rule of law and economic growth is a direct relationship, that is, the higher the rule of law index, the higher the rate of economic growth, and this is consistent with reality, as it is known that Algeria is a country with the rule of law. Accordingly, if the law that the state follows is valid, and it is applied to the fullest extent, by taking the necessary measures and applying the necessary penalties against any trespass on the state's property and breaching its security, then the problems that hinder the advancement of economic development will be reduced, which leads to the

preservation of internal stability. And foreign affairs of the country, and in turn works to increase the rate of economic growth, including the development of the national economy.

- There is a positive effect of the rule of law index (RL) on economic growth, that is, the relationship between the rule of law and economic growth is a direct relationship, that is, the higher the rule of law index, the higher the rate of economic growth. This, if anything, indicates that the State of Egypt is a country that enjoys effective governance and its law is in effect, and this is what made it rank 17 during the year 2021, and therefore when the state tries fighting corruption, and applying its laws efficiently and effectively, this will be reflected in the development of the country and the advancement of development.

4.6.3 The third aspect: Evaluating the model from a statistical point of view, by returning to the results of Appendix (3) related to the model for the State of Algeria, it is clear that the coefficient of determination $R^2 = 0.457$, which is a weak percentage; this means that there is a low explanatory power. Therefore, the dependent variable (economic growth) was explained in terms of the independent variables (indicators of good governance) by 46%, and the remaining 54% was due to other variables not included in the model.

While the results of Appendix No. (4) indicated that the coefficient of determination with regard to the estimator model for the State of Egypt amounted to $R^2 = 0.826$, which is a very high percentage, and this means that there is a very high explanatory ability, and therefore the dependent variable (economic growth) was explained in terms of the independent variables (indicators of good governance) by 82.6%, and the remaining 17.4% is due to other variables not included in the model.

4.7 Stability and validity of the model: After determining the optimal degrees of delay, and knowing the optimal model for the study, in this step the validity of the model will be confirmed, and whether it can be relied upon to conduct the study or not, with the help of several tests, including: the unit root test, the autocorrelation test between errors, and Heteroskedasticity test.

4.7.1 Unit Root Test: To ensure the stability of the model, the multiple roots test is applied, as the VECM model is considered stable if all points fall within the unitary circle, and the figure below shows the results of this test.

Figure 1: Multiple root test (Egypt)

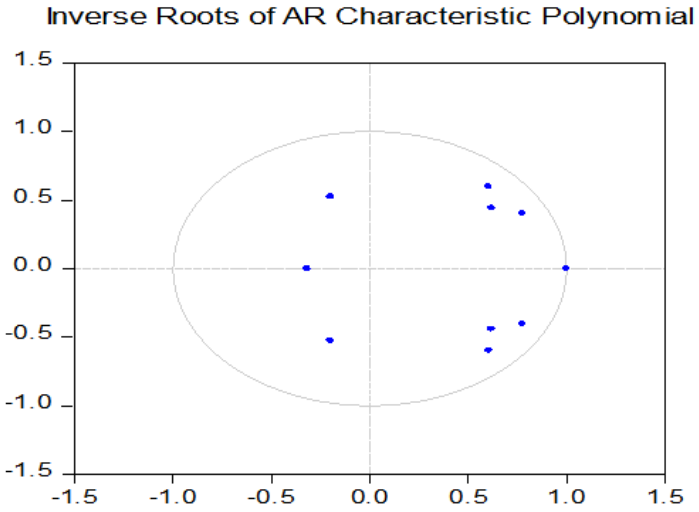
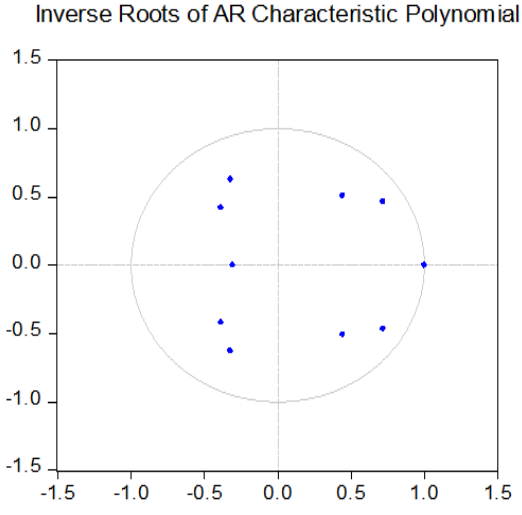


Figure 2: Multiple Roots Test (Algeria)



Source: Prepared by researchers based on the Eviews program

It is clear from Figures (1 and 2) that all points are located within the perimeter of the unitary circle, and this indicates that the inverse of the roots is less than one, and thus the VECM model fulfills the condition of stability in both states.
The following table confirms the previous result, as all coefficients of the unit root are less than or equal to the whole one.

Table 4: Unit root coefficients for Algeria and Egypt

Roots of Characteristic Polynomial			
Endogenous variables: DGDP DGE DCC			
DRL			
Exogenous variables:			
Lag specification: 1 2			
Date: 02/04/23 Time: 17:06			
Mode:1		Mode:2	
Root	Modulus	Root	Modulus
1.000000	1.000000	1.000000	1.000000
1.000000	1.000000	1.000000	1.000000
1.000000	1.000000	1.000000	1.000000
0.718515 - 0.465701i	0.856237	0.776780 - 0.404735i	0.875898
0.718515 + 0.465701i	0.856237	0.776780 + 0.404735i	0.875898
-0.321510 - 0.627362i	0.704948	0.604677 - 0.596568i	0.849428
-0.321510 + 0.627362i	0.704948	0.604677 + 0.596568i	0.849428
0.442995 - 0.508477i	0.674384	0.618652 - 0.440794i	0.759624
0.442995 + 0.508477i	0.674384	0.618652 + 0.440794i	0.759624
-0.386286 - 0.419929i	0.570577	-0.199894 - 0.524664i	0.561453
-0.386286 + 0.419929i	0.570577	-0.199894 + 0.524664i	0.561453
-0.306997	0.306997	-0.317227	0.317227

Source: Prepared by researchers based on the Eviews program

4.7.2 Serial Correlation LM Test: Based on the results shown in Table 5, it is clear that all probabilities corresponding to the calculated F statistic in lag from 1 to 3 are greater than a significant level at 5%, in the first and second models. Accordingly, the hypothesis is accepted (that there is no autocorrelation between errors).

Table 5: Serial Correlation LM Test for Algeria and Egypt

VAR Residual Serial Correlation LM Tests
Date: 02/04/23 Time: 17:08
Sample: 2010Q1 2021Q4
Included observations: 42

Mode :1						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	Df	Prob.
1	19.33626	16	0.2516	1.244427	(16, 80.1)	0.2544
2	16.24768	16	0.4358	1.026652	(16, 80.1)	0.4388
3	23.83866	16	0.0931	1.576055	(16, 80.1)	0.0948
Mode :2						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	Df	Prob.
1	24.48579	16	0.0794	1.632487	(16, 74.0)	0.0813
2	23.57532	16	0.0992	1.562537	(16, 74.0)	0.1013
3	21.64732	16	0.1549	1.416985	(16, 74.0)	0.1576

Source: Prepared by researchers based on the Eviews program

4.7.3 Heterogeneity test: The results of Table 6 indicate that the Chi-sq statistical value was estimated at (173.3693), with a probability of prob = 0.2223 > 0.05 greater than the 5% significance level, and this is in relation to the first model. In this case, the hypothesis that states (the stability of the variance due to the occurrence of error in the estimated model) is accepted, and the hypothesis that states (there is a difference in the variances of errors) is rejected.

The results also indicated the statistical value Chi-sq was estimated at (181.8683), with a probability of prob = 0.2223>0.05 greater than the 5% significant level, and this is with regard to the second model. In this case, the hypothesis that states (the stability of the variance due to the occurrence of error in the estimated model) is accepted, and the hypothesis that states (there is a difference in the variances of errors) is rejected.

Table 6: Heteroskedasticity Tests for Algeria and Egypt

VAR Residual Heteroskedasticity Tests (Levels and Squares)					
Date: 02/04/23 Time: 17:11					
Sample: 2010Q1 2021Q4					
Included observations: 42					
Joint test:					
Model: 1			Model: 2		
Chi-sq	df	Prob.	Chi-sq	Df	Prob.
173.3693	160	0.2223	181.8683	180	0.4470

Source: Prepared by researchers based on the Eviews program

4.8 Short-term significance test (Wald's test): What can be seen from Table 7 is that the statistical probability value (Chi-square) is less than 0.05, and in this case it can be said that the three features of the independent variables ((GE), (RL), (CC)) cannot be absent in the dependent variable equation ((GDP)) in the short term, in both the first model, which expresses the state of Algeria, and the second model, which expresses the state of Egypt.

Table 7: Wald test

Wald Test:			
System: %system			
Model: 1			
Test Statistic	Value	df	Probability
Chi-square	25.97940	3	0.0000
Model: 2			

https://cibgp.com/ P-ISSN: 2204-1990; E-ISSN: 1323-6903

Test Statistic	Value	df	Probability
Chi-square	86.21172	3	0.0000

Source: Prepared by researchers based on the Eviews program

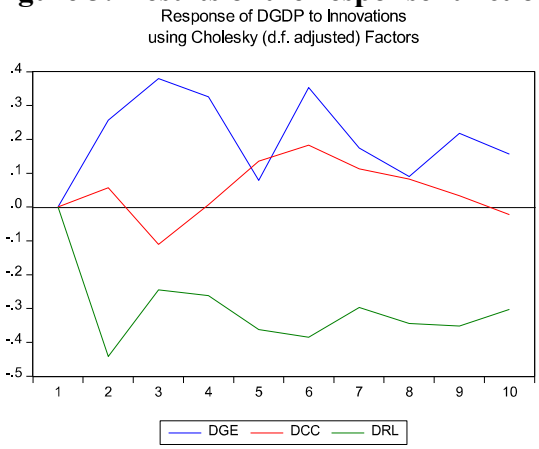
4.9 Impulse Response Functions : The impulse response functions are relied upon to find out how the dependent variable responds to a shock in the independent variable.

4.9.1 The reaction of the dependent variable (economic growth) to a shock in the independent variables for the first model (Algeria): To find out the response of the economic growth rate to the occurrence of a shock in the indicators of good governance, we use the figure and the table.

Table 8: Results of the response multiplier

Period	DGE	DCC	DRL
1	0.000000	0.000000	0.000000
2	0.256292	0.056748	-0.441799
3	0.379562	-0.110379	-0.245060
4	0.325930	0.007072	-0.262132
5	0.078464	0.135808	-0.362466
6	0.353788	0.183263	-0.384785
7	0.174032	0.112950	-0.296943
8	0.089516	0.083084	-0.344449
9	0.218183	0.033927	-0.351619
10	0.156257	-0.022426	-0.303316
Cholesky Ordering: DGDP DGE DCC DRL			

Figure 3: Results of the response function



Source: Prepared by researchers based on the Eviews program

-The reaction of the dgdp dependent variable to a shock to the dge variable: The results of the above figure indicate the extent to which the dependent variable responds to economic growth when a shock occurs in the governance effectiveness index. The first year until the third year, with a value of (0.37), Then it rebounded and recorded an adverse reaction that resulted in a decrease in the response multiplier starting from the fourth year with a value of (0.32) until the fifth year, where the decrease reached its peak with a value of (0.07), then a positive reaction was recorded in the sixth and seventh years, but the response multiplier soon decreased in the year Eighth, and the reactions remained between a positive and a negative reaction over time periods up to the tenth year, which is the year in which a negative reaction was recorded with a response multiplier of (0.15), and this in turn indicates that the effectiveness of governance plays a decisive role in influencing economic growth.

- dgdp reaction to shock in drl changing: It is evident that there is a negative reaction to economic growth as a result of a shock in the rule of law index that lasted up to ten years, and this is indicated by the downward trend of the curve, and this is confirmed by the results of the response multiplier shown in the table, which recorded a decrease that extended from the second year with a value of (-0.44) to By the tenth year, the value was (-0.30), and the shock reached its maximum value in the second year.

-dgdp reacts to a shock in the dcc variable: The results of the above figure indicate that there is a positive reaction to the rate of economic growth as a result of a shock in the administrative corruption index during the first and second years.), but I soon recorded a positive reaction starting from the third year that lasted for up to six years, And it was accompanied by an increase in the

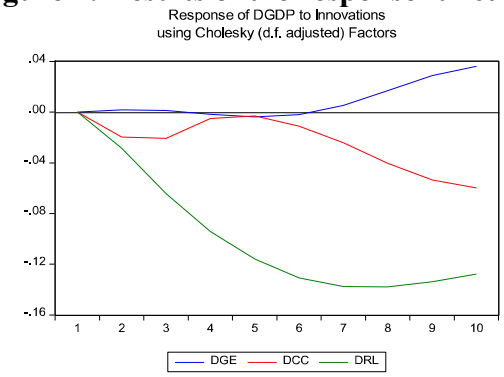
response multiplier, as its value was estimated in the third year (0.07) until the ninth year with a value of (0.033). The tenth value is (-0.02).

4.9.2 The reaction of the dependent variable (economic growth) to a shock in the independent variables for the second model (Egypt):

Table 9: Results of the response multiplier

Period	DGE	DCC	DRL
1	0.000000	0.000000	0.000000
2	0.001731	-0.019676	-0.028475
3	0.001267	-0.020729	-0.064447
4	-0.001672	-0.005125	-0.094221
5	-0.003863	-0.002845	-0.115805
6	-0.002028	-0.010941	-0.130676
7	0.005421	-0.024146	-0.137608
8	0.017116	-0.040325	-0.137820
9	0.028943	-0.053626	-0.133808
10	0.036263	-0.059730	-0.127766
Cholesky Ordering: DGDP DGE DCC DRL			

Figure 4: Results of the response functions



Source: Prepared by researchers based on the Eviews program

-The reaction of the dgdp dependent variable to a shock to the dge variable: The results of the above figure indicate the extent to which the dependent variable responds to economic growth when a shock occurs in the governance effectiveness index. The first year until the third year, with a value of (0.001), Then it rebounded and a negative reaction was recorded, which also resulted in a multiplier decrease in the response starting from the fourth year with a value of (-0.001) until the sixth year, when the decrease reached a value of (-0.002), then a positive reaction was recorded starting from the seventh year until the tenth year, and that is what This is confirmed by the results of the response multiplier, which in turn indicates that the effectiveness of governance plays a decisive role in influencing economic growth in the State of Egypt.

- dgdp reaction to a shock in the variator (drl, dcc): It is evident that there is a negative reaction to economic growth as a result of a shock in the rule of law index (DRL) and the administrative corruption index (DCC) that lasted up to ten years, and this is indicated by the downward trend of the curve, and this is confirmed by the results of the response multiplier shown in the table, which recorded a long decline ten consecutive years.

Based on the above, it can be considered that all shocks are temporary, as all variables lead to equilibrium in the long run, and this is what the figure above shows. Exposure to the impact of an applied shock on economic growth and the extent of its vulnerability to it, and the possibility of absorbing the shock that occurred by the independent variables and their behavior, in addition to its impact on the dependent variable, works to return it to a state of stability in the long run.

4.10 variance decomposition : In this component, the results of variance splitting will be analyzed for each of the first model, which represents Algeria, and the second model, which represents Egypt.

4.10.1 The first model (Algeria): The results of variance analysis can be illustrated through the following table:

Table 10 Segmentation of variance for the first model

Period	S.E.	DGDP	DGE	DCC	DRL
1	1.045562	100.0000	0.000000	0.000000	0.000000

2	1.292765	84.19785	3.930352	0.192692	11.67910
3	1.457273	77.37865	9.877021	0.725347	12.01899
4	1.688655	77.01639	11.08107	0.541942	11.36059
5	1.857934	76.49503	9.332190	0.981995	13.19078
6	2.063344	73.73546	10.50657	1.585078	14.17289
7	2.212114	74.46783	9.759839	1.639756	14.13258
8	2.349492	74.94681	8.797024	1.578656	14.67751
9	2.483130	74.77503	8.647665	1.431974	15.14533
10	2.594114	75.14981	8.286377	1.319541	15.24427
Cholesky Ordering: DGDP DGE DCC DRL					

Source: Prepared by researchers based on the Eviews program

- The results of the above table show that the standard error (S.E) of the prediction error of the dependent variable (economic growth) in the first year is equal to 1.045, then it increased with time to reach 2.594 in the tenth year, in the periods prior to the independent variables in the model, which are represented in each (the effectiveness of governance, the rule of law, and administrative corruption), The results of the variance segmentation test for the economic growth variable also show that 100% of the variance errors during the first period are attributed to the variable itself, while 84.19% of these errors in the second period decrease the economic growth variable and are distributed among the rest of the variables, while the effectiveness index Governance explains approximately 3.93% of variance errors during the third year, The explanatory power of the governance effectiveness index increased over time to reach 11.08% of the errors of variance, and it was offset by a decrease in the explanatory power of economic growth to reach in the fourth year 77.01% of the variance errors attributed to the same variable, while both the rule of law index and the administrative corruption index also witnessed an increase in explanatory power, the administrative corruption index increased from 0.19% during the second year to 1.31% in the tenth year. As for the rule of law index, its explanatory power increased from 11.67% in the second year to 15.24% in the last year.

4.10.1 The second model (Egypt): The results of variance analysis can be illustrated through the following table.

Table 11: Segmentation of variance for the second model (Egypt)

Period	S.E.	DGDP	DGE	DCC	DRL
1	0.065195	100.0000	0.000000	0.000000	0.000000
2	0.129974	92.89096	0.017732	2.291658	4.799654
3	0.192851	84.44340	0.012368	2.196337	13.34789
4	0.252297	76.91834	0.011618	1.324536	21.74551
5	0.306405	70.04151	0.023775	0.906668	29.02804
6	0.355368	64.10846	0.020931	0.768831	35.10178
7	0.400402	59.53464	0.034820	0.969289	39.46125
8	0.442509	56.18900	0.178112	1.624052	42.00884
9	0.482176	53.80268	0.510318	2.604727	43.08227
10	0.518987	52.25023	0.928711	3.572889	43.24817
Cholesky Ordering: DGDP DGE DCC DRL					

Source: Prepared by researchers based on the Eviews program

- The results of the above table show that the standard error (S.E) of the prediction error of the dependent variable (economic growth) in the first year is equal to 0.065, then it increased with time to reach 0.518 in the tenth year, in the periods prior to the independent variables in the model, which

are represented in each (the effectiveness of governance, the rule of law, and administrative corruption), The results of the variance segmentation test for the economic growth variable also show that 100% of the variance errors during the first period are attributed to the variable itself, while 92.89% of these errors in the second period decrease the economic growth variable and are distributed among the rest of the variables, while the effectiveness index Governance explains approximately 0.017% of the variance errors during the second year, so that the explanatory power of the governance effectiveness index increased with time to reach 0.92% of the variance errors in the tenth year, it was offset by a decrease in the explanatory power of economic growth to reach 77.01% of the variance errors attributed to the same variable, while both the rule of law index and the administrative corruption index also witnessed a fluctuation between a rise and a decrease in the explanatory power, as the administrative corruption index witnessed an increase from 2.29% during the second year, and reached 3.57% in the tenth year. As for the rule of law index, its explanatory power increased from 4.79% in the second year to 43.24% in the last year.

CONCLUSION:

After conducting the study of the long-term relationship between good governance and economic growth using the VECM model during the period from $Q_1$2010 to $Q_4$2021, and estimating and analyzing its results, with the aim of answering the problem of the study, which fell under the title "What is the nature of the relationship between good governance and economic growth during the period $Q_1$2010-$Q_4$2021?", the study reached a number of results that can be mentioned in the following points:

-The results of the Johanson test showed that there is a co-integration relationship between indicators of good governance and economic growth from Algeria and Egypt.

- There is a long-term equilibrium relationship between indicators of good governance and economic growth in Algeria and Egypt during the specified study period.

-The results of the causal test showed that there is a two-way causal relationship between economic growth and the administrative corruption index, while there is a one-way causal relationship between the governance effectiveness index and the administrative corruption index in Algeria.

-The existence of a unidirectional causal relationship moving from the effectiveness of governance towards administrative corruption in the State of Egypt.

-Despite the efforts made by the Algerian government to reach outstanding levels in the field of government, it still did not reach the required level, as it ranked 22nd, which is not considered one of the high ranks, and this indicates that there are some obstacles that prevented it from occupying the higher rankings. Perhaps among these obstacles is the spread of corruption and the failure to keep pace with technological developments in the field of digitization, which would have allowed it to implement the procedures and laws put in place efficiently and effectively. On the other hand, the State of Egypt ranked 17th, which is a good rank when compared with the State of Algeria, and this indicates that the State of Egypt enjoys effective governance during the specified study period.

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SUPPLEMENTS :

Model 1:

Null Hypothesis: D(CC) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.100565	0.0025
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(CC) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.220892	0.0093
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(CC) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.036380	0.0002
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Null Hypothesis: D(GE) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.957042	0.0000
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(GE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.854187	0.0000
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(GE) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.009472	0.0000
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Null Hypothesis: D(RL) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.050250	0.0002
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(RL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.985892	0.0012
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(RL) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.104641	0.0000
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.008481	0.0033
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.996278	0.0164
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(GDP) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.075622	0.0001
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Model 2:

Null Hypothesis: D(RL) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.650686	0.0000
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Null Hypothesis: D(RL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.271708	0.0000
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(RL) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.551862	0.0007
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(CC) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.981830	0.0002
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(CC) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.911339	0.0014
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(CC) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.025612	0.0000
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Null Hypothesis: D(GE) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.563507	0.0109
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(GE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.035672	0.0010
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(GE) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.640289	0.0006
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.930868	0.0000
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.869874	0.0001
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

Null Hypothesis: D(GDP) has a unit root
Exogenous: None
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.047370	0.0000
Test critical values:	1% level	-2.621185	
	5% level	-1.948886	
	10% level	-1.611932	

Model:1

Vector Error Correction Estimates
Date: 02/04/23 Time: 17:05
Sample (adjusted): 2011Q1 2021Q1
Included observations: 41 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
DGDP(-1)	1.000000
DGE(-1)	-66.89229 (13.8233) [-4.83909]
DCC(-1)	-145.6836 (20.4846) [-7.11185]
DRL(-1)	129.0023 (17.2314) [7.48647]
C	-0.273019

Error Correction:	D(DGDP)	D(DGE)	D(DCC)	D(DRL)
CointEq1	-0.593727 (0.15466) [-3.83904]	0.008252 (0.00609) [1.35575]	0.000274 (0.00078) [0.35223]	-0.001434 (0.00056) [-2.56137]
D(DGDP(-1))	-0.218651 (0.15391) [-1.42061]	-0.000439 (0.00606) [-0.07253]	-0.000371 (0.00077) [-0.47907]	0.000958 (0.00056) [1.71959]
D(DGDP(-2))	-0.171226 (0.14632) [-1.17020]	0.000890 (0.00576) [0.15448]	-0.000144 (0.00074) [-0.19505]	0.000384 (0.00053) [0.72490]
D(DGE(-1))	-29.09167 (8.31210) [-3.49992]	-0.732674 (0.32712) [-2.23976]	0.068252 (0.04184) [1.63120]	-0.069530 (0.03009) [-2.31102]
D(DGE(-2))	-15.58060 (5.47395) [-2.84631]	-0.384809 (0.21543) [-1.78625]	0.027146 (0.02755) [0.98519]	-0.028781 (0.01981) [-1.45260]
D(DCC(-1))	-28.69204 (34.1923) [-0.83914]	-1.460722 (1.34564) [-1.08552]	0.954899 (0.17212) [5.54797]	-0.140352 (0.12379) [-1.13404]
D(DCC(-2))	-108.9110 (43.4226) [-2.46211]	1.749737 (1.70890) [1.02390]	-0.331216 (0.21858) [-1.51531]	-0.078762 (0.15717) [-0.50112]
D(DRL(-1))	-73.19990 (43.9438) [-1.66576]	1.886333 (1.72941) [1.09074]	0.085796 (0.22120) [0.38786]	0.967476 (0.15906) [6.08250]
D(DRL(-2))	100.4684 (47.8944) [2.09771]	-1.952978 (1.88489) [-1.03612]	-0.175990 (0.24109) [-0.72997]	-0.257055 (0.17336) [-1.48279]
C	0.129985 (0.16468) [0.78933]	-0.001800 (0.00648) [-0.27767]	8.26E-05 (0.00083) [0.07552]	8.77E-05 (0.00060) [0.11352]
R-squared	0.457878	0.651755	0.567849	0.758469
Adj. R-squared	0.300488	0.550651	0.442386	0.688347
Sum sq. resids	33.88923	0.052488	0.000859	0.000444
S.E. equation	1.045562	0.041148	0.005263	0.003785
F-statistic	2.909189	6.446407	4.526020	10.81642
Log likelihood	-54.27176	78.36861	162.6831	176.2053
Akaike AIC	3.135207	-3.335054	-7.447858	-8.107574
Schwarz SC	3.553151	-2.917110	-7.030014	-7.689630
Mean dependent	0.039907	-0.002113	0.000300	4.58E-05
S.D. dependent	1.250122	0.061385	0.007048	0.006779

Model:2

Vector Error Correction Estimates
Date: 02/04/23 Time: 17:54
Sample (adjusted): 2011Q1 2021Q1
Included observations: 41 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
DGDP(-1)	1.000000
DGE(-1)	-20.66379 (3.51020) [-5.89248]
DCC(-1)	-8.516043 (2.77910) [-3.06432]
DRL(-1)	23.51535 (3.66351) [6.41962]
C	-0.013538

Error Correction:	D(DGDP)	D(DGE)	D(DCC)	D(DRL)
CointEq1	-0.159530 (0.03723) [-4.28531]	0.001547 (0.00165) [0.93521]	0.016349 (0.02070) [0.78973]	-0.010673 (0.00280) [-3.80640]
D(DGDP(-1))	1.146690 (0.16770) [6.83758]	0.007752 (0.00745) [1.04033]	0.184640 (0.09326) [1.97972]	-0.009513 (0.01263) [-0.75311]
D(DGDP(-2))	-0.519729 (0.16370) [-3.17480]	-0.000126 (0.00727) [-0.01718]	-0.082001 (0.09104) [-0.90074]	0.007962 (0.01233) [0.64573]
D(DGE(-1))	8.100642 (4.06319) [1.99367]	1.427939 (0.18056) [7.90874]	0.673828 (2.26959) [0.29521]	0.442017 (0.30604) [1.44431]
D(DGE(-2))	-10.66699 (4.58705) [-2.36948]	-0.619906 (0.20383) [-3.04126]	-0.031137 (2.56093) [-0.01221]	-0.729050 (0.34550) [-2.11101]
D(DCC(-1))	-1.734800 (0.36493) [-4.75354]	-0.006385 (0.01622) [-0.39373]	-0.600311 (0.20294) [-2.95805]	-0.068151 (0.02749) [-2.47945]
D(DCC(-2))	-0.556617 (0.34010) [-1.64249]	0.000264 (0.01511) [0.01744]	-0.273531 (0.18914) [-1.44750]	-0.037301 (0.02562) [-1.45613]
D(DRL(-1))	-5.275557 (2.53434) [-2.08164]	-0.059599 (0.11262) [-0.79561]	-0.297575 (1.40937) [-0.21114]	0.890655 (0.19089) [4.66589]
D(DRL(-2))	7.672805 (3.20580) [2.39341]	-0.097347 (0.14245) [-0.68336]	-0.276485 (1.78279) [-0.15521]	-0.164761 (0.24146) [-0.68235]
C	0.006029 (0.01083) [0.55693]	0.000639 (0.00048) [1.32760]	-0.001149 (0.00602) [-0.19088]	0.001091 (0.00082) [1.33535]
R-squared	0.826490	0.950310	0.347203	0.833092
Adj. R-squared	0.776117	0.945561	0.157681	0.784634
Sum sq. resids	0.131761	0.000260	0.040748	0.000747
S.E. equation	0.065195	0.002897	0.036255	0.004915
F-statistic	16.40716	25.33361	1.831993	17.19229
Log likelihood	59.50051	157.1624	53.55575	165.5269
Akaike AIC	-2.414659	-8.642067	-2.588232	-7.586677
Schwarz SC	-1.996715	-8.224123	-2.170287	-7.168733
Mean dependent	0.022148	0.001822	0.000111	0.002528
S.D. dependent	0.137765	0.007372	0.039603	0.010581